SCIENTIFIC AMERICAN

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

Vol. XXXIX.—No. 20. [NEW SERIES.] NEW YORK, NOVEMBER 16, 1878. [$3.20 per Annum. [POSTAGE PREPAID.]

THE TORPEDO VESSEL, DESTROYER.

Captain Ericsson's new torpedo boat, which is shown in the accompanying engraving, was recently launched from the wharf of the Delamater Iron Works into the Hudson. This boat has several novel and peculiar features. Its bow and stern are exactly alike, terminating in very sharp wedges. The length is 130 feet, depth 11 feet, beam 12 feet, extreme. The rudder is wholly unconnected with the visible part of the stern, being attached to a vertical wrought iron post welded to a prolongation of the keel, just aft of the propeller. Its upper part is nearly four feet below water line. The tillers consist of thin plates of iron riveted on opposite sides of the rudder, a few inches from its bottom; they are operated by straight rods connected to the pistons of horizontal hydraulic cylinders of five inches diameter attached to the sides of the keel. Accordingly the steering gear will be placed ten feet below water line, while the top of the rudder only reaches within four feet of the water line. This vessel is so far impregnable that in attacking bow on, it can defy the opponent's fire, offering absolute protection to the commander and helmsman, as well as protecting the base of the smoke pipe.

The hull is provided with an intermediate curved deck extending from stem to stern, composed of plate iron strongly ribbed and perfectly water tight. This intermediate deck sustains a heavy solid armor plate placed transversely to the line of keel 32 feet from the bow, inclined at an angle of 45°, and supported on the aft side by a wood backing four feet six inches deep at the base. The steering wheel is applied behind this wood backing, a wire rope extending from its barrel to a four-way cock near the stern, by which water pressure is admitted alternately to the hydraulic cylinders at the stern, the motion of whose pistons actuates the rudder. The lower division of the vessel is supplied with air for supplying the boiler furnaces, by powerful blowers drawing in air from above.

During attack the Destroyer is intended to be as deeply immersed in the water as the monitors; but a deck house or cabin 70 feet long, composed of plate iron, is riveted water-tight to the upper part of the hull. As this cabin, which has no opening in the sides, virtually forms part of the hull, it would be safe to run with the upper deck considerably below the water line. Owing to the peculiarity of construction, the builder says that the new torpedo vessel will live at sea in any weather, more particularly since its stiffness is most extraordinary, an advantage resulting from the circumstance that the body must be heavily ballasted in order to insure deep immersion, there being no other weight placed between the two decks than cork and inflated air bags.

Captain Ericsson declines furnishing for publication a description of the torpedo or the machinery of the boat, but we are promised a full account of these appliances at some future time, when they will be laid before our readers.

The Art of Prolonging Life.

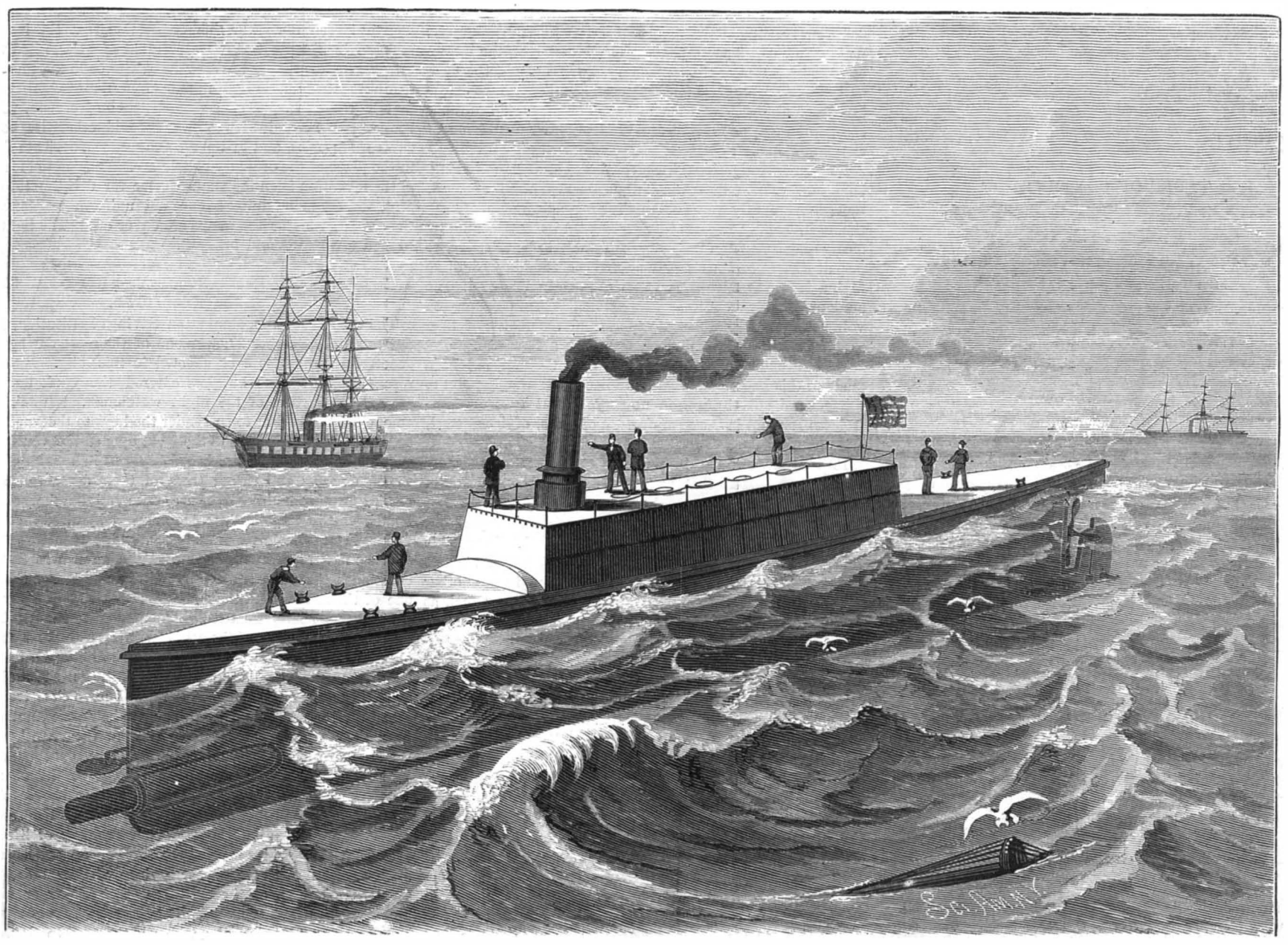
Persons living in marshy districts, says the Baltimore *Underwriter*, who are necessarily exposed to miasmatic exhalations, will find that lime juice mixed with water and taken freely as a beverage, will prove an excellent preventive of malarial fevers. Those who are suffering from intermittents will find that the antiperiodics, which are cheaper than quinine, the great type of the class, will answer as good purpose if taken in the only proper way, that is, a full or even heroic dose one hour before the expected recurrence of the chill. When distributed throughout the intermission in very small doses their effect is lost, and disappointment follows.

The medical gentlemen who so carefully prepared the tabulated reports of the mortuary experience of the Mutual Life, of New York, have shown in their admirable analysis of the causes of death, that the proportion of loss from consumption has been 19·17 per cent of the total mortality of the company, and 19 per 10,000 annually. Such figures show the immense importance of more effective methods of treatment, and we are glad to observe in the *Medical Record* the details of a treatment that, so far, has been very promising in its results.

The theory of cure is to clear the lungs by a mechanical effort, chiefly by manipulating the muscles of the throat so as to cause more forcible breathing; second, to establish perfect digestion; third, to promote a process of healing the tubercles, so that they shall become chalky or calcified masses; fourth, to compel the patients to take plenty of fresh air, sunlight, and out-door exercise. To secure perfect digestion, a special diet is ordered in each case, and the food is changed as the power of assimilating it improves.

To promote the calcifying of the tubercles, the salts of lime, which are found in most vegetable and animal food, must be supplied in a soluble condition; the theory is that too much heat in ordinary cooking destroys the natural combination of these salts with albumen, and renders them insoluble to a weak digestion. Out-door exercise is regarded as so important that the patients are instructed to go out in rain, snow, dampness, or even night air or dew, the habit thus acquired neutralizing the danger of catching cold from such exposure. Only strong head winds and extreme hot weather need be guarded against. The patients sleep with the windows open, summer and winter.

A Minneapolis physician, whose cinchona recipe for the cure of drunkards recently attracted attention, recommends this highly carbonaceous mixture in the treatment of consumption: One half pound finely cut up beefsteak (fresh); one drachm pulverized charcoal; four ounces pulverized sugar; four ounces rye whisky; one pint boiling water. Mix all together, let it stand in a cool place over night, and give from one to two teaspoonfuls, liquid and meat, before each meal. The value of this method of supplying a sufficiency of carbon in a form that may be readily appropriated is obvious.



CAPTAIN ERICSSON'S NEW TORPEDO BOAT, THE DESTROYER.

© 1878 SCIENTIFIC AMERICAN, INC.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy one year, postage included..... **$3 20**
One copy, six months, postage included **1 60**

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

☞Single copies of any desired number of the SUPPLEMENT sent to one address on receipt of 10 cents.

Remit by postal order. Address
MUNN & CO 37 Park Row, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly every number contains 16 octavo pages, with handsome cover, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies 10 cents. Sold by all news dealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses, as desired.

The safest way to remit is by draft, postal order, or registered letter.
Address MUNN & CO., 37 Park Row, N. Y.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in a commercial places throughout the world. Address MUNN & CO., 37 Park Row, New York.

VOL. XXXIX., No. 20. [NEW SERIES.] *Thirty-third Year.*

NEW YORK, SATURDAY, NOVEMBER 16, 1878.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF
THE SCIENTIFIC AMERICAN SUPPLEMENT
No. 150,
For the Week ending November 16, 1878.

Price 10 cents. For sale by all newsdealers.

STEAM FROM PETROLEUM.

A recent article in one of our daily papers, entitled "Steam from Petroleum," evidently the production of an over-sanguine inventor or an imaginative reporter, has brought us a number of inquiries concerning the use of petroleum as a fuel.

The theoretic calorific power of ordinary petroleum is about 16, of anthracite coal 13, of bituminous coal 15; that is to say, a pound of petroleum, with perfect combustion, will raise 16,000 lbs. of water 1° Fah., a pound of anthracite coal 13,000° lbs. water 1°, etc., but the heating effects depend so largely upon the methods of combustion that, in ordinary practice, these theoretic values are but little considered, the estimation in which they are held as working agents being determined by the practical economies resulting from their use.

The extreme wastefulness of the methods of using coals has long exercised ingenious and scientific minds in endeavors to find some remedy; but the best results thus far obtained by the improved Siemens and Ponsard gas furnaces and the pulverized fuel process show a utilization of but 20 to 25 per cent of the total heat of the fuel—a great gain certainly over the 7 to 8 per cent utilization in the ordinary reverberatory furnace, but still far short of the object aimed at.

On the discovery of petroleum in America the attention of metallurgists was at once directed to it in the hope of finding a fuel possessing important advantages over coal, and in every direction methods were devised for its application to metallurgic purposes; but its constitution and character were so little understood, so little known of the peculiar treatment demanded for the development of its powers as a fuel, that most of the proposed methods proved worthless.

After the elimination of the majority of these, several remained which possessed, in a greater or less degree, certain points of value. It had been determined, for instance, that the oil should be reduced to a fine spray or atomized, as it is called; that a jet of steam impinging upon a drip of the oil and conveying it into the furnace was the most effectual agent for this purpose; and that an exceedingly large amount of air was required to combine with the gases to insure complete combustion.

These points were thought to cover all the requirements, and various styles of apparatus were designed to carry them into effect, and were experimented with in various places. The results of some of the most favorable workings, as reported by Boards of Naval Engineers, showed economies of from 38 to 68 per cent over the use of anthracite coal in the generation of steam, and the further advantages of great reduction in weight and bulk of the fuel, in labor of firing, and in quick attainment of high temperatures.

As might be expected, however, of these early attempts, the apparatus was, in all cases, imperfect, the conditions necessary to complete combustion not yet understood, nor the dangerous character of the fuel fully provided against; therefore, notwithstanding the economies shown, the incomplete combustion with its accompanying offense, the difficulty of controlling the temperatures, and the occasional explosions and fires which alarmed both owners and insurance companies, led, on all sides, to the temporary abandonment of the new fuel.

Further investigations, however, here, as well as in England and France, determined that the steam jet as used, though apparently indispensable for atomizing or scattering the oil into spray, greatly interfered with its combustion by abstracting heat from the flame, and that, to be effective, to permit perfect combustion, it should be superheated to so high a degree that it would vaporize the oil on contact. The amount of air required for smokeless combustion—52 volumes to 1 of petroleum vapor—and the fact that they should be thoroughly mingled, were also ascertained.

Within the past few years so good an account has been made of this knowledge that all indications strongly point to the general substitution, in no very distant future, of petroleum for coal in the manufacture of glass, of iron, steel, and other metals, and for the formation of steam.

Prolonged workings in puddling and heating furnaces have demonstrated that by its use double the number of heats, as compared with coal results, can readily be obtained in a given time and with an economy of full 50 per cent with coal at $5 per ton and oil at $10 per barrel. In crucible furnaces, wherein a higher temperature is required and less of the calorific value of coal is utilized than in any other metallurgic operations, the advantages of the new fuel, as demonstrated in Pittsburg in the manufacture of steel for the East River bridge, are still more decided.

Under boilers an average evaporation of 14·98 pounds of water from 212° Fah. has been obtained from 1 pound of the oil, which had a theoretic efficiency of 17·5; and another instance is given of an evaporation of 16·77 pounds of water from 212° by a pound of oil, 17·52 theoretic value.

The great disparity between the practical effects of oil and coal—so much in excess of the difference in their calorific powers—is explained by the wasteful consumption of the solid coal, as above noted; while the combustion of the oil is very nearly or quite perfect, and is completed within the furnace, thus securing for the work from 85 to 90 per cent of its total heat.

The intensity of the oil flame, too, is a most important factor in the economy, assuring a temperature of nearly 3,500° Fah., in a properly-constructed furnace. This heat and the exceptional purity of the flame—there being no residual ashes or sulphurous gases—also insure purer iron in the puddling and melting, and better welding in the heating furnace, and the present unusual advantages to workers of glass.

The dangers ordinarily attending the use of this new fuel have been overcome, in one instance at least, by an ingenious and simple device that has been approved by those underwriters who have had it brought to their notice, thus removing an objection which has operated seriously against the earlier adoption of the process.

Coal tar and the residuum of petroleum are also utilized in this manner by liquefying them by heat or mixture with the oil, so that they will flow readily, but the residuum of ashes from their combustion is objectionable in some cases. Coal oils also are capable of being used with good results by this method, but the supply of petroleum will not, for a long while at least, be likely to become so limited or its price so high that economy will require any of these substitutes.

It is not, by any means, to be supposed that science and ingenuity have been exhausted in bringing the petroleum fuel process to its present strong position; it is yet in its infancy, and, as attention is drawn to it, will be improved in many respects. Because of its youth and the little experience with it, and its former unsatisfactory performance, it has been slighted by manufacturers; and because it will revolutionize the present methods of furnace-firing, it will for a considerable time be successfully opposed by the workmen, who like not to be forced out of their well-worn ruts, and who usually control such matters in the majority of iron works.

There are many rival inventors in this field striving to pass one another in the race, but most of them seem to be almost hopelessly out with their crude and unpractical appliances and ideas; and to this class, judging from inspection of the furnace, etc., at the Brooklyn Navy Yard, and from general observation, belongs, in our esteem, their designer.

Quite recently the inventor of perhaps the most perfect system for using this fuel has applied it to the manufacture of polished sheet iron, with results superior to any before attained in this country.

It would be difficult, we think, to name any process which, even at its present stage of development, is more worthy of the attention of all those manufacturers to whom cheaper fuel is a matter of any importance.

ANOTHER NEW ELECTRIC LIGHT.

During the past week the Electro-Dynamic Light Company of New York have exhibited an electric light which is, to say the least, very promising. The apparatus employed was the Sawyer-Man electric lamp, the joint invention of William E. Sawyer, a well known and successful electrical inventor of this city, and Albon Man, of Brooklyn. As we hope soon to lay before our readers a complete description of the lamp, with illustrations of its mechanism, we will merely remark in this connection that the lamp is inclosed in a hermetically sealed globe of glass, filled with nitrogen, and appears to differ from the common mode of exhibiting the electric light in non-supporters of combustion, mainly in the addition of a slender pencil of carbon, which completes the circuit between what would otherwise be the two carbon poles, and by its incandescence furnishes light, in the place of the ordinary voltaic arc. An essential feature of the invention is an ingenious device for dividing the current, and for maintaining a constant uniform resistance in the circuit, whether the lamps are on or off. The light exhibited was steady and brilliant.

A REMARKABLE BANK ROBBERY.—SCIENTIFIC SAFEGUARDS NEGLECTED.

The robbery of the Manhattan Savings Institution, Sunday morning, October 27, was one of the most daring and successful burglaries ever effected in this city. By some means unknown the burglars entered the bank building after the departure of the night watchman, at 6 o'clock, compelled the janitor to surrender the keys to the vault and secret of the combination of the lock, opened the vault, and spent nearly three hours of broad daylight in breaking open the inner safes and rifling them of their contents. They carried away something like three million dollars' worth of bonds, chiefly registered, and perhaps a hundred thousand dollars in negotiable paper and cash.

The most remarkable feature of the affair was the circumstance that an institution having the reputation of being one of the soundest in the country should prove to have its treasures so poorly guarded. The fact that the combination of the outer lock of the vault was intrusted to a feeble old man living in the same building is scarcely less astonishing than that the directors of the institution should have availed themselves of none of the well known electrical and mechanical appliances for defending their safes, not only from the assaults of burglars, but even the unauthorized entrance of those who had them in charge, except during banking hours. It is but another evidence of the amazing indifference of most men not scientifically educated to the scientific aspects of modern life, and the means which science provides for extending the scope and security of life and property. Here were men of reputed culture and sagacity intrusted with the care of the savings of thousands, who must have known of the existence of chronometer locks, by means of which the vault would have been closed against even the over trusted janitor who held the combination, during all hours not devoted to regular business. They must have known also of electrical appliances, by means of which

© 1878 SCIENTIFIC AMERICAN, INC.

not only the vault but the entire premises of the bank could have been so securely guarded that no well informed burglar would venture to attack it; and if some blunderer did enter the police would be instantly warned, and the invader captured in the act, as has occurred in several instances where the electric alarm has been used.

Yet these reputedly intelligent and careful directors did not realize that they were neglecting to take "all reasonable precaution" to insure the safety of the property in their care. It is, we say, but an additional evidence that men not scientifically educated are very apt to lack an adequate comprehension of the real conditions of modern life—what science has done and is daily doing to change the conditions to which life and property are subject. The incessant advances which science and invention are making to bring even the occult powers of nature into subservience to man are, it is true, so multitudinous and rapid that it is hard for the most studious to keep pace with them. It is true also that the best trained minds are apt to lose their alertness with age, and settle down into grooves out of which it is hard to get. But that only makes it all the more necessary for those in positions of great trust, like bank directors, to have in their employ some one who makes it his business to inform himself some one whose scientific bias leads him to look for scientific aids, and whose scientific training impels him to run counter to tradition and that easy-going confidence in what once sufficed, which, in the case of the Manhattan Bank, led to its easy plunder. Burglars are quick to avail themselves of scientific appliances. They must be met and vanquished in the same field.

It may be observed in this connection that the application of the telephone to the list of electrical safeguards presents a very promising field for experiment and invention. Warehouses, vaults, even the interior of safes, might be secretly and securely connected out of business hours with police headquarters, in such a manner as to insure the certain detection of any unwarranted entrance and the complete reporting of any burglar's movements.

A GRAND WORLD'S FAIR IN NEW YORK.

A numerously attended meeting was held in this city, October 31, for the purpose of initiating a movement for a world's fair to be held in New York in 1889. As expressed by the call, which was signed by many prominent manufacturing and commercial firms the object of the meeting was, in full, to consider the propriety of suggesting to the Mayor of New York that delegates from all the States be invited to assemble in this city on the 30th of April next, that being the ninetieth anniversary of the inauguration of Washington as the first President of the United States, and the establishment of constitutional government, in order that the proposition to hold a great exhibition of the industry of all nations in the city of New York, in the centennial year of that event (1889), or sooner, might be maturely considered.

At the meeting it was unanimously resolved, "That there be appointed an executive committee of ten, with power to add to their number, who shall take into consideration the subject for which this meeting was called, to determine when a National World's Fair shall be held in the city of New York, and authorizing such committee to take such action in the matter as shall be deemed advisable'

A Mexican Exhibition

The Mexican Minister of Public Works has just announced that the Government is about to nominate a commission to organize a special exhibition in that city at a conveniently early date. The exhibition is to be confined exclusively to American and Mexican productions, and to be under the direct auspices of the Mexican Government.

Mr. De Zamacona, who has the credit of suggesting this enterprise, is confident that it will be carried out. It certainly promises to furnish an admirable opportunity for our merchants and manufacturers to extend the export trade of the country. At any rate the friendly spirit shown by Mexico in thus limiting the exhibits to the productions of the United States and Mexico, ought at least to be met in a corresponding spirit; and the best way to show that would be by making a special effort to have our country, its resources and industries, adequately represented.

Australia to have a World's Fair.

The Department of State has been informed by the American Vice-Consul-General at Melbourne that it has been decided to hold an international exhibition in that city, commencing October, 1880. A public garden in the center of Melbourne has been secured for the exhibition, and Parliament has voted $300,000 for the erection of the necessary buildings. This will be the greatest exhibition ever held in the Southern Hemisphere. The Vice-Consul-General suggests that American inventors, for their own protection, should take out patents in each of the Australian colonies, each colony having a different patent law.

THE MOTION OF A WAGON WHEEL.

The instantaneous photographs of trotting horses, taken by Muybridge, of San Francisco, furnish the first visible demonstration of the much disputed fact that the top of a wagon wheel, when running along the ground, moves faster than the bottom. It is obvious that an instantaneous photograph of a wheel, revolving upon its axle in the air, would show all parts of the wheel with equal distinctness. But if the wheel have a progressive motion, and any one portion has a greater motion than its corresponding part, above or below, there must be a liability to blurring in that part of the picture.

These pictures are taken with so brief an exposure that the horse, though moving at a 2:24 gait, is sharply outlined. The wheels of the driver's sulky, however, have a different tale to tell. The lower third of each wheel is sharp and distinct as if absolutely at rest. Not so with the top, that part of the wheel showing a perceptible movement during the two-thousandth part of a second of the exposure of the plate. The upper ends of the spokes are blurred, and the rim likewise, thus giving a physical demonstration of the truth which mathematics establishes.

THE PARIS INTERNATIONAL PATENT CONGRESS.

The mails bring us part of the papers read at the International Congress on Industrial Property, held at Paris September 5th, and following days. The congress was authorized by a decision of the Minister of Agriculture and Commerce, under date of May 12, 1878, and the preparation was zealously undertaken by able men. An elaborate prospectus was prepared containing questions proposed for discussion, some of them rather metaphysical than practical, as will be seen by the resolutions which were adopted. The question of preliminary examinations has been discussed with great heat, but we are not yet informed as to the result. The tendency seems to be toward the adoption by all European countries of a preliminary examination modeled after our own, as a protection to the inventor himself. The committee of organizations consisted of M. Renouard, Senator, Member of the Institute, etc., President; M. Bozérian, Senator; M. Tranchant, Member of the Council of State, Vice-President; Count Maillard de Marafy, President of the Consulting Committee on Foreign Legislation of the Manufacturers' Union; MM. Pataille, Huard, Pouillet, Rendu, authors of works on industrial property; Tusca, Member of the Institute, President of the Society of Civil Engineers; and many manufacturers.

About 300 persons, including members from nearly every state in Europe, were represented at the first session of the congress. From the United States were present Messrs. A. Pollock, of Washington, and Francis Forbes, of New York city. Mr. Pollock was elected one of the Vice-Presidents. The congress met in both the morning and afternoon; in the morning, in three divisions, according to the subject, namely, patents, trade marks, or designs and models. In the afternoon the questions presented by the divisions were debated and passed on by the whole congress. The members were thus enabled to concentrate their attention on the division which particularly interested them.

The following resolutions had been voted on and agreed to up to the time of the close of our advices:

1. The right of inventors and authors in the domain of industry, over their works, or of manufacturers over their marks, is a property right; civil law does not create it; civil law only regulates it.
2. Foreigners ought to be assimilated to citizens.
3. The stipulations of reciprocal guarantee of industrial property ought to be made the subject of special treaties independent of commercial treaties, as well as treaties for the reciprocal protection of literary and artistic property.
4. A special department for industrial property should be established in each country. A central depot for patents, trade marks, designs, and models ought to be added to it for the instruction of the public. Independently of all other publications, the department of industrial property should publish a periodical official journal.
5. A provisional protection ought to be granted to patentable inventions, designs, models, and trade marks shown at official or officially authorized international expositions.
6. The time during which inventions, marks, models, and designs are shown at official international expositions ought to be deducted from the total duration of ordinary protection, and not be added to it.
7. The provisional protection granted to industrial inventors and authors who take part in official international exhibitions ought to be extended to all the countries which are represented at these exhibitions.
8. The fact that an object is shown in an international exposition ought not to be an obstacle to the right of seizure of the article if it is an infringement.
9. Each of the branches of industrial property ought to be the subject of a special and complete law.
10. It is desirable that in the matters of industrial property the same laws should govern a state and its colonies, as well as the different parts of a state. It is equally desirable that the treaties reciprocally guaranteeing industrial property concluded between two states should be applicable to their respective colonies.

PATENT RIGHTS, AND WHO OPPOSE THEM.

In a communication to the Industrial Property Congress, lately held in Paris, Mr. Henry Bessemer, the inventor of the process of steel making known by his name, remarks that our food, our clothing, our light, our homes, with all their thousand luxuries, owe their present character to that indomitable spirit of research and improvement which is characteristic of the present age—a spirit powerfully fostered and deservedly encouraged by those laws which proclaim a personal property in inventions. Without this protection, not merely in the bare idea of some new force or unknown object, but in the development and creation of practical means, based on the new idea, whereby results never before obtained are realized for the benefit and advancement of mankind, Mr. Bessemer has no doubt that the rapid progress which the world has made, and is still making, in arts, sciences, and civilization, would receive a severe check, which would at once stop the avenues to wealth and fame, and would thus dam up the now overflowing stream of human intelligence, bar every road to improvement in the industrial arts, and send us back to those days of superstition and ignorance, from which the light of science has emancipated us.

Yet there are men who oppose all laws securing property in inventions, and whose "retrograde notions" are now being pressed upon the world with unwonted force. Who are they? Mr. Bessemer answers:

First. A class of manufacturers whose purely selfish view is to make the most of their present imperfect means of production. Such men, on principle, oppose all change, because it would personally inconvenience them.

Second. The unintelligent, in all positions of society, who have through life dragged their unimaginative existence along in the same rut, and believe in no other than the beaten path which only they are able to tread. Such people are opposed to all novel ideas.

Third. A too numerous class who, while able to appreciate an improvement in their trade, are not honest enough to pay an inventor for the benefit he has conferred on them, and who either openly set him at defiance, or try to escape his just claims by some miserable evasion of the law; but having been convicted in so doing, have had to pay heavy damages to the persons they have wronged. It is this class of opponents who cry out most loudly against the patent laws.

Doubtless, adds Mr. Bessemer, there are also some honest and honorable men who oppose patents conscientiously, and simply because they believe them to be injurious to the public interests; but this is a very small class, and is composed chiefly of persons having no real practical knowledge of the question, either in its scientific or commercial bearings.

It would be impossible to state more patly and compactly the composition of the anti-patent forces; and it would be well to test the motives of those who shall assail our patent system in Congress next winter by the fact noted under the third classification.

A STEAM JURYMAN.

The other day a summons, commanding Thatcher Magoin to present himself for service in the jury box, was returned to the Commissioner of Jurors with the information that it had been served upon the wrong party. The Commissioner said to the bearer:

"That settles it as far as you are concerned, but Magoin must come here and show cause why he should not be a juror."

"He can't," was the reply, "he's too busy. If he did come he would make things hot for you. Besides, you would have to send a derrick and a truck to bring him. He turns the scales at 5,000 lbs."

The Commissioner was incredulous; worse, he made remarks not complimentary to the speaker's condition with respect to sobriety. Then the summoned man explained.

"I am telling you facts, Mr. Commissioner," he said. "Thatcher Magoin is a steam engine, and is located at the foot of Fletcher street. I am Nicholas Morris, stevedore. Years ago I was employed by a man named Thatcher Magoin. I named my engine on pier 19, East River, after him. When the Directory man came to the dock to get names he saw the name of Thatcher Magoin on the engine, and thinking that he was the boss, put it in the book. You'll see it on page 949."

This, we believe, is the first time that a steam engine has been called to do political duty. There appears to be no reason, however, why a well conducted or well constructed piece of machinery, with a phonographic metric attachment, should not be able to hear and weigh evidence quite as efficiently as the average jury.

Cleopatra's Needle.

Northern climates are ill-adapted for the preservation of stone monuments, at the best; and when there is added to the inclemencies of the weather the action of a corrosive atmosphere, like that of London, the hardest stone stands small chance of preserving its integrity for any great length of years. The Egyptian column, Cleopatra's Needle, is scarcely in position on the banks of the Thames when the question of its preservation engages the attention of the Metropolitan Board of Works. At a recent meeting, the engineer and consulting chemist of the board reported that the surface of the Needle was in a condition that made it liable to be rapidly disintegrated by the action of the London atmosphere and by frost. It was recommended that a trial be made of a "stone solution," to harden the surface and make it impervious to the weather; but, on the assertion by members of the board that the same solution had been used without success on the Houses of Parliament, the matter was referred to a committee for further inquiry.

Electrical Test for Oils.

Professor Palmieri, of Naples, has recently constructed an apparatus which allows the purity of oils to be judged of by the resistance that they offer to the passage of electricity. Olive oil—a poorer conductor than any other—is taken as the standard of comparison. The apparatus may also serve to reveal the presence of cotton in silk fabrics; for a very small proportion of cotton in silk tissues greatly increases the conductivity of the latter.

© 1878 SCIENTIFIC AMERICAN, INC.

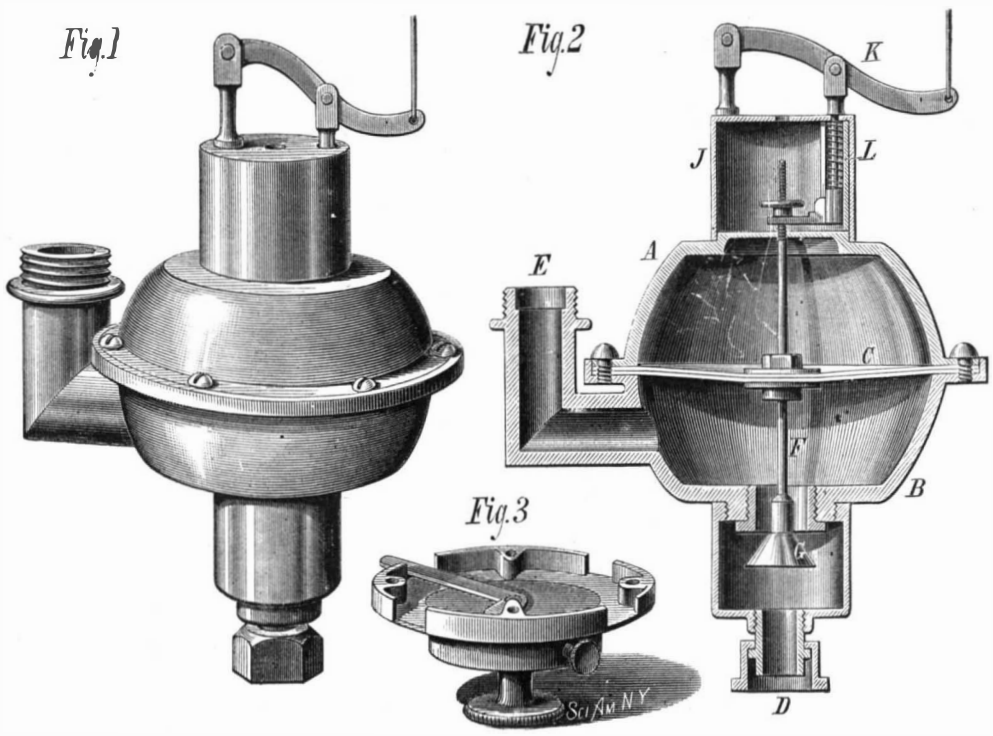
A NEW GAS REGULATOR.

The unavoidable fluctuation of gas pressure is the main if not the only objection to the use of gas as an illuminating agent. The sudden flaring up of the flame under increased pressure not only impairs the light and indicates a waste of gas, but it permits a quantity of unconsumed carbon to escape and vitiate the atmosphere of the room and endanger the health of the occupants.

The importance of avoiding the escape of unburnt carbon has not been fully recognized in this country. In Europe this subject has received considerable attention, and in many of the cities gas regulators are in general use.

We illustrate one of the most successful of these instruments, which, after the most thorough tests, has been adopted in several different departments of the United States Government, and it has been in successful use in many of the public buildings in Washington for several years.

The regulator, which is shown in perspective in Fig. 1 and in section in Fig. 2, has the usual casing composed of two hemispheres, A B, joined together by screws that pass through the flanges, between which the edges of the diaphragm, C, are tightly clamped. The lower hemisphere has an inlet, D, and an outlet, E. The diaphragm is composed of two thicknesses of pliable leather, having their adjacent faces coated with plumbago or other gas resisting medium. The coating being thus placed out of direct contact with the gas remains unaffected.



ADAMS' NEW GAS REGULATOR.

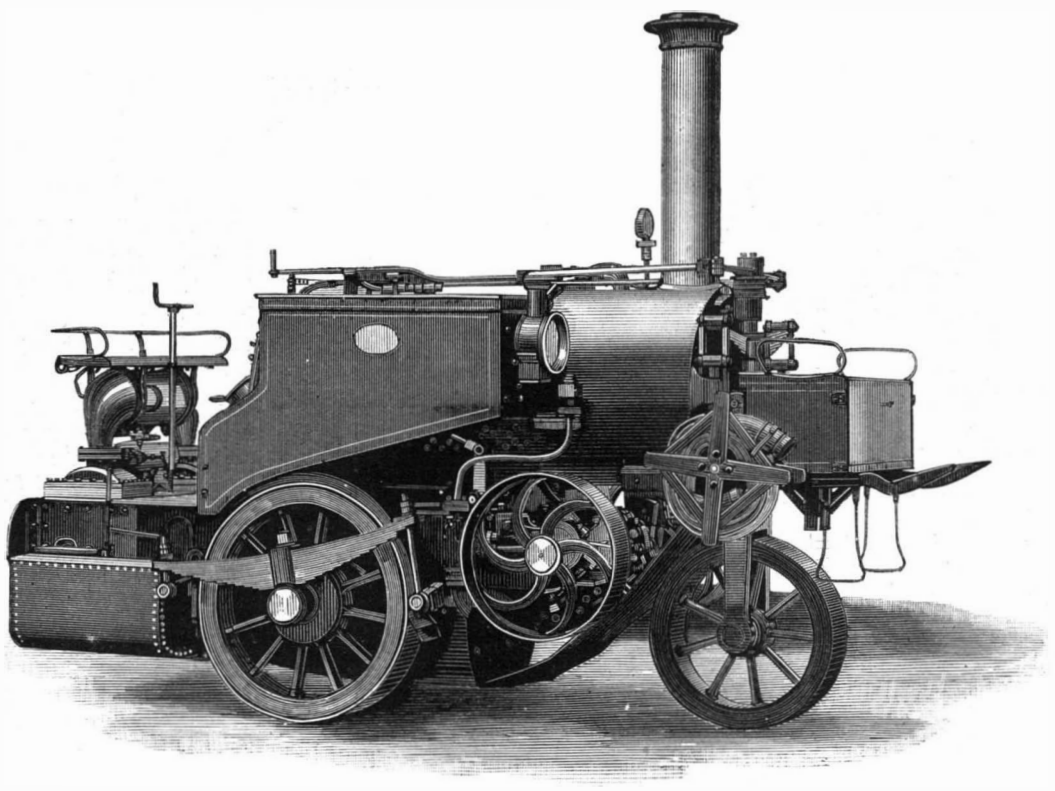
A valve stem, F, is suspended from the center of the diaphragm, and carries at its lower end a conical valve, G, which is capable of closing against the valve seat so as to entirely shut the inlet. The stem, F, rises above the diaphragm and passes through a hole in the top of the casing into a supplemental case, J. A lever arm, K, is pivoted in a standard at the top of the supplemental case, and is connected with a vertically sliding rod, L, which carries at its lower end a forked foot that embraces the valve stem, F, below the adjusting nut. The sliding rod, L, moves in a tube, and is pressed downward by a spiral spring. The lever arm, K, is connected by a wire with the knob, shown in Fig. 3, either directly or through a system of bell cranks or pulleys. By turning this knob, the regulator may be adjusted so that any desired pressure may be had in the distributing pipes; this pressure will thereafter be maintained with certainty and uniformity. Any increase in the gas pressure in the regulator raises the diaphragm, and by closing the valve diminishes the supply; a diminution of pressure produces the contrary effect.

This regulator was recently patented by Mr. Joseph Adams, through the Scientific American Patent Agency, who may be addressed for further particulars at Room 40, Corcoran Building, Washington, D. C.

COMBINED TRACTION ENGINE AND STEAM FIRE ENGINE.

A combined traction engine and steam fire engine, constructed by M. A. Schmid, of Zurich, and exhibited at the Paris Exhibition, has as a test of its lability to travel, made the journey from Zurich to Paris, a distance of about 450 miles, in eight days. The engine itself, in service, weighs six tons, and brought with it a wagon weighing about five tons, containing coals sufficient for forty and water for fifteen miles. As there were in the road over which it passed gradients of one in seven, there can be no doubt of its ability to surmount any ordinary difficulties. As will be seen from the illustration, for which we are indebted to the *Engineer*, the engine is supported on three wheels, the leading wheel being worked by a crosshead and lever bars from the foot plate. The distribution of weight is very happily chosen, and the consequent tendency to upset on uneven ground, with only three wheels, is entirely obviated by the way in which almost the entire load is thrown on the driving wheels. The cylinders have a diameter of seven inches and a stroke of ten inches, and the motion is communicated to the driving wheels by toothed gear and an endless chain. The latter can be instantly disconnected, and the engine used either as a steam fire engine capable of throwing 300 to 400 gallons per minute under a pressure of 100 lbs. to the square inch, or as a portable engine for agricultural purposes. The diameter of the driving wheels is forty inches, and of the steering wheel thirty inches; the grate surface is five square feet, and the heating surface one hundred square feet; the usual pressure of steam is 150 lbs. to the square inch.

According to the statement of those who accompanied the engine from Zurich, the journey was effected without any mishap or breakdown of any kind. The highest speed attained was fifteen miles per hour. The tires of the wheels give evidence of the nature of the road over which it passed; otherwise there was nothing about it to denote the test it had withstood. With regard to the general disposition of the moving parts, certainly no space has been lost, but the difficulty of making repairs has been proportionately increased; and although the state it is now in shows no sign of an early probability of any repair being required—excepting, of course, the renewal of packing, etc., which it has already undergone without any extraordinary removal of parts—the replacement of any damaged or worn member would undoubtedly necessitate a considerable dismounting of many members which, in an ordinary engine of this class, would neither interfere nor be interfered with. We cannot speak too highly of the workmanship, and from its performances as witnessed in the limited space within which its gyrations are confined, the favorable impression derived from its finish, compactness, and general appearance has been fully confirmed.



NEW TRACTION ENGINE.

New Mechanical Inventions.

An improvement in Vibrating Churns has been patented by Mr. Samuel Mellon, of Cameron, West Va. The object of this invention is to furnish a mechanism by which a churn may be easily operated, and to construct the operative parts in such a manner that they may be readily attached to and taken off the churn.

An improvement in Vehicle Springs has been patented by Mr. David G. Wyeth, of New Way, Ohio. This is an improvement upon the spring covered by letters patent No. 187,694, issued to the same inventor. The improved gearing has a less number of parts and also a greater compactness as a whole, so that it is lighter and cheaper than the other.

A Vehicle Wheel Hub has been patented by Mr. Daniel May, of Lumberton, N. C., which consists in a hub having mortises in the axle box for the spokes, which mortises are open at alternate sides, and collars having projections on their inner faces to enter the mortises in the axle box, so that the mortises are closed after the spokes are inserted. The collar at one side closes the openings on that side, and the openings at the opposite side are closed by the other collar.

An improvement in Trimmers for Wax-thread Sewing Machines has been patented by Messrs. Joseph I. Pellerin and Hector Pellerin, of Montreal, Quebec, Canada. The object of this invention is to provide means for applying the principle of cutting the leather simultaneously with the seaming thereof to the class of shoemakers' sewing machines which use a waxed thread.

An improved Waxing Device for Sewing Machines has been patented by Mr. Wm. S. Hadaway, of Chiltonville, Mass. This invention is intended to furnish for power-operated sewing machines an improved thread-waxing device that can be easily adjusted for differently sized threads, and that may be easily regulated for the quantity of wax to be used, so as to save a great portion of the wax hitherto wasted.

An improved Machine for Straightening Car Axles has recently been patented by Mr. Joseph A. Hodel, of Cumberland, Md. By a system of adjustable jacks and yoke with counter screw, the straightening strain is confined to the part that is already bent without affecting the other parts of the axle.

Mr. Eben Brown, of Milford, Mass., has patented an improvement in Machines for Turning Needle Blanks. This invention is to automatically regulate the action of the cutting tool upon the blank in turning machines, so that the blank will be cut to the standard gauge, and the tendency of the machine to enlarge the needle or other article produced from the blank is corrected by the act of forming such blank.

An improved Stock Car has been patented by Mr. Henry S. Moody, of Omaha, Neb. The object of this improvement is to protect cattle from bodily injuries, to allay fever, and to counteract the effects of heat, thirst, and exhaustion, from which the animals so severely suffer as the result of the present mode of transit in railway cars. This improvement secures to the consignor the full normal weight, and the consumer the benefit of meat in a prime and healthy state.

© 1878 SCIENTIFIC AMERICAN, INC.

VAN RENNES' CALORIC ENGINE AND PUMP.

As a motor of small size for use in the trades, a new construction of hot air engine and pump has recently been brought out by Mr. D. W. Van Rennes, of Utrecht, Holland, which has quickly found favor, owing to its simplicity and low running expenses.

This motor is represented in our illustrations, in which Fig. 1 shows a motor of the smallest size, heated by a gas flame; Fig. 2, one for four horse power; and Fig. 3, a vertical section of a motor connected with a so-called caloric pump.

On a solid bed frame of suitable size is supported a closed cylinder, T. At the inside of the cylinder is a large piston, X, whose rod, *e'*, passes through a stuffing box, *e*, to the outside. Between the piston, X, and the walls of the cylinder, T, is left a small communicating space. The upper part of the cylinder, T, is surrounded by a funnel shaped jacket, *t*, which is partly filled with water for the purpose of cooling, while the lower end of the cylinder is heated up by a gas flame, and in larger engines by a coal or coke fire. The temperature of the air at the inside of the cylinder becomes by the heat of the fire higher at the lower than at the upper part of the same. The heated air ascends in the space around the piston to the upper part, and passes through a pipe projecting from the cover and through a rubber tube to a small copper cylinder, *p*, which oscillates on a pillar, D, and is open at the bottom. The pressure of the air forces the piston, *a'*, of the small cylinder, *p*, forward, and moves simultaneously the piston of the stationary cylinder downward. As the piston rod, *e'*, of the large piston is connected by a walking beam and crank rod with the crank shaft of a flywheel, and also the piston of the oscillating cylinder by a piston rod with a second crank of the flywheel shaft, it is obvious that the two rectilinear motions of the pistons produce the rotary motion of the crank shaft. As soon as the pistons, X and *a'*, have arrived at their terminal points, the cooling water jacket begins to exert its influence. The cooling off of the air above the pistons, X and *a'*, produces a partial vacuum, which, in connection with the direct pressure of the atmosphere on the bottom of the piston, *a'*, lifts the piston, *a'*, and returns simultaneously the piston, X, into its former position. The alternate raising and lowering of the pistons produced by the continuous heating up of the large cylinder, produce a continuous rotary motion, which may be utilized.

The caloric pump has in its working some similarity with the "Pulsometer," only that heated air effects here what steam accomplishes in the other. As in the caloric engine the cylinder, *p*, is connected with the main cylinder, so in the pump a cylindrical vessel is connected by a pipe, *r*, with the cylinder, T. A suction pipe leads therefrom into a water reservoir below, while a force pipe, C, runs from the top to the place to which the water is to be conducted. The mouths of both pipes are closed by valves, *n* and *o*, which open upwards. The heated air passes through the opening, *m*, into the cylindrical vessel, and into pipe, *c*, closing the valve, *o*, and opening the valve, *n*. As soon as the air is cooled off by the cold water jacket, the atmospheric pressure closes the valve, *n*, while a partial vacuum is formed above valve, *o*. This in connection with the air in the suction pipe causes the opening of the valve, *o*, and, by the partial vacuum created in the suction pipe, the lifting of the water from the reservoir. The next supply of heated air cannot escape through the pipe, *c*, as the lower end of the same is closed by the water; it therefore exerts a pressure thereon sufficient to force it up and out through valve, *n*. As soon as the pump is in motion, a continuous current of water, but no air, is forced through valve, *n*, so that by the action of the fire below the cylinder, T, the alternate heating and cooling of the inclosed air, and thereby the continuous raising of the water, are produced. One of these pumps is at work in a factory near Amsterdam, where it lifts per minute 28½ gallons of water to a height of 18 feet, and works to the great satisfaction of the owners.

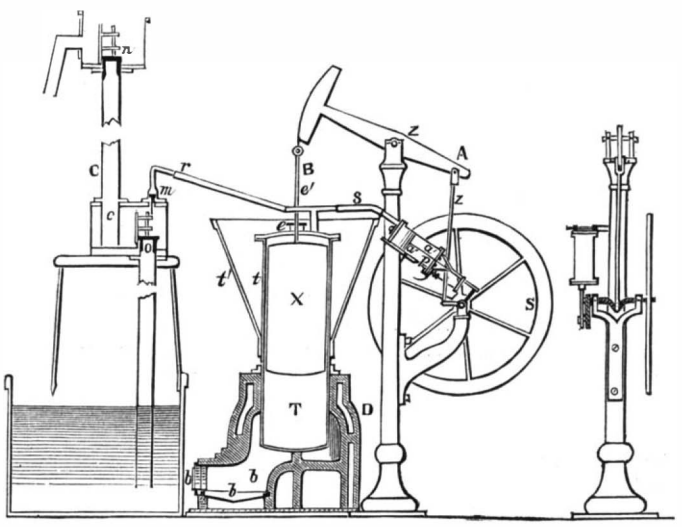


Fig. 3.—VERTICAL SECTION OF ENGINE AND PUMP.

Building in Steel.

In their final report the Committee of the British Association on the use of steel for structural purposes, states "that the employment of steel in engineering structures should be authorized by the Board of Trade under the following conditions, namely: 1. That the steel employed should be cast steel, or steel made by some process of fusion, subsequently rolled or hammered, and that it should be of a quality possessing considerable toughness and ductility, and that a certificate to the effect that the steel is of this description and quality should be forwarded to the Board of Trade by the engineer responsible for the structure.

"2. That the greatest load which can be brought upon the bridge or structure, added to the weight of the superstructure, should not produce a greater strain in any part than 6½ tons per square inch. In conclusion, we have to remark that in recommending a coefficient of 6½ tons per square inch for the employment of steel in railway structures generally, we are aware that cases may and probably will arise when it will be proposed to use steel of special make and still greater tenacity, and when a higher coefficient might be permissible, but we think those cases must be left for consideration when they arise, and that a higher coefficient may then be allowed in those instances where the reasons given appear to the Board of Trade to justify it."

This report has since been acted upon by the Board of Trade in the printed paper issued by them in reference to railway structures. "It will be observed," they say, "that a coefficient of 6½ tons per square inch is assigned to steel, that of iron being 6 tons per square inch. This increase of the coefficient will effect important economy in structures, especially in bridges of large spans, and will also tend generally to increase the employment of steel for railway and shipbuilding purposes."

This measure seems to have been designed in the special interest of steel manufacturers as opposed to iron manufacturers, to secure to them advantages which would not naturally accrue to them, else we think a higher coefficient, a greater difference in strength and resisting force, as compared with iron, would have been demanded of the steel.

New Inventions.

Mr. Martin Bock, of Hughesville (Drum's P. O.), Pa., has patented an improved Clock Case, in which a time movement, a striking movement, and an alarm movement are carried in and by a single frame, and inclosed in a case of neat appearance and of compact form and size; provision is made for operating and regulating the various parts from the exterior of the case; a cheap, substantial, and serviceable clock is produced, and several advantages are obtained.

An improved Annealing Furnace has been patented by Mr. Edwin H. Hill, of Worcester, Mass. This invention relates to an apparatus for annealing and spooling wire at one operation, while it is more particularly intended for wire used on reaping machines; it is also applicable to other descriptions of wire.

Mr. Ferdinand Diescher, of New York city, has patented an improved device for attachment to a bedstead to prevent children from falling out of bed. The invention consists in a number of strips of wood jointed together at their upper ends and having the lower ends spread out fan-like, and attached to the bedstead by means of a socket that receives the middle strip.

Mr. Philip Listeman, of Collinsville, Ill., has patented an improved Gate, which is so constructed that it may be conveniently opened and closed by a person on horseback or in a vehicle. It is simple in construction and easily operated.

An improved Post Hole Digger has been patented by Mr. Charlton Patterson, of Rock Island, Ill. This invention consists in the combination, with the digging bucket, of an annular piston and central piston rod, operated by a connecting rod and lever, the latter being pivoted to the hollow handle of the post hole digger.

Morris Jacobs, of Fort Clark, Texas, has patented an improved Padlock which cannot be unlocked by a key, in the ordinary manner, without a preliminary and peculiar manipulation in order to place the tumblers or locking bolt in the required position for contact with the bit of the key. The body of the padlock is made in two separate parts, the one being pivoted to the other, and capable of rotation (when released by spring catches) to change the position of the tumbler and bolt with reference to the key hole.

Mr. Seth Kethledge, of Center Point, Iowa, has patented an improved Lumber Measure, in which the motion of the spur wheel or toothed disks is transmitted to an indicator which has a reciprocating rectilinear motion longitudinally of the carrying frame or case. No adjustment is required for the purpose of measuring boards of different widths. Instead of a circular dial there is a scale marked with figures arranged in columns extending longitudinally on the surface of the carrying frame or case, and a separate column is provided for each of the different standard lengths of lumber.

An improvement in Rotary Engines and Pumps has been patented by Messrs. Walter E. Bartrum and Henry C. Powell, of London, England. This invention relates to rotary apparatus that may be employed as an engine worked by steam or other fluid under pressure, or as a pump for raising or forcing fluids, or as a liquid or fluid meter.

Mr. Frederick K. Collins, of Butler, Ind., has devised an

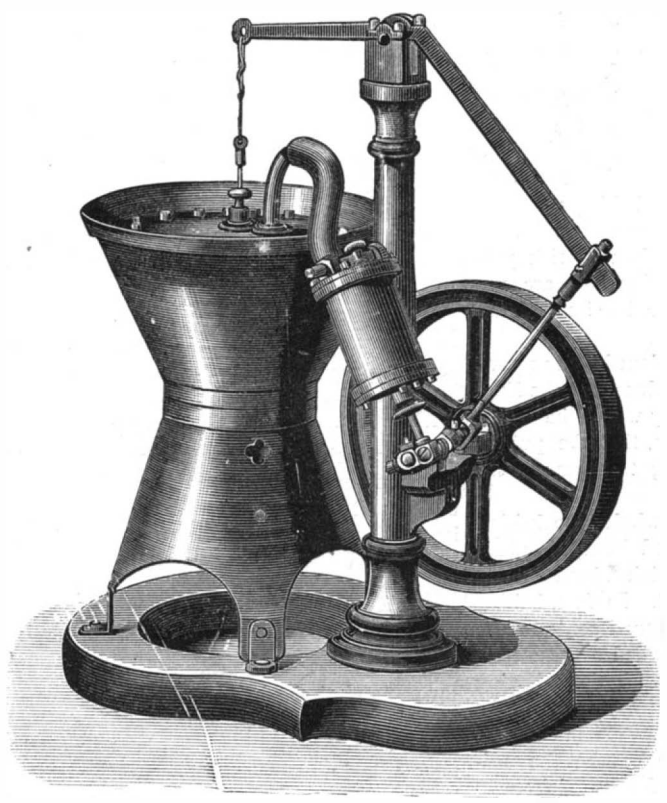


Fig. 1.—SMALL CALORIC MOTOR.

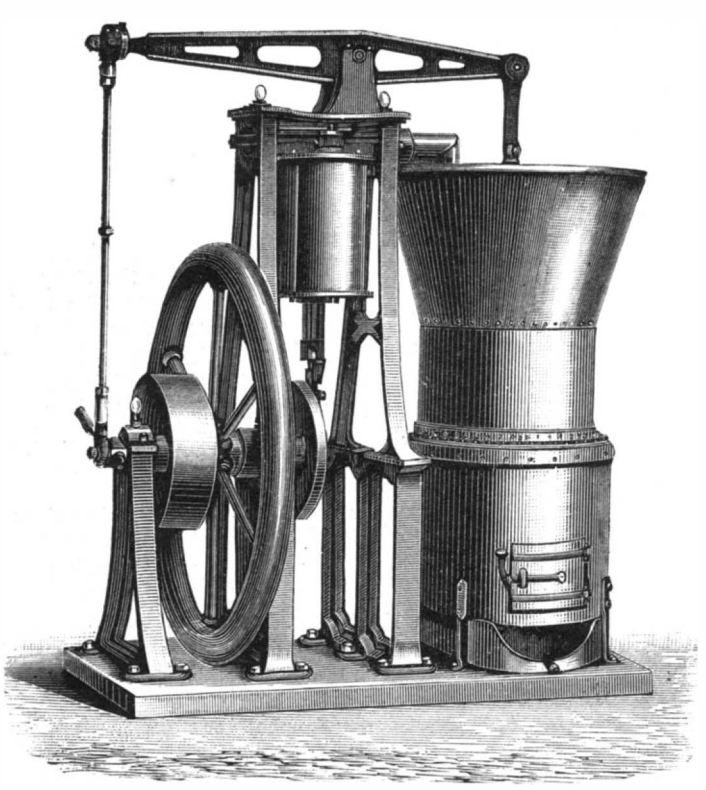


Fig. 2.—FOUR HORSE POWER CALORIC ENGINE.

© 1878 SCIENTIFIC AMERICAN, INC.

improved attachment by which the person sleeping or resting on a bed or sofa will be fanned, thereby insuring a more comfortable rest in hot weather. The invention consists of a bed cover or cloth that is hung to hooks at the foot end of the bedstead, and attached to fulcrumed crank arms at the head end of the bedstead. The crank arms are operated by crank rod connection from a suitable clock train, so as to impart a fanning motion to the spread or cover.

Mr. Floyd Heavener, of Laramie City Wyoming Ter., has patented an improvement in Wind Wheels, designed to render the same self-governing by causing the area of resistance which the wheel presents to the wind to be automatically varied in inverse proportion to the force of the wind, to render the action of the wheel uniform.

Correspondence.

The Deleterious Use of Alum in Bread and Baking Powders—Alum being Substituted for Cream of Tartar

BY HENRY A. MOTT, JR. PH.D., E.M.

Having been appointed Chemist by the United States Government for the Indian Department, it became my duty to submit to chemical analysis, among other articles, the various baking powders offered the Department, and as a result of my investigation I found that at least fifty per cent of the baking powders offered were grossly adulterated. After making this discovery I determined to submit to analysis every baking powder I could find on the market, and to expose such powders as were adulterated, so that the public may be warned from purchasing them in the future. The number of baking powders I have examined amount to *forty-two*—twenty-nine of them from various sections of the country having been offered to the Department, and thirteen obtained from various grocery stores throughout the city of New York.

Instead of the baking powders of commerce being composed alone of those constituents which have been demonstrated to be perfectly harmless and wholesome, the public have imposed upon them powders largely adulterated with most injurious and hurtful compounds, put up in cans neatly labeled "chemically pure," as if that fact (?) had anything to do with rendering the powders wholesome. Scheele's green (arsenite of copper) is often "chemically pure," but it is always a deadly poison.

It, therefore, becomes necessary for the benefit of the public to examine into the powders on the market, and to denounce such of them as are composed of constituents detrimental to health.

The best powders are composed of bitartrate of potash (cream of tartar), tartaric acid, carbonate of ammonia, and bicarbonate of soda, held together to prevent decomposition by a little starch.

The injurious powders are composed of alum and bicarbonate of soda, and often contain terra alba (white earth), insoluble phosphate of lime, etc., etc. The effect of alum when taken internally has been shown by Wilmer and others to produce dyspepsia, constipation, vomiting, griping, and even inflammation of the gastro-enteric mucous membrane, as it is a powerful astringent acting chemically on the tissues. These serious effects will not of course be brought about immediately from the small quantity of alum used in one loaf of bread, but it is certain that persons continuing to eat bread containing alum will, in time, suffer from its evil effects, and the weaker the constitution the sooner will the effects be noticed.

Duma speaks to the same effect when he says: "It is to be feared that this salt exerts a deadly action by its daily introduction into the stomach, especially in persons of a weak constitution." And other great authorities, such as Carpenter, Dundas, Thompson, Gibbon and Normandy, all agree that the continued use of bread containing alum will bring about dyspepsia and other troubles, and such was the opinion of the late Baron Liebig. The celebrated Pereira considered "that whatever may have been the effect in the case of healthy persons, sick persons did really suffer in that way." In the *Lancet* is mentioned a case in whom dangerous gastro-enteritis was apparently induced by a single dose containing between ten to twenty grains of burnt alum. Dr. Parkes, in his work on Hygiene, states that from eight to forty grains of alum, and probably more, have been found in a four-pound loaf of bread.

The effect of alum on bread is to tend to whiten it, and to prevent an excess of fermentation (when yeast is used) when the altering gluten or cerealine acts too much on the starch; but while it accomplishes this object, it lessens at the same time the nutritive value of the bread by rendering the phosphoric acid insoluble.

Sufficient proof, I think, has been shown that alum is a most dangerous element to introduce in baking powders, and it now becomes necessary for the benefit of the public to expose such unwholesome and injurious powders as contain it. Having analyzed the Royal Baking Powder, I find it composed of only those elements which have been demonstrated to be perfectly wholesome and healthful, having for its active principle pure grape cream of tartar instead of the injurious alum used in the following powders. I do not mean by signalizing the Royal Baking Powder, that it is the only properly made powder on the market, as there may be others equally as good. I simply introduce it as I had to select one, and thought the one I had used in my kitchen for years, and which had always proved satisfactory, would be the best illustration.

Out of the many baking powders I have examined, I have selected the more prominent ones that are adulterated, giving in each case a quantitative analysis of the same. The following analyses are of "Dooley's Standard Baking Powder" "Patapsco Baking Powder," "Charm Baking Powder," and the baking powder manufactured by C. E. Andrews & Co., of Milwaukee. The analysis of the last three baking powders given in the first column was made by Professor Robert W. Schedler.

No. 1.

DOOLEY'S STANDARD BAKING POWDER.

Burnt alum	26·45 per cent.
Bicarbonate of soda	24·17 " "
Sesquicarbonate of ammonia	2·31 " "
Cream of tartar	None
Starch	47·07 " "
	100·00

No. 2.

PATAPSCO BAKING POWDER.

Smith, Hanway & Co., Baltimore, Md.

		Analysis by Dr. Mott.
Burnt alum	19·16 per cent	20·03 per cent.
Bicarbonate of soda	23·36 " "	22·80 " "
Cream of tartar	None	None
Starch	57·48 " "	57·17 " "
	100·00	100·00

No. 3.

CHARM BAKING POWDER.

Rohrer, Christian & Co., St. Louis, Mo.

		Analyzed by Dr. Mott.
Burnt alum	29·60 per cent	30·06 per cent.
Bicarbonate of soda	31·13 " "	31·82 " "
Cream of tartar	None	None
Starch	39·27 " "	38·12 " "
	100·00	100·00

No. 4.

BAKING POWDER MANUFACTURED BY C. E. ANDREWS & CO., MILWAUKEE, WIS.

Burnt alum	22·53 per cent.
Bicarbonate of soda	21·79 " "
Cream of tartar	None
Starch	55·68 " "
	100·00

On reviewing the above analyses it will be seen that, in the "Patapsco Powder," about 20 per cent of burnt alum is used, over 22 per cent in Andrews', over 26 per cent in Dooley's, and about 30 per cent in the Charm. And the manufacturer of "Dooley's Powder" not only has the audacity to put on the market this injurious and unwholesome powder, but to put upon the labels the deceptive statement, "chemically pure."

Not one pound of these powders could be sold in England, as it is against the law to use alum for making bread. Why have we not such a law?

A case is reported in the English Law Reports of 1871-2, 7th Queen's Bench, 135, November 15, 1871, where a baker was convicted for using alum in making bread.

I could furnish, if it were necessary, analyses of many other alum powders, as at least 50 per cent of the baking powders contain alum; but the above serves to illustrate their nature, and to show the importance of discriminating with a great deal of care when purchasing baking powders. It is far better to select only "standard powders," as the "Royal Baking Powder," for example, than to risk purchasing the many adventurous compounds which are sure to be put on the market by persons who have no higher motive than dollars and cents.

What would become of the above-mentioned baking powders containing alum if they were introduced on the English market? The answer is simple—they would be swept out of existence. It is to be hoped, then, that the public, by refusing to purchase them, will bring to them all the same fate.

By exposing these injurious and unwholesome baking powders, the public must not be frightened from using baking powders when properly made—of which I have already stated there are a number on the market. In fact, baking powders are a great convenience, as the constituents are so combined that their use is always attended with success; and there is no danger of biscuits made with them having an alkaline taste, or being impregnated with yellow specks or streaks, as is often the case when ordinary cream of tartar and soda are used. This results from the fact that the ordinary cream of tartar found in market is adulterated from 10 to 90 per cent with foreign substances; consequently it becomes necessary to change the proportion to be used with every new lot, which can only be correctly arrived at by a chemical analysis of the cream of tartar.

The advantages of using "baking powder" in preference to yeast are, that with the former none of the nutritive parts of the flour are destroyed, a larger yield is obtained, and the result accomplished with a great saving of time, which would otherwise be required to promote the fermentation when yeast is used.

The advantages of using "baking powder" in preference to the ordinary cream of tartar and soda found on the market are not only that it is more economical, but the results are always attended with success, there being no fear, as stated, of producing an alkaline taste or yellow streaks in the product.

The Swedish Buckeye Machine.

To the Editor of the Scientific American:

In number 25 of the SCIENTIFIC AMERICAN for the 22d of last June, Mr. E. H. Knight, in a letter from the International Exhibition in Paris, concerning the reaper and mower exhibits, says that "Westeras Mekaniska Werkstad" has illegally pirated the patented "Buckeye machine" of Adriance, Platt & Co., of New York; and in a bold faced manner entered on a contest at the Exhibition. As these statements have been published even in the Swedish newspapers, we respectfully request that you in your paper would copy the following explanations:

The Buckeye machine is not patented in Sweden. In consequence whereof is anybody in this country justified in making a copy of the same.

Westeras Mekaniska Werkstad has never pretended to be the inventor of the machine, and which as well our advertisements from the commencement of the manufacture, as our catalogues plainly ascertain, when mentioning that "it is made from the Buckeye model," although that has not been inscribed on the machine, as such a thing has been deemed unnecessary.

We have certainly not thought there was anything cabalistic in the figures; we have simply let them remain (in order not to alter the model) and use them in our catalogues so as to give such countrymen of ours, who are in possession of American Buckeye machines, an opportunity of obtaining parts for reserve, which otherwise would have been almost impossible.

The Swedes are not yet able to stand a contest with the Americans in the construction of harvesters, especially as they only for a few years past have been used in this country, and then of American make. The handiwork has formerly here been cheap, and harvesters therefore less necessary; but of late, on account of several reasons, the day's wages have been raised and the farmers compelled to, at a very high price, buy American machines in want of any Swedish ones.

Consequently, when we came to the conclusion of making reapers, we thought ourselves best serve the public at large by using a pattern which we considered the best; and we certainly believe that we have acted with perfect honesty as long as we never have claimed those copies to be our own invention; on the contrary, always told their origin, though not on the machine itself, as we have deemed that unnecessary, every machine being accompanied by a catalogue explaining that it is of the Buckeye construction, and the appearance so plainly shows the copied model, that no doubt regarding our position of manufacturers of the said machine ever ought to arise.

WESTERAS MEKANISKA WERKSTADS AKTIEBOLAG.

Westeras, September, 1878.

The Mound Builders' Unit of Measure.

Mr. J. W. McGill, who has been making a critical study of the artificial mounds of northeastern Iowa and contiguous parts of Wisconsin and Minnesota, finds considerable evidence of the employment of a unit of measurement in their erection, the possession of which would prove the mound builders to be tolerably advanced toward civilization when they entered the country. In the *American Journal of Science and Arts*, for October, Mr. McGill gives a large number of measurements made by him in one of the most extensive systems of mounds in northeastern Iowa, and arrives at the conviction that the linear unit employed by the builders was simply, or had grown out of, the pace or yard.

The northern limit of the mounds of definite dimensions is not certainly known. Mr. McGill has sought vainly for evidence of the use of measurements in the most northerly of the mounds. His own examinations so far extend only to latitude 43° 30′ N., and there the mounds are of constant or related dimensions. The most northerly of the measured mounds are undoubtedly within Minnesota.

In conclusion Mr. McGill observes that if we assume a slow southerly migration to have taken place in the mound builders, it will explain the evident increase in geometrical knowledge attested by the various works found in passing across the United States from north to south. In the Northwest we find measurements of simple lines, but not of angles or areas. In Ohio, angles were correctly measured, the squares being accurate squares and the circles perfect circles; and areas were measured, as attested by adjoining squares and circles being equal or very nearly equal in area, though there is no satisfactory evidence that the cardinal points were then known. In the lower Mississippi region the cardinal points were known. The gradual modification in the various arms and implements, and the striking improvements in pottery, together with many other important considerations, lend support to this view.

A FULTON, N. Y., man recently laid his finger on the table in front of a buzz saw to feel the momentum of the air. The saw was going so fast that the teeth were not to be seen. His finger was taken off. While he was looking at it the foreman came up with the question: "How did you do it?" "Why, I put my finger down so," answered he, placing the other forefinger, as he thought, well away from the teeth. To his horror, the saw took off that one, too, at the second joint.

© 1878 SCIENTIFIC AMERICAN, INC.

Parsnips.

The *Journal d'Agriculture Pratique* contains an article in favor of the parsnip as fodder for all kinds of domestic animals, and especially for milch cows. The author first notices some of the charges that have been made against the root as provoking certain diseases, and shows that they have but slight foundation. He then quotes Trehonnais, who ranks this as first among roots in respect to nutritive value.

In Bretagne 100 lbs. of parsnips are considered as equivalent to 300 of beets, and 16 to 18 lbs. of parsnips in the daily ration increase the flow of the milk and the richness of the milk in butter; several authorities are quoted as making similar statements, and among them so trustworthy a writer on these subjects as Magne. As to richness in nitrogen and proportionately in albuminoids, Corenwinder gives the following statement: Parsnip, 1·38 per cent; sugar beet, 0·25; red carrot, 0·23; ruta baga, 0·23; white turnip, 0·16. On good authority the albuminoids are regarded as the most valuable constituent of fodder, and therefore according to this comparison between these several roots, the parsnip is by far the most valuable one for this purpose.

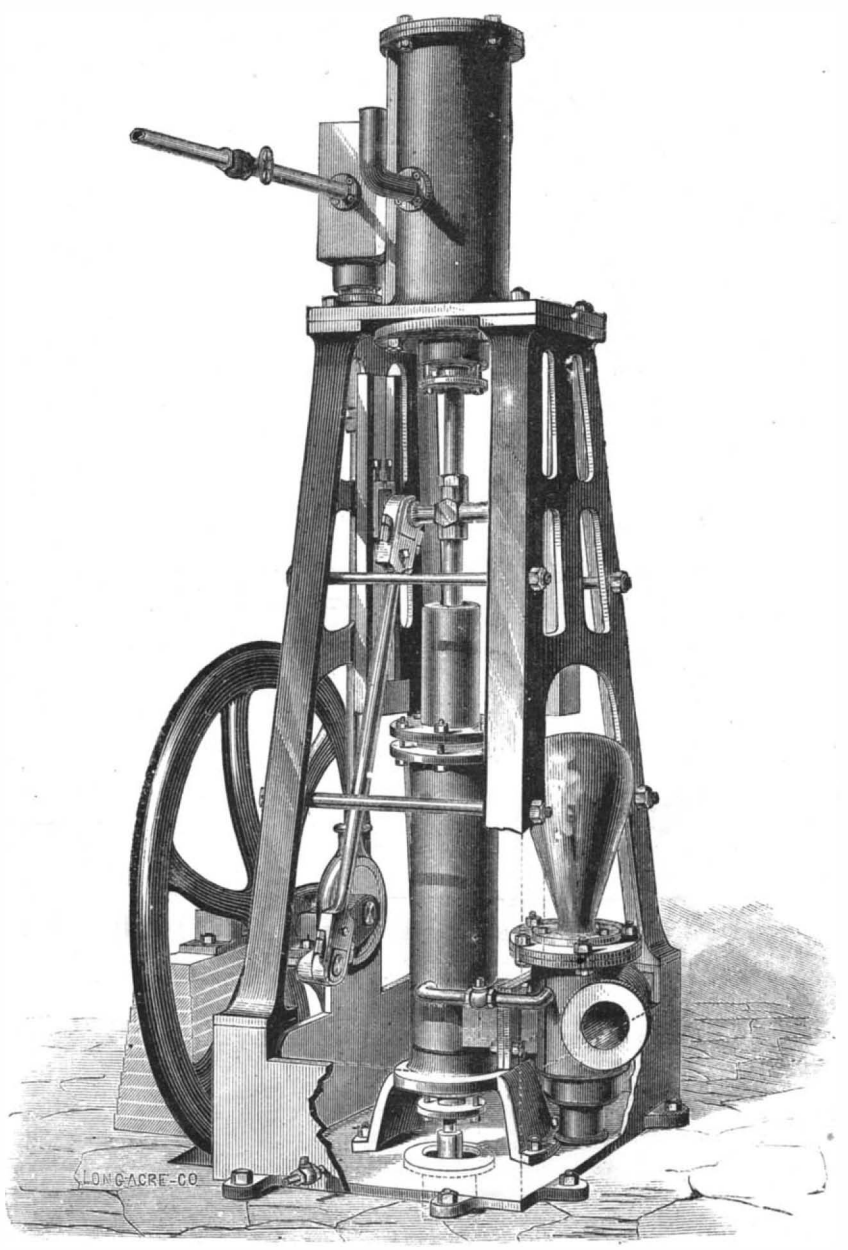
THE WATSON PUMP.

Philadelphia, at the present time, has a widespread and well earned fame for the production of many varieties of tools and machines, from the smallest implement to the stately locomotive, and other gigantic engines. At many of the machine establishments specialties are made the prominent articles of production. The Novelty Machine Works of Mr. James Watson, No 1,608 South Front street, Philadelphia, is one of these, where are manufactured a number of specialties, among which is the force and lift pump, for artesian wells or other deep pumping, shown in our engraving. The piston rod, plunger, and lifting or deep well rod of this pump, being in direct line, make the machine both simple and efficient. The bed plate is so constructed as to make a delivery water tank, from which the force pump takes its supply.

One of these pumps is now in operation in the artesian well at the Continental Hotel, in Philadelphia, where it raises water from a depth of one hundred and fifty feet into the tanks, which are placed upon the roof of the building one hundred feet above the pump room. The engineer in charge attests its perfect efficiency: it is so simple as to give no trouble should any repairs be required after long use. It lifts one gallon and a half of water to the stroke, or sixty gallons a minute; and it is very economical in the use of steam.

These pumps could be advantageously applied for purposes of irrigation in such sections as the arid lands of Colorado, and other districts that only require a supply of water to produce abundant vegetable growth, and thus greatly enhance the value of the land.

The machines are all of the best material and workmanship. We may also here state that the entire machinery of the Continental Hotel is driven by one of Watson's steam engines, which satisfactorily performs the work assigned to it. Mr. Watson has recently constructed some very superior machines for crushing bones, used in making fertilizers and manufactures; a patent gap lathe, and several very effective milling machines, and a variety of other labor-saving machines and implements. None but the best artisans are employed on the premises, and the whole work is superintended by the proprietor in person, who was practically brought up to the business by a long apprenticeship in England, and thus is calculated to direct understandingly the mechanical operations, as well as to attend to the theoretical and designing departments. Mr. Watson has secured a high reputation, both as a manufacturer and a man of business, by his skill, promptness, and probity.



THE WATSON PUMP.

Albumen of the Serum and that of Egg, and on their Combinations.

The alkaline albuminates differ according to the degree of concentration of the alkali employed. Weak alkalies give rise to a combination which does not yield in solubility to paraglobulin. The acid albumens differ equally according to the energy and degree of concentration of the acid. M. Aronstein had about the same time arrived at the following results: "That by dialysis, albumen can be obtained free from salts; that the albumen, both of blood and of eggs, is soluble in water, and does not coagulate on boiling, even after the addition of an acid; that the coagulation of these two species of albumen under the influence of heat is due to the presence of foreign salts." The results are diametrically opposite to those of the author. He concludes that Aronstein and Schmidt regarded their dialyzed albuminous solutions as free from salts, because they incinerated too small quantities of matter; that their solutions remained limpid on heating, because they still contained alkali, and that they did not obtain coagulation after the addition of an acid, because such acid was used in excess. He finds that after the most complete dialysis, there is obtained a combination of albumen with phosphate of lime and magnesia, which is soluble in water, but a really neutral solution of which abandons albumen in a coagulated form at the boiling temperature; that it is not possible to obtain by dialysis albumen free from salts, and that we are not justified in pronouncing it a compound soluble in water.—*A. Heynsius.*

New Agricultural Inventions.

An improvement in Grain Binders has been patented by Mr. Ignatz Karel, of Blue Earth City, Minn. This invention relates to grain binders for binding grain by means of twine; and it consists in a device for bundling, which also carries the twine to the knot-forming and twine-cutting mechanism. It has a novel arrangement for forming the knot.

An improved combination Digging Implement has been patented by Mr. James P. McCann, of Wesson, Miss. This is a new digging tool in which different kinds of spades, shovels, forks, hooks, hoes, etc., may be interchanged upon the same handle, the latter by itself being available for use as a tamping bar.

Mr. Robert Eason, of Springville, Ohio, has recently patented a Cider Mill, by which the cider is made with great rapidity, and with but a small amount of manual labor, the different operations being all performed by use of suitable devices operated from the driving shaft of the mill. The cider mill may be operated by one attendant only, who controls the entire machine from one platform, accomplishing successively the grinding of the apples and pressing of the pomace, the removal of the pomace from the cribs, the filling of the cider into barrels, and the hoisting and conveying of the barrels.

Mr. John S. Lenox, of Gainesville, Texas, has devised an improved Fence, which may be constructed out of common materials, such as can be obtained by farmers, and in such a manner that it will be strong and effect a saving in expense and land. It consists in a rail fence having the rails laid up in a straight line and the bottom one resting upon a pin that is driven in the ground. Wire links are placed between the ends of the rails, and wire is used to hold the rails firmly in place, and also to secure the inclined stakes and riders.

Mr. Jacob Essig, of Milford, Minn., has patented an improved Machine for Thrashing Grain and cleaning it at one operation. This invention possesses novel features, which cannot be described without an engraving.

Messrs. William T. Hildrup and Albert Tschop, of Harrisburg, Pa., have patented a Feeding Device for Seeding Machines, in which the seed is delivered by a revolving feed roller. The peculiar construction insures a rapid, uniform, and even flow of seed.

Closing of the French Exhibition.

The great Exposition Universelle at Paris has taken place, and is now rapidly approaching its dissolution. During the past summer it has been the leading attraction not only in and for Europe, but for the world at large, and has been visited by hundreds of thousands of persons of all nationalities, ages, and ranks, and of both sexes. From England a constant stream of visitors has been kept up, not merely from London, but from every town of any consequence in the provinces. Persons in search of pleasure or recreation have this year put off their customary visit to the seaside or Scotland, and have gone over the channel in order to participate in the general gathering in the French metropolis. Business men of all trades and pursuits have traveled to Paris intent on the lessons to be learned there, and have, for the most part, returned home not sadder but certainly wiser men. They have thereby acquired a better and more thorough knowledge of the manufactures and producing capabilities of their Continental and American rivals, and, with the acquisition of that knowledge, have also imbibed a keener and plainer appreciation of the difficulties they have to encounter nowadays in maintaining their old control of the markets of the world. Many of the British visitors were scoffers at the mere mention of foreign competition, and scouted the very idea of the Germans, Belgians, or Americans being in a position to do us harm in any market. This was aforetime and prior to their walk around to the different sections of the Exhibition. They do not feel quite so confident about the matter since that promenade, and are certainly not disposed to underrate the progress made in recent years on the Continent and in the United States.

Our friends at home, continues the *Ironmonger*, have long been convinced of their ability to win in the industrial contest, but they have now begun to admit that it is urgently and vitally necessary for them to gird up their loins and put forth their utmost strength.

The same journal, in an article on agricultural machinery and implements at the Exhibition, thus expresses its inability to describe the multifarious articles in this department:

To write of the immense collection of agricultural machinery and implements in the different parts of the Exhibition with anything like justice, and with a due and fitting appreciation of the value and merits of each separate section, would be to produce a volume far exceeding the whole of the space at our command; hence it is quite clear that what we have to say on the subject must be closely condensed, and from a general rather than from a detailed point of view.

The French, English, and American sections each have a large area devoted to these appliances, the two former being particularly imposing, and the latter hardly less so. Other nations—Belgium, Sweden, Denmark, Norway, etc.—send samples of a rough-and-ready kind of what they can produce in these classes, but they are not of a nature to place their producers in the front rank, and certainly have no claim either to originality or to take any prominent position in any purely international comparison.

Beginning with our own set of exhibits, we may at once give it as our impression that we are at the top of the tree, nothing in the whole range of building being of that equable and high excellence which is, from beginning to end, characteristic of our productions.

Most of our leading agricultural implement makers are present, and they send fixed portable and traction engines, plows, harrows, drills, thrashers, corn dressers, mowers, reapers, hoes, scarifiers, etc., got up with the most assiduous care, and with that close finish which has so long enabled us in this respect to hold the rest of the world at arm's length. In fact, some of the engines, plows, mowers, etc., are so exquisitely got up, polished, or nickel-plated, that they look fitter for a lady's boudoir than for actual work. In pleasing the eye, nevertheless, the manufacturers have in no single particular neglected utility and solidity, so that every article shown will do its work as well in the field as one taken from ordinary stock. Each exhibitor seems to have rivaled his neighbor, so that the general result is a higher tone than has ever previously been noticeable in the same class of goods.

In that portion of the United States space devoted to the same articles we find almost all their principal houses "on the spot," not so much in machinery, as in implements and light contrivances. None of our readers need telling that in all kinds of implements the United States manufacturers are quite up to our own level. If they do not rival us in respect of solidity and finish, they are even with us on the scores of ingenuity, lightness, and the adaptability to special uses of particular articles. This is more observable in mowers, reapers, self-binders, hay and straw forks, and sundry small implements, than in anything else; and we shall merely repeat the record of an acknowledged fact when we say that in these matters our American cousins have done

© 1878 SCIENTIFIC AMERICAN, INC.

full justice to their reputations. Alluding to the French exhibit of agricultural machinery, the same writer says: It may be that we are able to find room for criticism here and there; that the portables are rather primitive in design and construction; that the reapers and mowers are somewhat clumsy; that bright brass drill tubes and boiler casings, and so forth, are not according to our ideas; but the broad fact still remains that the French are rapidly learning to manufacture all kinds of implements for their own use, and that they are quick to take advantage of all our improvements, as well as to note where we have failed. Under this great roof are all sorts of agricultural appliances from every part of France—from lost Lorraine to far Finisterre, from Rouen to Marseilles—some good, others indifferent, but all offering an increasing competition to us, and, consequently, placing more difficulties in our path.

The French manufacturers, it may be noted, appear to pay special attention, in the strength of cultivator tines, etc., to the great variety of soil in different parts of their country, and also discard all mere external ornaments for strength and solidity—especially in thrashers and the like large articles. In giving this measure of appreciation to our neighbors across the channel, we must not be understood to place them on a level with ourselves and the Americans, but simply do so to show that they are not asleep, but are actively and strenuously striving to supply themselves.

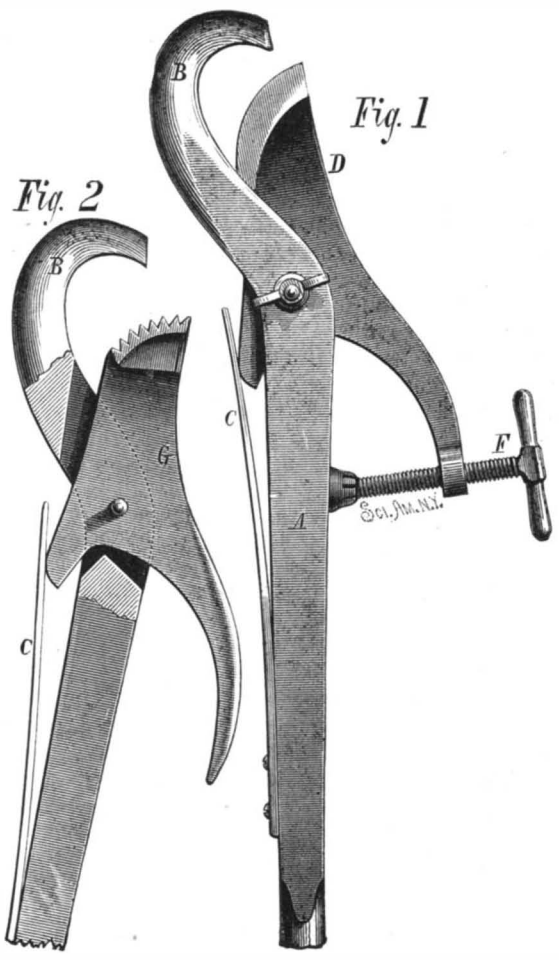
In the Swedish and Norwegian sections are a number of plows, chaff cutters, etc., which are more notable for their unusual strength than for any other quality. The plow beams and colters are uncommonly heavy, mostly of iron, and the shares, breasts, etc., are rough and uncouth. The chaff cutters are bulky and heavy, and have uninclosed feed motions. Our notice of this important section would be incomplete without a brief mention of a singular combination, shown near the Canadian timber trophy. It is a model of a combined reaper and thrasher, as used in South Australia, and of Australian manufacture. The knife bar is let down by a rack motion, and is geared on a universal joint from the road wheels, which also actuate a spindle moving the thrashing beaters in the hinder portion of the machine, into which the cut corn is forced in a continuous stream, so to speak. The machine is useful as showing the requirements of a climate where it is being already largely used; but that it is not in all respects satisfactory would appear to be shown by the offer of a reward of £4,000 for a perfect machine of the kind, by one of the Australian governments.

Roads in Baden.

In the Grand Duchy of Baden, in Germany, the government has built magnificent macadamized roads, as smooth as Central Park rides. These are lined on both sides by fruit trees—pears, apples, cherries, plums—and it is asserted that the fruit alone pays the full cost of repairs. All the droppings of the road are carefully and constantly scraped around these trees. The rain water of the road beds is led to them, and they bear most bountifully choice and valuable fruit. The beauty of such roads, nicely shaded, well kept, and in a picturesque country, is a thing never forgotten.

PIPE WRENCH AND CUTTER.

A new and very simple pipe wrench with a pipe cutting attachment is represented in the accompanying engraving.



TRULAND'S PIPE WRENCH AND CUTTER.

Fig. 1 shows the tool arranged for cutting, and Fig. 2, which is partly in section, shows the tool arranged for turning or holding pipe or round rods.

The handle, A, is curved, forming the jaw, B, near which there is a slot in which the cutter, D, is pivoted. One arm of the cutter is pressed by a spring, C, which is secured to the handle; a screw, F, passes through the other arm, and is used to force the edge of the cutter into the pipe as the tool passes over it. When the tool is used as a wrench the serrated jaw, G, is substituted for the cutter, and its engagement with the surface of the pipe is insured by the pressure of the spring, C, on one of its arms. The serrated jaw is disengaged from the pipe by the pressure of the thumb on the arm that extends downward nearly parallel with the handle.

This implement was recently patented by Mr. William L. Truland, of Lansingburg, N. Y., from whom further particulars may be obtained.

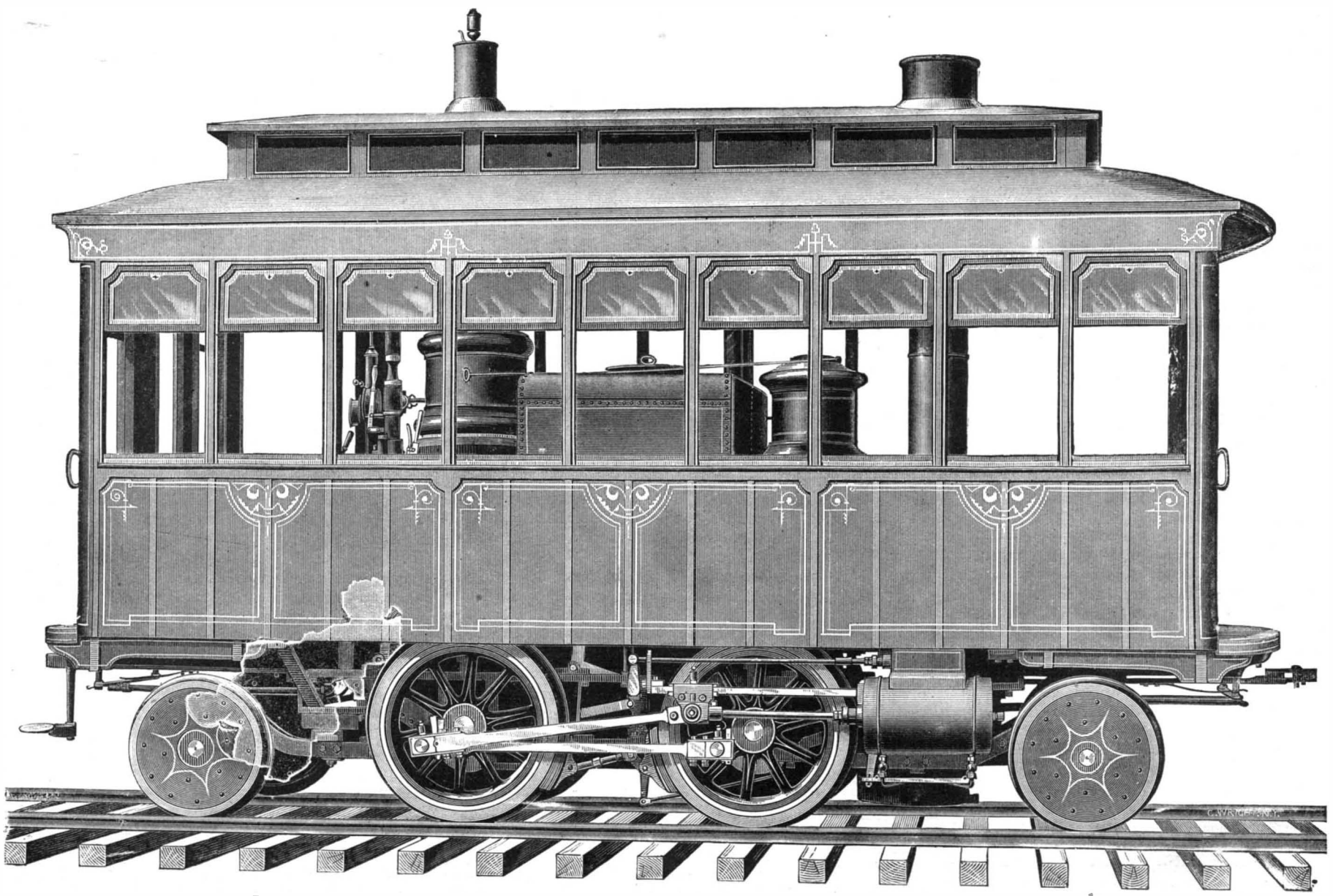
A Mirror Telegraph.

A party of gentlemen were standing on the Lake House porch recently watching the telegraphing between two parties of United States Signal Surveys. One party was stationed on the highest peak of the mountain range northeast of us, and the other on one of the peaks near Lake Tahoe. The telegraphing is done by an instrument known as the heliotrope, which concentrates the rays of the sun to a focus and casts them straight ahead, similar to a mirror, and by an agreed series of long and short flashes can communicate the temperature, etc., from point to point similar to telegraphing. This is in general use over the United States, and is of great value to the Weather Bureau. The party whose signals were noted is situated thirty-five miles from here, and yet the flashes were as bright as the sun.—*Reno (Nev.) Journal.*

WE understand that the fine steam engine now driving the machinery at the Mechanics' Exhibition in Boston has been purchased by Professor Edison, and will be placed in his laboratory at Menlo Park, N. J. The engine was built by C. H. Brown & Co., of Fitchburg, Mass., and is remarkable for its efficiency and finish.

LOCOMOTIVE FOR THE METROPOLITAN ELEVATED RAILWAY.

We publish on this page an engraving of one of the locomotives used on the Metropolitan Elevated Railway. The dimensions of these engines are as follows: Cylinders, 10 inches in diameter by 16 inches stroke; driving wheels, 39 inches diameter; truck wheels, 28 inches diameter; total wheel base, 15 feet 6 inches. The boiler is made of steel and has 125 flues 1½ inch in diameter and 70 inches long. The fire box is 42 inches long by 27 inches wide; axles, 4½ inches diameter; capacity of the tank, 320 gallons; weight of the engine loaded, 32,500 lbs.; weight on driving wheels, 27,500 lbs. These engines have now been working for several months, and have done good service. They pass around curves of 90 feet radius, and the heaviest trains consist of three loaded cars. The engines last ordered have larger boilers, and the cab is made shorter, so as to expose the water tank and a part of the boiler to view.

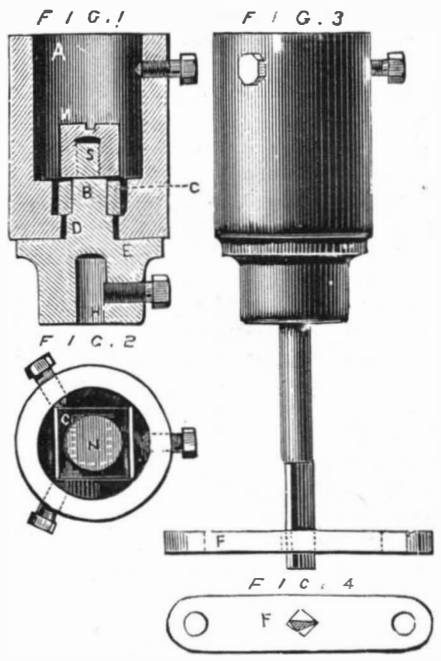


LOCOMOTIVE FOR THE METROPOLITAN ELEVATED RAILWAY, NEW YORK CITY.

© 1878 SCIENTIFIC AMERICAN, INC.

DRILLING SQUARE HOLES.

To drill a square hole with a rotary motion at one operation may seem to many a novelty in mechanics, but Mr. J. Hall, of Chancery Lane, has obtained a patent for a method of accomplishing the feat. For this purpose he employs a three sided drill, either flat or fluted, which, in cross section, is of the form of an equilateral triangle. He makes the bottom or cutting edges of the drill perfectly flat, and three in number, each cutting edge extending from one of the outer corners to the center of the triangle. The proposed method of using such drills in an ordinary vertical drilling machine is as follows: A special drill chuck, forming part of the invention, is provided, and attached to the lower end of the drilling spindle. The chuck is constructed in such manner as to admit of the drill traveling automatically in a horizontal plane some little distance. This is rendered necessary by the peculiar movement of the cutting edges of the drill, which does not operate or rotate on a fixed central point, but diverges somewhat in proportion to the size of the hole.



TOOL FOR DRILLING SQUARE HOLES.

The drill chuck is constructed in the following manner: The upper part of the cavity of a metal cylinder is bored out circularly, so as to fit on to the drilling spindle, to which it is screwed by one or more screws. Below the circular bore a square recess is made, and below this latter, and coming well within the limits of the square recess, there is a circular hole passing through the end of the cylinder. The drill holder or socket is in a separate piece, the bottom portion of which is provided with a square or round recess for holding the shank or upper end of the drill, which is held firmly in its place by means of a set screw. The device is shown in the accompanying engraving, which we take from the *English Mechanic*. The upper part consists, first, of a screw, S, at the top, Fig. 1; secondly, of a square shoulder, B; thirdly, of a circular shoulder, D; and, fourthly, of another but much larger circular shoulder, E. Through the circular hole at the bottom of the hollow cylinder the upper portion of the drill holder is inserted until the large circular shoulder meets the bottom of such cylinder. A loose square collar, A (Figs. 1 and 2), provided with an oblong rectangular slot, is then placed within the cylinder and over the square above mentioned, above and on to which is screwed down a nut, N, from the inside of the cylinder. The loose square is of such thickness that when the nut is tightened down on to the square shoulder the loose collar is left to work freely. When this is done the drill holder will readily travel in a horizontal plane such distance as the play between two of the sides of the loose collar, and two of the sides of the square recess, in one direction, and in another direction the distance of the play between two of the sides of the small square shoulder of the drill holder and the ends of the rectangular slot in the loose collar. The horizontal travel or play is proportionate to the size of the hole to be drilled. Near to the lower end or cutting edges of the drill is fixed rigidly a metal guide bar or plate, F. The guide bar is provided with a square hole similar to the hole it is required to drill, the dimensions of the three sides of the drill being such that the distance from the base to the apex of the triangle, which such three sides form, is the same as of the sides of the square holes it is required to drill.

Mr. Hall prefers to make the guide bar of steel, which he hardens at that part where the guide hole is made. The method of operation is then as follows: The three sided drill being fixed in the self-adjusting chuck, the guide bar with the square guide hole therein rigidly fixed above the point where it is required to drill, the drilling spindle carrying the chuck drill is made to revolve, and is screwed or pressed downwards, upon which the drill works downwards through the square guide hole, and drills holes similar in size and form to that in the guide. The triangular drill for drilling dead square holes may also be used without the self-adjusting drill chuck in any ordinary chuck, when the substance operated upon is not very heavy nor stationary; then, instead of the lateral movement of the drill, such lateral movement will be communicated to the drill by the substance operated upon

Although the patentee only cites the case of a vertical drilling machine in connection with this invention, he declares that the specified improvements are equally applicable to lathes, ordinary braces, ratchet braces, and all other descriptions of drilling apparatus. In making oblong dead square cornered holes, either the substance to be operated upon must be allowed to move in one direction more than another, or the hole in the guide plate must be made to the shape required, and the drill chuck made to give the drill greater play in one direction. Fig. 1 shows a vertical section of the improved chuck, in which A is the hollow cylinder, which may be attached to any ordinary drilling machine; H is the drill holder; S is a screw; B is a square shoulder; D is a circular shoulder; E is a circular shoulder of a larger dimension; N is a screw nut for tightening on to the square shoulder, B, and the loose square collar. Fig. 2 is a plan view of Fig. 1. Fig. 3 is an elevation of the improved chuck; C showing the three sided drill and the guide bar, F, complete. Fig. 4 is a plan of the guide bar, F, showing the three sided drill in cross section.

Indications of Progress.

While Paris has been reveling in excess of light, and, according to many, paying pretty heavily for it, we, says the *Electrician* (London) in issue of October 16th, have been waiting the results of the experiments. However, amidst the confusion of cries, there seems to be a general consensus of opinion that electricity is the best method of lighting under certain circumstances. This being the case, efforts are being made to supply any demand that may arise. No less than three electric light companies have been registered within the last few days, with a total capital of over £200,000. The British Electric Light Company, promoted by Mr. E. J. Reed, takes up Rapieff's patent, and is patronized by the *Times*. The Electric Lighting Company, promoted by Mr. Hollingshead, is to work the Lontin system, and is patronized by the frequenters of the Gayety, and all who walk through the Strand during certain portions of the evening. These two have a nominal capital of £100,000 each. The Sun Electric Light Company is the third and last, with a capital of £5,000 only. Mr. Strickland is the promoter, and the company is formed for the development of the Harrison system, about which little has been publicly said, but which private report mentions in the highest terms. The candles are said to surpass the Jablochkoff, and the division of the light seems to anticipate Mr. Edison. The public will soon be able to judge the value of these reports for themselves, as arrangements are being made to use the light on a very large scale.

RUSSIAN POTTERY.

We present engravings of two examples of unglazed Russian pottery of quaint design. It resembles in texture and material the old black Wedgwood ware so much admired by connoisseurs.

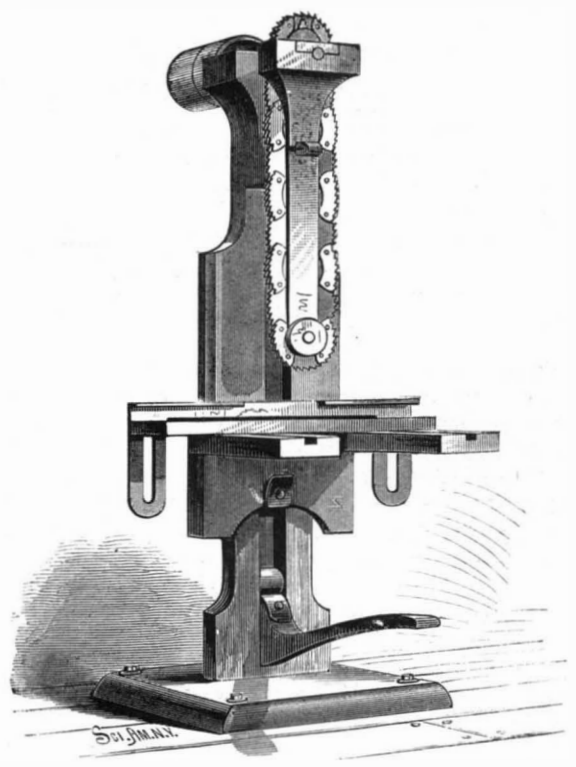
RUSSIAN POTTERY.

Practical Education in Russia.

In a letter from the Paris Exhibition, Col. Forney, of the Philadelphia *Press*, remarks that while American progress has astonished Europe, yet "Germany, Switzerland, and France have methods and systems that deserve to be studied. Even Russia may be a model for all of us. Yesterday I saw some Russian machinery at the Exhibition; and my admiration increased as I was told that much of this exquisite work was made by the youth, many of them sons of the best families, sent into the machine shops to learn trades as a part of their education. There was no alternative; they were compelled to pass this ordeal. The government is the master, and young Russia must obey; and now obedience becomes a delight; and it is as much the fashion to finish a practical education in this way, as formerly it was the fashion to pass through a school, or an academy, or college, for the easy acquisition of superficial accomplishments."

NEW MORTISING MACHINE.

A novel form of mortising machine, the invention of Mr. Wm. W. Green, Jr., of Chicago, Ill., is shown in the accompanying engraving. In this machine the usual vertically reciprocating chisel is replaced by an endless chain consisting of saw sections jointed together and running over two pulleys, the upper one of which is spurred, and acts as a driver. The lower pulley is journaled in the end of a vertical arm, which is of the same thickness as the endless chain saw.



GREEN'S MORTISING MACHINE.

The vertically sliding table which supports the work is of the usual description; but it is raised by very simple means. To the pedal is attached a strap, which passes under one pulley and over another, and is attached to the table. A downward pressure on the pedal raises the latter and carries the work up to the cutter. The width of the mortise may be varied by using pulleys of different diameters.

Recent Engineering Inventions.

Mr. William P. Barclay, of Virginia City, Nev., has patented an improvement in Hydraulic and Wire Rope Pumping Systems. In pumping machinery, such as is commonly employed in freeing mines from water, heavy rods of wood, jointed and bolted together by iron plates, are used. These rods, to have the requisite strength, become excessively heavy, requiring counterbalancing, thus throwing into the pumping apparatus a quantity of heavy material that requires to be oscillated at each stroke of the pumps, thereby consuming a great amount of power and rendering the action of the pump slow. By this improvement these difficulties are overcome and the pumping is effected economically. This invention employs as many force pumps in the mine or shaft as may be required, placing them one above the other at suitable distances apart. These pumps are provided with the usual inlet and discharge valves placed one above the other.

Mr. Frederick Bowen, of Barnhart's Mills, Pa., has patented an improved Pump for Oil Wells. The object of this invention is to provide for withdrawing and replacing the packing of the pump plunger in oil or artesian wells without disturbing the tubing or valves. It consists in the arrangement of the upper valves in connection with the cell containing the stuffing box, and in the manner of securing and removing the packing ring of Babbitt metal.

Comstock Silver Lodes.

The survey of the silver mines situated on the Comstock lode was carried on in 1877 by Professor I. A. Church, of Lieut. Wheeler's party. The character of the vein was carefully mapped from one thousand to two thousand feet deep. The heat varied from 84° Fah. in old drifts to 116° in freshly opened ones. The source of the heat is, it is believed by those in charge of the works, ascertained to be the decomposition of the rocks under the agency of atmospheric influences. This was observed of the thick sheets of lava

© 1878 SCIENTIFIC AMERICAN, INC.

lying upon the vein in the upper one thousand feet of rock. Below this it is known to be going on for fifteen hundred feet further. At 2,400 feet it is nearly uniform, neither increase nor decrease being observed. The miners cut through singular bands of hot and cold rocks, a fact which seems to suggest that the origin of the local heat is the motion which is taking place in tangential and orthogonal directions in the earth's crust as the result of its slow contraction by cooling. It is thought the lode will continue hot, but not increasingly so.

ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, November 16, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated:

PLANETS.

	H.M.		H.M.
Venus rises	6 28 mo.	Saturn in meridian	8 06 eve.
Mars rises	5 11 mo.	Uranus rises	0 06 mo.
Jupiter sets	9 19 eve.	Neptune in meridian	10 40 eve.

FIRST MAGNITUDE STARS, ETC.

	H.M.		H.M.
Alpheratz in meridian	8 18 eve.	Procyon rises	9 30 eve.
Mira (var.) in meridian	10 29 eve.	Regulus rises	11 33 eve.
Algol (var.) in meridian	11 16 eve.	Spica rises	4 14 mo.
7 stars (Pleiades) in merid.	11 56 eve.	Arcturus rises	3 17 mo.
Aldebaran in meridian	0 48 mo.	Antares sets	4 59 eve.
Capella in meridian	1 27 mo.	Vega sets	11 42 eve.
Rigel rises	7 53 eve.	Altair sets	10 30 eve.
Betelgeuse rises	7 39 eve.	Deneb sets	2 52 mo.
Sirius rises	9 55 eve.	Fomalhaut in meridian	7 07 eve.

REMARKS.

The moon at rising November 17 will be about 5° northeast of Regulus, and a few hours later will be 3° south of Uranus. Thursday morning she will be very near Spica, and several degrees southwest of Mars.

Venus now rises 20 minutes before the sun; she can nevertheless be seen, as we have seen her when only seven days from conjunction.

MOON'S PATH THROUGH THE CONSTELLATIONS.

Saturday, *Cancer*	15°	Wednesday, *Virgo*	12°
Sunday, "	29°	Thursday, "	26°
Monday, *Leo*	13°	Friday, *Libra*	11°
Tuesday, "	27°		

NOTE.—The number of degrees the moon has advanced in each constellation at 7h. 0m. evening, is given, being a convenient hour for observation.

Progress of Horticulture.

The members of the Massachusetts Horticultural Society celebrated the eightieth year of their oldest living fellow member, Colonel Marshall P. Wilder, by a fête at the Parker House, Boston, on the 21st of September. Colonel Wilder in response to remarks by Alderman Charles Breck, spoke as follows:

"Mr. President: I thank you for your kind expressions of respect, and you, my dear, dear friends, for the very cordial reception you have given me. Nothing could be more grateful to my feelings than these warm demonstrations of friendship and regard, coming, as they do, from those who have known me for many years and are conversant with my many frailties and faults. Yes, the wheels of time move on and tell the story of our bygone days; and if I live to see the opening of another Sabbath morn I shall have passed the bounds of fourscore years. Most devoutly would I render thanks to the Giver of all good that he has prolonged my life, and that I am able to be here with you on this joyous occasion—here in the presence of my beloved pastor, who for thirty years has been my spiritual adviser—here with so many kind friends and co-laborers, with whom I have taken sweet counsel these many years—here to receive your friendly salutations and, perhaps for the last time, to enjoy the sweet melody of your voices and breathe in the still sweeter consolation which arises like incense from off the altar of sympathizing souls. When we reflect upon our past labors, our thoughts naturally revert to the Massachusetts Horticultural Society, whose fiftieth annual exhibition has just closed, and for which you, Mr. President, and your good father have done so much. Well do I remember its first exhibition in the old Exchange Coffee House in this city. Well do I remember the scene, with its two small side tables and one at the head of the hall. Well do I recollect the contribution of fruits when Robert Manning, the great pomologist of America, contributed only two baskets of fruit, and the subsequent growth of his enterprise, when he donated many hundred varieties, and afterwards had in the Pomological Garden at Salem 2,000 varieties of fruit trees. Thank God, his son, bearing his own name, is with us to-day. Well do I remember the dinner at which sixty gentlemen participated, and the speeches which succeeded it. The scene is before me now. There sat at the head of the table the eloquent Dearborn; there on his right and left sat His Honor, Lieutenant Governor Thomas L. Winthrop (father of our beloved Hon. Robert C. Winthrop), and His Honor the then Mayor of the city, Harrison Gray Otis, and the accomplished statesman and orator, Daniel Webster of immortal fame. [Applause.] There, too, were Hon. John C. Gray, vice president, Dr. Jacob Bigelow, corresponding secretary of the society, and John B. Russell, all of whom still survive; and here to-day, much to our joy, are the brothers Hovey, who were present on that occasion. Well do I remember the toast of General Dearborn—'Intelligence and industry, the only true promoters of the public good'—a sentiment which deserves to be written in letters of living gold. I thank you, Mr. President, for your kind allusion to me as one who has done something to promote the interests and welfare of my fellowmen. My friends, I have lived to see great progress and improvement in the agriculture and horticulture of our country, much of which may be primarily traced to the enterprise and labors of Massachusetts men. Suffice it to say, that, from the day when Governor Endicott planted his pear tree at Salem, which still lives; from the day that Perigrine White planted his apple tree at Marshfield, Mass.; from the day when our society was formed it has stood prominently before the world as a leader and patron of agricultural and horticultural science. How marvelous the progress in our own day! How grand the march of horticulture since the establishment of our own society! It is scarcely fifty years since the Massachusetts Horticultural Society was formed. Then there were but few horticultural and agricultural societies in our land; now they are counted by thousands, and are scattered over the continent, all working harmoniously for the promotion of these arts. Then there was scarcely a nursery of any note west, and only a few east of the Hudson river; now they are planted from one shore of our country to the other, and among them many of the largest in the world. Then Mr. Hovey had not sowed the seed of his strawberry and other fruits, which have since immortalized his name, or commenced laying out his extensive grounds and building his houses in Cambridge. Then I had not planted a seed of the camellia, the azalea, pear or grape, nor even attempted the hybridization of a plant; now our American fruits and plants enrich the gardens and adorn the catalogues of foreign lands. Then we had no such splendid villas as those of Hunneywell, Payson, Gray and others, with their broad lawns, extensive glass structures and magnificent plants, which are such an honor to our land. Then we had many old and fine homes and gardens, such as Governor Gore's, Mr. Lyman's, Mr. Preble's, Mr. Cushings's, the Perkinses and others; but very little in the way of landscape gardening or in new or rare plants or fruits. Then our exhibitions were confined to a few days of the year, and were for many years held in small rooms; now many of our exhibitions are the best given in any State in the Union. Then we had no building of our own; now we possess the most costly and magnificent temple of horticulture that the world can boast. Then the American Pomological Society, whose president, by the mercy of God, in his 28th year of service now stands before you, had never been dreamed of—a society that emanated primarily from the influence of the Massachusetts Horticultural Society—a society that embraces not only our national domain, but whose jurisdiction extends over our continent—whose catalogue prescribes the appropriate fruit for fifty States, Territories, and districts, and at whose quarter-centennial in this city, the far off State of Nebraska, with her governor at her head, carried off triumphantly the Wilder medal for the best collection of fruits. Then there were few exports of fruits; now we send 400,000 barrels of apples in good years to foreign lands. Then the grape was scarcely cultivated; now, in addition to all that are used for the table, we make 15,000,000 gallons of wine, and wine, too, that took the first prize at the World's Exhibition at Vienna, in 1873. Then the statistics of our fruit crop were not thought worthy of record; now it amounts to $140,000,000, or nearly the average annual value of our wheat crop. But I must bring these remarks to a close. I thank you for the kind references to me as a pioneer in rural affairs. You do me no more than justice, for I cannot, as I have told you before, remember the time when I was not fond of the cultivation of the soil. But, gentlemen, my labors are mostly over. Soon I shall be resting in the bosom of my mother earth; but if I can believe I have done anything to advance the great interests of our land, and which shall contribute to the happiness of my fellow men, I shall, so far as this world is concerned, die content, feeling that I have not lived in vain."

Mr. Wilder resumed his seat amid a storm of applause.

Notes from the South.—Facts about the Cotton Worm.

BY PROFESSOR C. V. RILEY.

The readers of the SCIENTIFIC AMERICAN may not be uninterested in a few notes of a trip recently made through the land of sub-tropical products—the land of cotton, of the long-leaved pine, the *Tillandsia* or hanging moss, the beautiful crape myrtle (*Lagerstræmia indica*), the magnolia, the cypress, and the China berry (*Melia azedarach*)—the land where the cow pea comes to perfection, and where side by side with such products of the farther north as corn, wheat, and oats, may be seen growing the sugar cane and rice.

My mission south is the direction of the investigation now being carried on by the Commissioner of Agriculture into the insects injuriously affecting the cotton plant, and the best means of counteracting their ravages. The Commission of Inquiry was organized by the appointment of Prof. A. R. Grote, of Buffalo, N. Y., and Prof. J. H. Comstock, of Cornell University, as special assistants, and of Prof. J. E. Willet, of Macon, Ga., Prof. E. A. Smith, of Tuscaloosa, Ala., Dr. E. H. Anderson, of Kirkwood, Miss., and Wm. J. Jones, of Virginia Point, Texas, as local agents and observers.

Two circumstances have somewhat interfered with the inquiry, namely, the yellow fever and the general freedom of the plant from the cotton worm, the serious injuries of this last being restricted to the "cane break" regions of Alabama and to the southwest counties of Georgia, especially the country between the forks of the Flint and Chattahoochie rivers—the more malarious portions of either State. Yet many interesting and important facts have already been ascertained. The general want of knowledge among cotton planters (or rather among their superintendents, for the planters are mostly away from home at this season) on the most noticeable and important habits of the cotton worm is the more remarkable, considering the losses sustained by them from this insect in the past. I find that the opinions of the most observant are seldom founded on intelligent observation, and that such opinions are, consequently, of little value. This state of things is due to three evident causes: First, the general unhealthiness of the regions in which the insect does most damage, and the intense heat that prevails during the months when most of the observations must be made; second, the fact that the culture of the crop is turned over to uneducated and unobserving negroes; third, the failure to discriminate between the cotton worm (*Aletia argillacea*) and the boll worm (*Heliothis armigera*) in their later stages, and the natural difficulty that besets the solution of some of the questions, such as the winter habits of the *Aletia*.

It had often been a wonder to me that no true parasites had ever been found infesting this insect, since there scarcely exists a plant-feeding species that is not attacked by some parasite. Several such have been discovered on *Aletia* this summer. Again, I wondered what plants the moth naturally fed from, since it was known to be fond of sweets and had, to my knowledge, done considerable injury in Kansas by boring into peaches.

The cotton plant is peculiar for having a gland on from one to three of the larger ribs of the more mature leaves, and a still larger gland at the base of each of the three lobes of the involucre. As soon as I learned that these glands secreted a sweetened liquid I inferred that the plant would be found to furnish nourishment to the moth as well as to the larva, and drew attention to this belief in the Atlanta *Constitution*. It was with no small degree of pleasure that at Baconton subsequently, in company with Professors Comstock and Willet, I was able to prove my anticipation correct by studying the normal habits of the moth with a dark lantern at night. The moth is, therefore, attracted to the plant by the sweets which this last affords, and as these sweets are first produced when the plant begins to flower and fruit, we have here a possible explanation of the well-known fact that the worm is never noticed on the young plants, but first appears about the time of fruiting. We have also discovered that the moth feeds on the honey copiously secreted from glands occurring at the apex of the peduncle, just above the pods, of the cow pea (*Dolichos*), extensively grown through the South as a forage plant; also on the sweet exudation from the rachis of the flowers of *Paspalum læve*, a tolerably common grass.

It is by taking advantage of this love for sweets which the moth possesses, that we shall probably arrive at one of the most effectual ways of preventing the ravages of the worm; for if we can allure the first moths of the season to certain death we nip the evil in the bud; and I am now having experiments made to test the effects of different poisons mixed with sweets to use as bait. These baits may be applied to the trunks of the dead pine trees that occur in so many cotton plantations, or to the trunks of any other trees; or they may be used in pans, upon which perforated platforms of wood or tin are made to float.

I have also discovered that the worm affecting the cotton in the southwestern portion of the cotton belt, as in Southern Texas, is often another species (apparently *Anomis exacta*, Gn.), though belonging to the same genus as that which is already so well known. We shall most likely find, as a consequence, corresponding difference of habit.

The use of Paris green, either in water or powder, which I first recommended for the insect in 1873, is now the general and, in reality, the only satisfactory mode of killing the worms, though some other preparations of arsenic are to a limited extent employed. We may yet discover something as effectual and less dangerous; but in any event there is a great deal to be learned in the more economical, safer, and more effectual use of the green poison. It is now either sprinkled in water through coarse sprinklers that waste the bulk of the liquid on the ground, or dusted from equally coarse and crude sieves. The carelessness with which it is generally used has, also, prejudiced the negroes against it; for the powder settles on their persons and is carried by perspiration to the nether parts, causing swelling of the groins and other troubles. The cost averages $1 per acre for a single application, and this great cost naturally deters many from attempting to save the crop. Lastly, few planters begin to poison until the worms are nearly full grown and have fairly begun to strip the plant, by which time it is often too late to go over a large plantation successfully. I have no doubt whatever that all this can be materially changed.

For some days after the worms hatch they feed on the underside of the leaf, confining themselves to the parenchyma without eating through. There they may be in large numbers without attracting attention, and there, before they have an opportunity to riddle and devour the foliage, they should be killed, and might be with the minimum expenditure of poison, if this were applied from beneath instead of from above. We shall endeavor to perfect a machine for this purpose. By means of a force pump, to which an atomizer is attached, the liquid may also be sprayed on to several rows of the plants at once, thus greatly reducing the cost of labor and material, as has been proved in parts of Alabama.

© 1878 SCIENTIFIC AMERICAN, INC.

In traveling through the South one finds very many signs of coming prosperity, and they are more particularly noticeable in Georgia. I have met with few persons who are not satisfied that emancipation—whatever it may prove for the negro—was the very best thing that could have happened to the white population of the South. In slavery times, in proportion as a man's slaves increased, he had to increase the extent of his plantation; for Sambo was valued only according to his cotton-producing capacity. The natural tendency was an increasing negro population, and a decreasing white population with widening estates, to say nothing of the enervating and demoralizing effects of the institution. To-day the tendency is all the other way. The authorities recognize the value of intelligent white labor, and are making successful efforts to induce immigration. King Cotton has had his day, and while he will ever raise a proud head in this latitude, diversified farming is the motto of the more intelligent and far-seeing. I had the pleasure of riding up from Albany with Senator Gordon, who is deservedly popular. He had just come from his large sheep farm, and interests himself largely in the improvement of stock in the State and in the general advancement of agriculture within her borders; and he is but one of many prominent men equally alive to its advancement.

The great strides made in fruit culture since the war can hardly be appreciated by one who has not been here. The best evidence of its rapid growth, and of the spread of esthetic taste, may perhaps be found in the constantly increasing sales of the nurserymen, and especially of Mr. P. J. Berckman's, of Augusta, who is prominently identified with Georgia's advance in horticulture. The entrance to Mr. Berckman's "Fruitland Nurseries" is by a broad avenue of magnificent magnolias; and after spending a few hours among his greenhouses and his well kept stock of choice fruit and ornamental trees, many of them new to Northern eyes, the secret of his patronage is easy to discern. Exotic conifers are here made a specialty, and I have never witnessed anything more beautiful, outside the grounds of Messrs. Ellwanger & Barry, of Rochester, than his beautiful *Cupressus Knightiana elegans* and the fine *Cunninghamias* that lift their heads forty or fifty feet high.

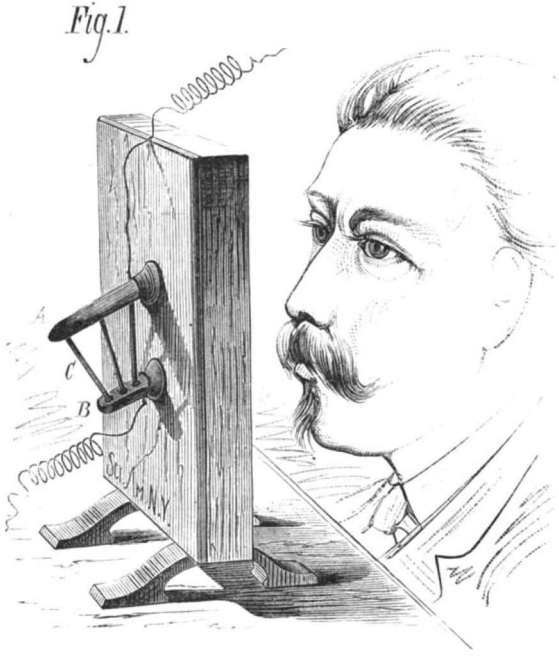
Washington, D. C., October 14, 1878.

SOME MODIFICATIONS OF THE MICROPHONE AND TELEPHONE.

BY GEO. M. HOPKINS.

The microphone now exists in many forms, and is an exceedingly interesting instrument, although it has not, thus far, attained the usefulness of the telephone. The several forms of microphone are easily constructed, but all, so far as I know, are defective in some particular. An instrument of this sort that is sensitive enough to transmit the slightest sounds is too sensitive to transmit the heavier sounds properly. In the instruments shown in Figs. 1, 2, and 3, these defects are in a great measure remedied. These microphones are so simple and so easily made that I give a description of each, so that any one who wishes to experiment in this direction may be able to do so.

Fig. 1.

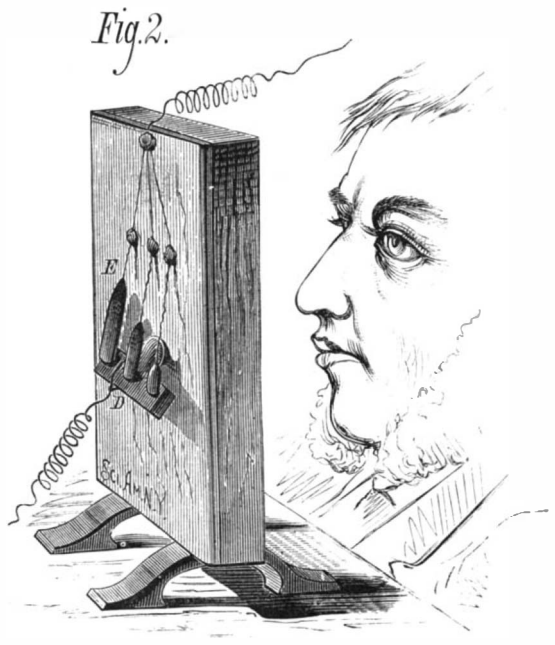


MICROPHONE WITH GRAPHITE RODS.

The instrument shown in Fig. 1 has a wooden diaphragm one eighth inch thick and four inches square, which is glued to a narrow frame supported by suitable legs. Two pieces of battery carbon, A B, are secured by means of sealing wax to the diaphragm about an inch apart and at equal distances from the center. They are both inclined downward at about the angle indicated in the engraving, say 30°. The carbon, A, is longer than the carbon, B, and has in its under surface three conical holes—made with a penknife point—which are large enough to receive the upper ends of the graphite pencils, C. The lower ends of the pencils rest in slight cavities in the lower carbon. The pencils, C, are simply pencil leads sharpened at each end and placed loosely between the carbons; they are inclined at different angles, so that the motion of the diaphragm which would jar one of them would simply move the others so as to transmit the sound properly. Battery wires, which are connected with a telephone*, are attached, one to the carbon, A, the other to the carbon, B.

The diaphragm and its support in Figs. 2 and 3 is the same as that already described. The microphone shown in Fig. 2 has a piece of battery carbon, D, secured in an inclined position to the diaphragm near the middle, by means of

Fig. 2.



MICROPHONE WITH PENDANTS.

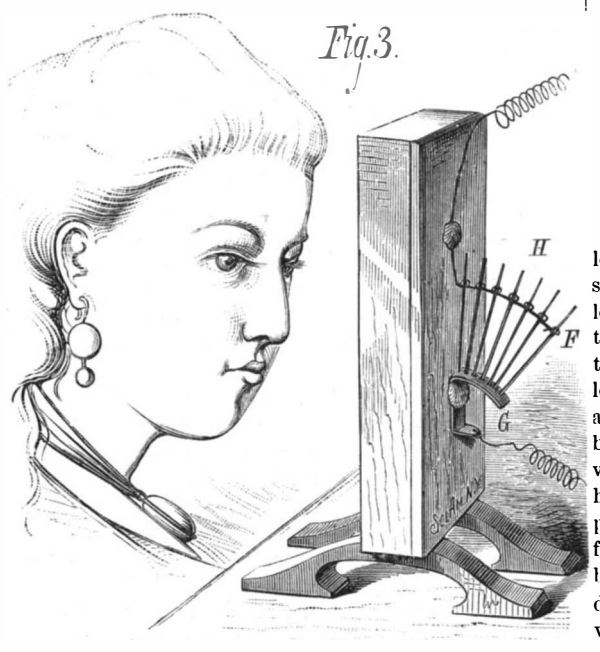
sealing wax. Three carbon pendants, E, of different sizes, are suspended by very fine wires, so that they rest upon the upper surface of the carbon, D. The three fine wires are all connected with one of the battery wires, and are fastened at suitable distances apart to the face of the diaphragm by a drop of sealing wax. A fine copper wire is wound around the carbon, D, and connected with the battery.

The construction of the microphone shown in Fig. 3 is so obvious as to require little description. One of the battery wires terminates in a series of coils, F, and is attached to the diaphragm above the middle. The other wire is connected with a strip of metal, G, which is secured to the diaphragm below the middle, and is curved and indented to receive the wires, H, which, by the way, must be quite fine, say No. 30.

These instruments are used as transmitters; a Bell telephone is used as a receiver. By using a number of rods, pencils, or pendants instead of a single pencil, as in the Hughes microphone, much if not all of the jarring is avoided, while it is capable of performing the feats usually expected from instruments of the name, such as the transmission of the sound of the ticking of a watch, the tramp of a fly or an ant, the crumpling of paper, whistling, instrumental and vocal music, and, under the proper conditions, articulate speech, whispering, etc.

The instrument shown in perspective in Fig. 4 and in section in Fig. 5 fulfills the requirements of both microphone and transmitting telephone, being capable of transmitting articulate speech as loudly and clearly as any of the well known forms of telephone. It is not necessary that one

Fig. 3.

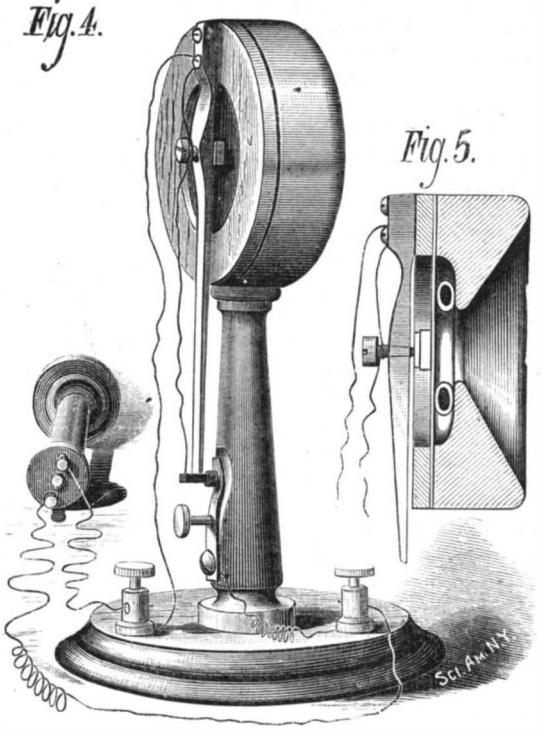


MICROPHONE WITHOUT CARBON.

should speak directly into the instrument; it may be in one part of the room and the speaker in another. It will transmit a whisper, or the conversation of two or three persons, and it is partial to violin and flute music or whistling. It seems almost incredible that an instrument of this construction should do these things, as everything is accomplished through the medium of a long lever actuated by the diaphragm; but this construction amplifies the vibrations of the diaphragm, and renders the instrument effective. The mouthpiece, which contains a ferrotype diaphragm, is mounted on a standard, and the diaphragm is damped as in the phonograph by means of short pieces of rubber tubing placed between it and the mouthpiece. A wooden spring is attached to the diaphragm support, and extends across the diaphragm downward toward the base of the standard. A small set screw passes through the spring and bears upon a thin metal plate that rests upon a soft rubber block, placed against the center of the diaphragm. The spring between the set screw and the fixed portion is reduced somewhat in thickness, and from the set screw to the lower end it is tapered to make it as light as possible. A small pencil of battery carbon is cemented to the extreme lower end of the spring, and a very fine copper wire is wound around it and carried upward to the fixed portion of the spring, thence downward to the binding post at the left. A small metallic spring is secured to the standard near the base, and carries at its free end a block of battery carbon, which is brought into light contact with the carbon on the end of the wooden spring by turning the adjusting screw that passes through the metal spring and bears against the standard. The metal spring is connected with the binding post at the right. This instrument, placed in an electrical circuit in which there is a Bell telephone, will transmit speech with considerable loudness. It requires no call or alarm, as a loud sound made directly into the mouthpiece will produce a noise in the receiving instrument which may be heard in any part of a room of ordinary size.

* Full directions for making telephones in SCIENTIFIC AMERICAN SUPPLEMENT, No. 142.

Fig. 4.



NEW FORM OF TELEPHONE.

The French Dam below Pittsburg, Ohio.

Three years ago Congress appropriated $100,000 for the construction of a Chamoin dam at Pittsburg, under the direction of the War Department. The construction was begun during the past summer. It is intended to form slack water to the two rivers which unite at Pittsburg and form the Ohio River, to create a harbor six miles long for the commerce of the city.

The peculiarity of the French dam is that it is the dam of low tides. That is, it is a dam which is set up against the stream when the stream is low, diverting the water into a lock, after the manner of a canal, and falling in ordinary times prone on the bottom of the river, allowing navigation to pass over it in its usual course. The dam is raised or lowered by means of a series of props which are handled by a simple process. The gate of the canal is opened and closed by hydraulic power operated from a gigantic tank at an elevation on the river bank. In detail, the French dam, which has received the name of Chamoin, after its inventor, is simply an extended series of wooden wickets from four to six feet in width, and from ten to fifteen in length, placed side by side on end on a stone platform, at an angle of eighty degrees (from the horizontal) across a river bed. Each wicket as it faces the stream has behind it a cast iron prop, whose lower end is adjusted when the dam is up in a hurter or catch, at the head of a slide on the platform of the structure, along which it can be lowered at pleasure, the wicket falling with its prop; the whole dam being let down by degrees according to the necessity made by the rising water. Such is the character of the dam which is everywhere employed for the improvement of the low tide rivers of France; which converts the Saone, the Meuse, the Marne, the Yonne, and the Oise into navigable slack water, and the Seine from its head waters to Rouen into a canal.

© 1878 SCIENTIFIC AMERICAN, INC.

The dam to be constructed on this principle in the Ohio River at Pittsburg is one of the largest of its kind, the main dam being 1,200 feet in length and composed of 200 wickets. The lock will be the largest in the world. It will have a width of 110 feet, and will admit the passage in bulk of an entire coal fleet. The engineers who have the work in charge announce their intention to prosecute it with such energy as to complete it within a year.

If, when the work is completed and tried, Congress decides to adopt the system for the permanent improvement of the Ohio River, probably not less than $20,000,000 will be required to convert through this means its whole length, at low tide, into navigable slack water. The enterprise receives its large present interest from the fact that it is a national one, and, at the same time, the introduction of a foreign engineering device for the improvement of one of the most important of American rivers.

The Mediterranean Trade.

The import trade of the cities on the shores of the Mediterranean Sea is estimated at $500,000,000 a year. Of this not more than one fifth falls to the share of the United States, the greater part being monopolized by England. For a year or more efforts have been making in Philadelphia to win a larger share of this profitable trade, and already the *Record* reports that nearly thirty-five agencies for the sale of American goods have already been established along the Mediterranean. Many of these agencies are in the hands of influential mercantile houses who have hitherto acted in the interests of the English. The wisdom of this method of bringing American goods directly in contact with those produced by our English competitors is demonstrated on the arrival of every foreign mail. Orders and inquiries are pouring in for various kinds of American products never before sent to Southern European ports. A few weeks since came a communication asking for estimates of the cost for equipping a hundred miles of railway with Bessemer steel rails. At the present moment negotiations are in progress for the shipment of over 70,000 feet of iron piping for a Mediterranean entrepot which has hitherto been supplied exclusively from Glasgow. A large order from Egypt has been received for canned goods. Inquiries have been made for samples and prices of our paper manufactures for purposes of comparison with those of English and German makes. All kinds of agricultural implements and machinery are in demand. Leathers also are being called for, the foreign consumers finding that American fine calfskins and carriage leathers will hold their own in competition with the French product. Our oilcloths have been pronounced as being cheaper, more durable, and less heavy than those of English manufacture, which are gradually being superseded. Boiler rivets, an entirely new article of export, have also grown into favor, and a preliminary order for five tons was recently shipped to Italy. American biscuits, also, are making headway against the British article in France and Cuba, while as an outgrowth of the same movement the importations of English biscuits into the United States have been almost entirely stopped through the demand for the article of home manufacture.

Mr. George N. Torrence, the senior member of Torrence & Co., the pioneers of the Mediterranean trade, says that all that is now wanted to obtain complete control of this trade is a line of Mediterranean steamships. That want will soon be supplied. Half of the required capital, about $2,000,000, has already been subscribed, and the vessels will probably be in course of construction before the close of the year. No subsidy will be asked for or expected. Meanwhile the establishment of agencies will continue until the whole European Continent is honeycombed with sample depots of American productions.

American Competition in Great Britain.

The *Ironmonger* (London) in its last issue mentions a number of articles in which the United States is entering into alarming competition with the English. It says: Curriers complain of American competition. In Australia more particularly the American skins and general prepared leather have got a strong footing, against which curriers in Walsall find it difficult to contend. The demand from home centers is also adversely affected by reason of the United States importations. It is, however, satisfactory that curriers here believe that the consumption of the foreign product in this country is declining consequent upon the quality being inferior to the English make. There is a certain rottenness about it which results from hasty curing. The prices of our transatlantic friends are such as to keep down those of English makers, and it is peculiar in this connection that the more finished the American leather is the more severe is the competition with us. The American leather really becomes cheaper in proportion to the labor that is expended upon it.

Plating by nickel, another American introduction, seems now to be taking root here, though in the opinion of many it is still in its infancy. It appears to flourish mostly in bar and restaurant fittings.

A correspondent in the same paper states: I have just had my attention called by Messrs. Selig, Sonnethal & Co. to some new American articles in labor-saving machinery, a tool called a "lightning" tire shrinker being a noticeable one. This tool saves all cutting and welding of iron, is managed by one man with perfect ease, and is said to work as well on the lightest steel tire as on a wagon tire 3 inches wide; it only occupies about 2 feet of space on the floor. The "lightning" horseshoeing machine, probably the production of the same brain, is a vise, with an arrangement for fixing steel dies and saws. It has a small anvil attached to it and is worked by a treadle. The shoes are griped when the foot is placed upon the vise, and the latter falls open when the foot is removed. The work of shoeing with this machine is done rapidly and in good finished style. The wear of the hammer and anvil is saved, and no help is needed. If our moulders imagine that the fine iron castings from the States, that have been so much commented upon, are due to superior material, they are very much mistaken, as it is through moulding machines that the superiority is attained. For a new one, called the "Pioneer," also shown to me by Messrs. Selig & Co., it is claimed that a workman of ordinary ability can perform one third more work in a day with much less fatigue, and produce better castings than by hand ramming. The patent quick speed drill, making 1,500 to 2,000 revolutions per minute, and worked by the hand, is also a most meritorious production. I was further shown a "Universal Lathe Dog," which stands square with the work, and will hold any shaped pieces without "skewing;" and a "Black Diamond Mill Pick," on a new principle, the "blades" being hardened by a patent process, in which quicksilver is a prominent operator, the steel becoming wonderfully hard. I asked for the "Lester" saw, and was shown a machine worked by a treadle, having a scroll saw with tilting table, capable of various operations, and doing 1,000 strokes per minute; also a circular saw, 2½ in. diameter, with a drilling attachment, an emery wheel, and a turning lathe, capable of making 7,000 revolutions per minute. Some time since, in your "Notes on Novelties," you illustrated a new frame pulley by Messrs. Harper, of Willenhall, which, it was intimated, would compete with the lowest-priced American ones in the market. But I find that the American firms have not found it necessary to reduce their prices to meet this competition.

Rapid Increase in French Woolen Industries.

The total wool industry of France has doubled since 1867, and trebled since 1860. According to the report of the Vice President of the Jurors appointed to decide upon worsted yarns and fabrics exhibited at Paris, Mr. Henry Mitchell (President of the Bradford, Eng., Chamber of Commerce), it appears that the worsted manufacture of France employs 2,648,000 spindles, 27,557 power looms, and an enormous number of hand looms. Not many years ago the value of the silk manufacture of France was far in excess of that of worsted, but the latter is now of more value than the former. The total value of the worsted industry in France is 700,000 000 francs, or about $140,000,000, nearly half of which is for export. The wool industry of France is rapidly attaining great proportions. M Legrand, one of the largest French manufacturers, informed Mr. Mitchell that in the district with which he is connected the number of spindles in 1860 was 140,000, while at the present time there are 670,000 spindles. The value of the products is 150,000,000 francs, or about $30,000,000.

The Adelphi Explosion.

The common verdict of juries called to investigate the causes of "accidents" resulting in loss of life through boiler explosions was strikingly varied in the case of the Adelphi disaster. Our readers may remember that the boiler of the steamer Adelphi exploded in Norwalk Harbor (Conn.), on the morning of September 28, 1878, killing several persons and wounding a large number.

The coroner's jury, instead of finding nobody to blame, as usual, distributed the blame impartially among the steamboat owners, the officers of the boat, the Government Inspector, and the laws which govern their action. The verdict rendered contains the following strong language:

"We find that the said steam boiler exploded because of overwork and overpressure, legalized by a United States statute, increased after shiftless inspection, and persistently used by the attendants in charge after sufficient evidence of dangerous defects."

The rules of Supervising Inspectors of Steamboats require: "To ascertain the tensile strain of the plates (used in manufacturing marine boilers) the inspector shall cause two pieces to be taken from each sheet to be tested; . . . that piece showing the greater tensile strain shall be held to be the tensile strength of the plate from which the test pieces were taken." This rule the jury deemed injudicious, as the whole plate is strong only as its weakest part is strong.

Furthermore, section 4,433, title li.i, United States Revised Statutes, provides: "The working steam pressure allowable on boilers constructed of plates inspected as required by this title, when single riveted, shall not produce a strain to exceed one sixth of the tensile strength of the iron or steel plates of which such boilers are constructed."

The jury pronounced this law unsafe in the extreme, and contrary to the best mechanical authorities both in this country and Great Britain.

"Cognizance should be taken of the fact that the riveted joint is the weakest point of the whole structure, being only about 56-100 the strength of the solid plate, and we find that the best practice allows the strain not to exceed one sixth the strength of the riveted joint, instead of one sixth the strength of the solid plate. Under this section, 4,433, we find the United States Inspectors allow about 75 per cent more pressure than is the practice of other reputable mechanical authorities."

The jury found also that while a pressure of 36 1/10 lbs. was all the law allows to a boiler of the size and construction of the one exploded, the inspector had allowed 37 lbs. in 1876, and subsequently increased the allowance to 40 lbs. per square inch, contrary to law and reason; that the certificates of inspection falsely described the structure of the boiler; that the inspector's work had been very superficial and negligent in character; that the engineer had withheld from the inspector's knowledge certain known defects in the boiler, and had not regarded the requirements of the law in respect to making repairs; that in requiring the chief engineer of the steamboat company to perform the duties of captain, the owners had prevented him from maintaining a proper oversight of the machinery of their boat; that the company's agent had made to the Government Inspector false statements regarding repairs ordered by him; and that the rules and practices of the Steamboat Inspection Service were incorrect, loose, uncritical, and unworthy of respect.

We have not heard that any of the parties responsible for the disaster—it cannot be called an accident—have been, or are likely to be, held to account therefor, further than is shown in the dismissal of the assistant inspector, who failed to discover the boiler's fatal weakness.

THE ROCKPORT GRANITE QUARRIES.

At the extreme point of Cape Ann, on the Massachusetts coast, is the small town of Rockport, where are situated the extensive granite quarries for which the region is noted.

Forty years ago quarrying for granite was begun here in a small way by Mr. John Stimson, whose success led to the development of one of the most important granite quarries in the country. The quarries are now owned by the Rockport Granite Company, who have shown great enterprise and engineering skill in the prosecution of the work. Roads have been made, bridges built, breakwaters and wharves constructed, houses and stores erected, and employment furnished for from one hundred to over three hundred men, for whose convenience and accommodation neat cottages and well stocked stores have been provided by the company.

The Rockport granite is noted for its superior quality, being very hard, durable, and free from iron or other substances which injure and discolor granite. It is found in huge masses of great solidity, and of a remarkably uniform structure. The finer varieties are susceptible of a good polish, and when carved they retain their color and sharp edges admirably. The pressure required to crush this granite varies from 300 to 1,200 tons per square foot.

The first granite paving stones used in the United States were furnished by these quarries, for Lafayette, near New Orleans. The first blocks were 7 inches deep, and nearly 12 inches square. Their length was afterwards doubled and their depth increased to 10 inches. Thousands of tons of these paving blocks have been sent to Cuba.

The Rockport quarries have furnished great quantities of granite for the dock improvements of New York; for the reservoir on Beacon Hill, Boston; for Forts Warren, Winthrop, and Independence, Boston Harbor; the sea wall at Lovell's Island, and the sea wall at Brewster, Mass. The Henry Clay monument, New Orleans, the Lincoln monument at Cincinnati, and many imposing monuments at Mt. Auburn, Forest Hills, and other cemeteries are of this granite.

For engineering purposes, mechanical and civil, Rockport granite is in great demand. In this connection reference may be made to the foundation of the large engine at Glenham Mills, Dutchess county, N. Y. In the stones used for this purpose 115 feet of 3½ inch holes, made perfectly round, were cut in eighteen days—sufficient evidence that the company possess facilities for furnishing blocks of the largest size at short notice.

At the quarries may be seen blocks 25 feet in length, and upward; piles of paving stones, 100,000 and upward in number, ready for shipment; and blocks of all sizes and forms for special purposes. The quarries are well supplied with steam engines, pumps, derricks, and other appliances for keeping the works clear of water, and for lifting the blocks for transportation. The splitting of the granite is easily accomplished. With hand drills and hammers the workmen cut lines of holes an inch in diameter, from three to six inches deep, and from two to six inches apart, according to the size of the block. Into these holes are inserted half round slips of iron, a pair to each hole. Then steel wedges are driven between the irons so as to exert a uniform and steady pressure, which gradually increases until the great mass yields and splits apart. The blocks are shipped either in the rough or are first taken to dressing sheds, where they are cut to ordered sizes, hammered, and faced.

A notable enterprise in connection with the quarries is the construction of a breakwater, which enables shipping to approach the quarries at all stages of the tide and in all sorts of weather. Before it was built it was only in fair weather, when the sea was smooth, that vessels could come near. At present the breakwater rises 25 feet above low water, is 500 feet in width on the bottom, 75 feet deep, and 2,000 feet in length; yet this huge work is constantly being extended by the addition of tons upon tons of granite blocks.

THE Key West (Fla.) *Key* says: "Our fishing smacks report a stream of fresh or poisonous water along our bay coast from two to ten fathoms out, that kills all the fish in its range. They report sailing for two hundred miles through dead fish, covering the sea as far as the eye could reach with all the varieties. Immediately on the shore the water is salt and natural, while less than a mile off it appears of a red brick color."

© 1878 SCIENTIFIC AMERICAN, INC.

TO INVENTORS.

An experience of more than thirty years, and the preparation of not less than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. In addition to our facilities for preparing drawings and specifications quickly, the applicant can rest assured that his case will be filed in the Patent Office without delay. Every application, in which the fees have been paid, is sent complete—including the model—to the Patent Office the same day the papers are signed at our office, or received by mail, so there is no delay in filing the case, a complaint we often hear from other sources. Another advantage to the inventor in securing his patent through the Scientific American Patent Agency, it insures a special notice of the invention in the SCIENTIFIC AMERICAN, which publication often opens negotiations for the sale of the patent or manufacture of the article. A synopsis of the patent laws in foreign countries may be found on another page, and persons contemplating the securing of patents abroad are invited to write to this office for prices, which have been reduced in accordance with the times, and our perfected facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

Vertical Engines, 10 to 15 H. P., thoroughly well made. John Hartrick & Co., 47 Gold street, New York.

Magic Lanterns and Stereopticons of all prices. Views illustrating every subject for public exhibitions. Profitable business for a man with a small capital. Also lanterns for college and home amusement. 74 page catalogue free. McALister, Mf. Optician, 49 Nassau St., N.Y.

Mellen, Williams & Co., 57 Kilby St., Boston, Mass. Wiegand Sectional Steam Boiler. Ætna Rocking Grate Bar.

For the best advertising at lowest prices in Scientific, Mechanical, and other Newspapers, write to E. N. Freshman & Bros., Advertising Agents, 186 W. 4th St., Cin., O.

Holly System of Water Supply and Fire Protection for Cities and Villages, is fully described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 140.

Valuable Patent for Shooting Target for sale. Recently patented. Address Wm. Kuehn, 499 Spring St., Buffalo, N Y

For Models, parts of Models, and Experimental Machinery, address Michael J. Stark, Buffalo, N. Y.

Scroll Saw Designs. A. W. Morton, New York.

A valuable unimproved Water Power can be obtained at low figures. Address Geo. Stevens, Columbus, N. J.

Manuel Dengo, San Jose, Costa Rica, Central America, desires catalogues and price lists of all kinds of machinery.

$200.—4 H. P. New York Safety Engine and Boiler. Lovegrove & Co., Philadelphia, Pa.

Telegraph and Electrical Material of every description. Jerome Redding & Co., 30 Hanover St., Boston, Mass.

Books for Engineers and Machinists. Catalogues free. E. & F. N. Spon, 446 Broome St., N. Y.

Boston Blower Co., Boston, Mass. Blowers, Exhaust Fans, Hot Blast Apparatus. All parts interchangeable; material and workmanship warranted the best. Write for particulars.

A Manufacturing Co. will furnish on favorable terms room, power, and some capital, to good party having successful business which can be profitably extended. No experiments tried. Address Hardware, Box 3918, N. Y.

Northrop's Sheet Iron Roofing makes most durable fireproof roof. Used on all kinds of buildings. Send for circular and prices. Northrop & Co., Pittsburgh, Pa.

Engines, ½ to 5 H. P. Geo. F. Shedd, Waltham, Mass.

H. Prentiss & Co., 14 Dey St., N. Y., Manufs. Taps, Dies, Screw Plates, Reamers, etc. Send for list.

The Lawrence Engine is the best. See ad. page 317.

For the most substantial Wood-Working Tools, address E. & F. Gleason, 52 Canal St., Philadelphia, Pa.

Sheet Metal Presses, Ferracute Co., Bridgeton, N. J.

Oak Tanned Leather Belting, Rubber Belting, Cotton Belting, Round Leather Belting. Greene, Tweed & Co., 18 Park Place, New York.

Nickel Plating.—A white deposit guaranteed by using our material. Condit, Hanson & Van Winkle, Newark, N.J. English Agency, 18 Caroline St., Birmingham.

Punching Presses, Drop Hammers, and Dies for working Metals, etc. The Stiles & Parker Press Co., Middletown, Conn.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon & Co., 470 Grand St., N. Y.

Wanted.—Articles to manuf. D J. Miller, Mohawk, N.Y.

Fine Gray Iron Castings a specialty, also Wire Workers' Pickets and Rosetts in stock. A. Winterburn's Foundry, 16 De Witt St., Albany, N. Y.

Solid Emery Vulcanite Wheels—The Solid Original Emery Wheel—other kinds imitations and inferior. Caution.—Our name is stamped in full on all our best Standard Belting, Packing, and Hose. Buy that only. The best is the cheapest. New York Belting and Packing Company, 37 and 38 Park Row, N. Y.

For Solid Wrought Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., for lithograph, etc.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. Bliss & Williams, Brooklyn, N. Y., and Paris Exposition, 1878.

North's Lathe Dog. 347 N. 4th St., Philadelphia, Pa.

The Cameron Steam Pump mounted in Phosphor Bronze is an indestructible machine. See advertisement.

Wheel Press, Cotton Press, Pipe Line, and Test Mercury Gauges. T. Shaw, 915 Ridge Ave., Philadelphia, Pa.

For Telephones, Amateur Photo. Apparatus, etc., address E. Sackmann & Co., 278 Pearl St. N. Y.

For Sale Cheap.—One 50 lb. Hotchkiss Air Spring Hammer, nearly new. D. Frisbie & Co., New Haven, Ct.

Special Planers for Jointing and Surfacing, Band and Scroll Saws, Universal Wood-workers, etc., manufactured by Bentel, Margedant & Co., Hamilton, Ohio.

We make steel castings from ¼ to 10,000 lbs. weight, 3 times as strong as cast iron. 12,000 Crank Shafts of this steel now running and proved superior to wrought iron. Circulars and price list free. Address Chester Steel Castings Co., Evelina St., Philadelphia, Pa.

Diamond Saws. J. Dickinson, 64 Nassau St., N. Y.

Machine Cut Brass Gear Wheels for Models, etc. (new list). Models, experimental work, and machine work generally. D. Gilbert & Son, 212 Chester St., Phila., Pa.

Elevators, Freight and Passenger, Shafting, Pulleys, and Hangers. L. S. Graves & Son, Rochester, N. Y.

Emery in bbls. and cans, all numbers. Polishing Supplies. Greene, Tweed & Co., 18 Park Place, New York.

Howard's Bench Vise and Schleuter's Bolt Cutters. Howard Iron Works.

Fine Taps and Dies for Jewelers, Dentists, and Machinists, in cases. Pratt & Whitney Co., Hartford, Conn.

Hydraulic Cylinders, Wheels, and Pinions, Machinery Castings; all kinds; strong and durable; and easily worked. Tensile strength not less than 65,000 lbs. to square in. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

The Turbine Wheel made by Risdon & Co., Mt. Holly, N.J., gave the best results at Centennial test.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new Injector, worked by a single motion of a lever.

Dead Pulleys, that stop the running of Loose Pulleys and Belts, taking the strain from Line Shaft when Machine is not in use. Taper Sleeve Pulley Works, Erie, Pa.

For Sale Cheap.—One Horizontal Engine, 18 in. x 36 in.; one plant Hoisting Engines, four drums; and two 25 H. P. Vertical Engines. Apply to Wm. Taylor & Sons, 25 Adams St., Brooklyn, N. Y.

Notes & Queries

(1) W. M. J. asks: 1. Are the white fumes seen coming from a locomotive, steam? A. Steam partially condensed. 2. Is there any kind of steam visible? Is there any kind of steam invisible? A. Dry steam is invisible.

(2) F. N. Y. asks: 1. Can I get sufficient depth by the bichromate and gelatin process to make a mould for making pictures similar to lamp shades made resembling porcelain? A. No. 2. Are they made of porcelain? A. Yes.

(3) J. N. B. writes: I have some small castings (iron), and there are some blowholes in them. Can you inform me how I can fill them, and what with? A. It would be best to drill out the holes and plug them with iron; however, you may plug them with an amalgam of tin, zinc, and mercury, or with fusible metal.

(4) J. P. W. asks how to make harness soap. I want to use soap and put in something to make it black, and something to make it oily and good for leather. I have experimented some with black, but the lye in the soap has a bad effect on it and turns it out more of a brown color. A. Resin soap, 2 lbs.; sperm oil, ¾ lb. Digest the soap with a quantity of boiling water just sufficient to thoroughly soften it, when it may be triturated with the warm oil and a sufficient quantity of fine boneblack until a uniform paste is obtained.

(5) E. V. asks: 1. Is stenography a good business for these times? A. Stenography is never a good business except to a few who are by nature specially fitted for it. 2. What is the largest number of words that has been written in a minute? A. 200 words per minute may be reported, but not fully written out. 3. At what rate does a common speaker talk? A. From 50 to 250 words.

In answer to your last query we advise you to consult a physician.

(6) P. C. M. asks how a schoolroom can be warmed comfortably. A. Cause the fresh air supply to enter under the stoves; close all openings for the escape of hot air from the upper part of the room; ventilate by means of openings in the floor, the escape pipes leading to the chimneys or through them, to secure an up draught.

(7) C. F. L. asks why the heating of an iron sphere to nearly the melting point (as noted in your paper of September 28) should change its appearance to a disk. A. It is only by the gradation of light and shade that we can tell solids from plane surfaces. The highly heated sphere shows no such gradations.

(8) J. G. S. writes: I have some wine that is too sour for wine and not sour enough for vinegar. What shall I do to it to make it sour? A. The souring of wine is due to the conversion of the alcohol into acetic acid. This is very common, and may result from too small a proportion of alcohol, too high a temperature of the cellars, or exposure to the atmosphere. The wine, if too far soured, is fit only for making vinegar; but slight cases can be remedied by an addition of sugar. To convert your wine into vinegar the wine should not contain more than 10, nor less than 3 per cent of alcohol. The temperature should not be above 36° C. nor below 10° C. A plentiful supply of air to the wine and an intimate contact between the two. The addition of a small amount of vinegar, or still better, some of the so-called vinegar plant (mother) *Mycoderma aceti*. This method is very generally employed for making wine vinegar. Generally a "souring" vessel or "mother" vessel, made of oak wood, is employed; this vat is first, when newly made, thoroughly scalded with boiling water, and when thereby the extractive matter of the wood is exhausted, the vessel is filled with boiling hot vinegar; when the wood is soaked with vinegar, there is poured into the vessel 20 gallons of wine, and after eight days again 2 gallons of wine are added, and this operation continued weekly until the vessel is two thirds filled. About fourteen days after the last addition of the wine the whole of the contents will have become converted into vinegar. Half this quantity is withdrawn from the souring vessel and carried to the store; to the remainder more wine is added, and the preparation of vinegar continued uninterruptedly.

(9) F. D. W. asks for a preparation that will bleach feathers and horsehair without injuring them. A. You may try exposing them to the vapor of burning sulphur in a barrel or other tight vessel.

(10) J. G. E. asks: What ingredients do they use in pressing plugs of smoking and chewing tobacco to make the leaves adhere together, and also to flavor it? A. Molasses, licorice paste, glycerin, salt, and anise are frequently employed.

What sized cylinder and what sized boiler would be required to drive a screw 16 inches diameter, with a pressure of steam at 100 lbs. to the square inch, and the speed she would be likely to run at? A. Cylinder 2½ x 4, boiler 20 inches diameter, 3 feet high, revolutions 300 to 400.

(11) Constant Reader: What is the most suitable metal for working upon a foot lathe by hand? I wish something which can be turned and bored with ease. Can you tell me of an alloy which will melt at a moderately low temperature, but would be tough enough to be turned down without clogging on a small foot lathe? Would this alloy be hard enough to be used for making the cylinder and side valves of a small engine, the cylinder being about 2 x 4 inches. If not, for what parts could it be used? Could you give me the composition of several alloys of different degrees of hardness? What should be the size of boiler, and what pressure should be used to obtain ¼ horse power, with an engine the cylinder of which is of the size above named? What is the pitch of a propeller? In what proportion is it to the diameter? Is there any rule by which to calculate the diameter and width of blades, etc., of a propeller, the length, width, and draught of the boat being known? Is there any by which the proper depth of a small steam launch can be calculated, the length and width being given? A. Brass would be the best alloy for the purpose. You can make a boiler 10 in. in diameter and 15 in. high, and carry a steam pressure of 30 lbs. per square inch. The pitch of propeller can be from 1¼ to 1½ times the diameter. The other rules you desire could not be given in this limited space, but you can proportion small screws and hulls from samples of larger ones, many of which have been described in our columns.

(12) N. E. S.—The washing compound consists chiefly of sal soda, lime, and resin soap.

(13) J. B. F. writes: At our factory we are using soft iron for all the castings we make, but find we will have to use some very much harder than we have been able to produce by adding a small quantity to what is in the furnace after ordinary work is poured. I have thought we might accomplish what we wish by hardening the iron in the ladle. Is there any way in which this can be done? A. We know of nothing that will produce the desired result in the manner suggested.

(14) W. P. K. asks: 1. Is spun glass flexible? A. Yes. 2. How fine can it be made? A. The threads are often drawn as fine as a single hair. 3. What are its constituents? A. Of a soft glass variously colored by metallic oxides. The glass without the coloring matter usually has the composition: Silica 75, potash 5, soda 10, lime 10.

(15) D. M. P. asks if there are not fire engines in New York propelled by steam which visit fires without the aid of horses? If so, who was the inventor thereof, and when did they first come in vogue; moreover, are they in use at the present time? A. There are, we believe, at present four self-propelling steam fire engines in use in this city. They were built by the Amoskeag Manufacturing Company, but the principal details of the self-propelling apparatus have long been used in connection with traction engines.

(16) R. W. S. asks: 1. Has frost any effect upon spiral springs that are in constant use out of doors? A. They sometimes become more brittle. 2. What is the best material for springs for hard usage? A. Steel. 3. Which is the best spring to use where the diameter is small, and the power required is great, a single spring of large wire wound small or a double spring of smaller wire, and which is apt to set the most? A. There is not a great deal of difference if proper proportions are observed in the two cases.

(17) V. E. C. writes: Can you tell me what metal and at what heat it will melt that will allow me to handle it in the melted state? A. The experiment is often performed with mercury, and with Rose's fusible metal—lead 3 parts, tin 2 parts, bismuth 5 parts—melts at 196° Fah.

(18) J. C. C. asks: Is there a process to restore the steel fire sheets of oil stills after crystallization by overheating in the presence of carbon? A. We think not.

(19) E. M. asks where he can learn the process of casting rubber type and stereotype, and if it requires much apparatus. A. See p. 1326, SCIENTIFIC AMERICAN SUPPLEMENT.

(20) C. A. P. asks: I have a meerschaum pipe, and by accident the stem broke off close to the bowl. What is the best cement to fasten it together? A. Slake pure caustic lime with a little boiling water, and mix the dry powder with the white of an egg to form a thin paste. This should be used in small quantity, immediately, as it soon sets.

(21) A. M.: What is the easiest and most efficacious way to destroy roaches (Blatta)? I have tried arsenic, poke root, and borax to no effect. A. A little alum or borax solution in hot water, applied with a cloth to the woodwork, and injected into the cracks in the vicinity of their hiding places, is usually quite effectual.

(22) H. S. asks: Can a body be petrified by laying the same in a solution of silicate of soda? Or can it be successfully injected into a dead body so as to entirely petrify the whole body? A. We believe experiments in this direction have not proved very successful.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

J. B. W.—Green trap containing marcasite—iron sulphide—W. M.—An indurated clay containing much sand, iron oxide, and lime.—T. F.—It is magnetite—magnetic oxide of iron, loadstone.—W. S.—Not infusorial earth. Consists of lime, carbonate silica, and much organic matter. The sample contains a little potash and traces of phosphoric acid. The material may prove of some value as a fertilizer.—H. S.—Silicious clay containing much iron sulphide. Is not necessarily indicative of the proximity of metallic ores or coal.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges with much pleasure the receipt of original papers and contributions on the following subjects:

The Consumption of Natural Gas. By T. B. McC.

Jupiter. By R. D. S.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

September 17, 1878,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A complete copy of any patent in the annexed list, including both the specifications and drawings, will be furnished from this office for one dollar. In ordering, please state the number and date of the patent desired, and remit to Munn & Co., 37 Park Row, New York city.

Arithmetical results, obtaining, J. Sawyer 208,037
Auger, W. Haney 208,087
Axle skein, vehicle, F. R., Jr., & W. W. Willson.. 208,131
Bag, J. Arkell 208,138
Band cutter, wire, W. E. Sackdiker 208,046
Bed bottom, spring, M. R. Davis 208,077
Belting, wire, G. A. Pickhardt 208,198
Binder, temporary, N. S. Otis (r) 8,419
Bit stock, C. L. Griswold 208,168
Blacking box, Morse & Sholes 208,031
Boilers, heater and feeder for, G. W. Moore 208,194
Book support, M. L. Schoch 208,039
Boot and shoe insole, M. Mayer 208,190
Boot and shoe laster, G. W. Copeland *et al* 208,156
Boot and shoe lasting mechanism, H. G. Thompson 208,127
Boot and shoe soles, beater, etc., for, S. Ross (r). 8,421
Boots and mittens, drying moist, B. F. Buxton 208,070
Boring machine, T. G. Morse 208,030
Bosom boards, M. Price 208,120
Bottle stopper, H. Bell 208,146
Bottle stopper, F. J. Seybold 208,043
Bottle stopper fastener, T. H. Shahan 208,205, 208,206
Bottles, securing corks in, C. Michel 208,193
Bowls, etc., connection for, W. E. Sherriffs 208,044
Brake, car, W. W. Patterson 208,116
Brake, railway, J. & J. G. Hardy 208,170
Brake, railway car, W. R. Green 208,086
Brake shoe clamp, C. Heinen 208,092
Brick, dovetailed grooved, W. J. Mackrell 208,186
Bridge truss, G. W. Cooley 208,155
Burglar alarm, J. K. Johnston 208,177
Burial casket, J. Maxwell 208,023
Calendar dial and watch crystal, D. T. Kendrick. 208,182
Can for liquids, G. W. Peck 208,118
Can for oil and other liquids, G. W. Peck 208,117
Can, tin, S. H. Bradford 208,065
Cap and stopper fastener, screw, J. K. Chase 208,010
Car coupling, J. Forman 208,081
Car coupling, J. G. Marls 208,188
Car heater, F. E. Ensign 208,013
Car roof, H. Aldridge 208,007
Car safety, T. Mueller 208,113
Car starter, H. Schreiner 208,040
Carriage, child's, F. L. Hughes (r) 8,417
Carriage curtain window, F. A. Neider 208,196
Cattle, gangway transferrer, E. L. & E. Forman. 208,164
Chair, H. Clark 208,153
Churn, B. Gue 208,169
Churn dasher, J. W. Tatum 208,212
Clevis, C. F. Search 208,042
Clock case, J. H. Welch 208,216
Coal, treating, M. B. Eaton 208,011
Coffee pot, O. W. Noble 208,032
Coffee roasting apparatus, A. McDonald 208,025
Cooler, beer, A. Roos (r) 8,420
Corset, M. P. Bray 208,066
Corset, H. S. Strauss 208,049
Corsets, manufacture of, A. Fellheimer 208,162
Cotton condenser, T. Camp 208,071
Cradle, E. Whitehead 208,052
Crane, hydraulic, S. T. Wellman 208,051
Cultivator, F. M. Cropp 208,073
Cultivator, cotton, W. W. Harvey 208,088
Curtain roller and bracket, H. L. Werne 208,130
Door securer, W. A. Ingalls 208,176
Dredge bottle, W. Sellers 208,125
Electric alarms, etc., switch for, P. Ernwein 208,161
Elevator bucket, W. J. Bennett 208,147
Elevator, M. V. B. Wright 208,217
Engine, dummy, J. F. Thomas 208,213
Eyeleting machine, Woodward & Goodson 208,133
Felting machine, W. Keenan 208,180
Fence barb, wire, Baker & Bestor 208,140
Fence, portable, W. McLaughlin 208,027
Filter, J. & R. Bean 208,144
Firearm, breech-loading, C. E. & R. Green 208,085
Firearm, magazine, F. W. Tiesing 208,128
Fire extinguisher, car stove, P. P. Quackenboss.. 208,200
Flat iron heater, N. Crotsenberg 208,075
Floor cloth, manufacture of, J. Robley 208,036
Food preserving compound, R. S. Dashiell 208,159
Fruit picker, I. Gothard 208,167
Fruit picker, G. C. Hawkins 208,090
Furnace, gas retort, G. Siegel 208,106
Furnace, hot air, J. W. Crary (r) 8,416
Furnace, steam boiler, C. D. Smith 208,209
Gas regulator, J. Adams 208,134
Gas retorts, J. Slade (r) 8,422
Glass tempering, F. S. Shirley 208,207
Governor for engines, B. Brazelle 208,067
Governor, steam engine, B. Brazelle 208,149
Grain binder, J. F. Appleby 208,137
Grain separator, A. J. Humphreys 208,175
Grate, hot air, A. H. Buckhout 208,069
Grate, shaking, A. McDonald 208,109
Gun, machine, F. E. Schultze 208,203, 208,204
Gun, spring air, C. Herzfeldt, Jr 208,016
Harness breast collar, R. Pattin 208,115
Harness pad, M. V. Longsworth (r) 8,418
Harrow, E. Vandawater 208,129
Harvester guard finger, Ballew & Fuller 208,141
Hat pouncing machine, W. Keenan 208,179
Heater, portable water, E. Hersey 208,174
Hinge, lock, C. B. Clark 208,152
Hoe, J. N. Parker 208,197
Hog trap, W. Huston 208,098
Horse collar, A. D. Martin 208,107
Hose nozzle, Raymond & Perkins 208,122
Husking and shelling implement, L. F. Johnston 208,178
Hydrant, C. Carr 208,072
Ice, apparatus for making, J. Kyle 208,019

© 1878 SCIENTIFIC AMERICAN, INC.

Index, H. Beach	208,143
Indicator, office, E. H. Glidden	208,166
Indicator, station, W. H. H. Day	208,160
Irrigating apparatus, P. Dickson	208,078
Jelly, fruit, J. Millen	208,111
Journal bearing, anti-friction, S. Hill	208,095
Ladder, extension, L. Hauerwas	208,089
Lantern, A. L. Baron	208,142
Lantern and lamp, Morgan & Walton	208,112
Leather skiving machine, C. W. Schwanengel	208,041
Lighting device, automatic, Iseminger & Faloon	208,099
Lock, recording, J. R. Pershall	208,033
Lock, vehicle seat, W. B. Allen	208,136
Locks, flexible key for, L. J. Roberts	208,123
Lubricator, car axle, T. Haynes	208,091
Lumber measure, S. Kethledge	208,101
Magnetic metal separator, B. Fitts	208,163
Malt to mash, wetting, M. Schmahl	208,038
Manure, carriage for spreading, A. Mekenney	208,029
Match cutting machine, C. Pernet-Jouffroy	208,100
Meat smoking apparatus, Lewis & Crumb	208,185
Medicament for catarrh, J. W. Blosser	208,064
Moulding machine, etc., G. S. Roberts	208,202
Mop, H. L. Franklin	208,165
Motion transmitting and converting, J. Titus	208,050
Net, unloading, O. Marshall	208,189
Overcoat, J. F. Carter	208,151
Pan and cover, baking, B. F. Henry	208,173
Paper dish, H. A. House	208,096
Paper dishes, moulding, H. A. House	208,097
Pencils, holder for lead, O. Cleveland	208,154
Pipe fastener, adjustable, G. Burkhardt	208,150
Pipe, soap bubble, S. B. Bliss	208,063
Pitcher, double walled, H. B. Beach	208,056
Planter, corn, A. Heckman	208,015
Planters, attachment for corn, A. H. Law	208,020
Planters, check row for corn, J. P. Moos	208,193
Plow, W. Strait	208,048
Plow, ditching, L. M. Koehler	208,103
Plow, harrow, and seed planter, N. M. Fowler	208,082
Plow stock, C. M. Crossley	208,074
Plow sulky, J. E. Alexander	208,053
Potato digger, S. L. Allen	208,008
Power, device for transmitting, W. C. Baker	208,055
Press, baling, Z. Phillips	208,119
Printing, photo-mechanical, J. B. Obernetter	208,114
Printing press, W. A. Lavalette	208,184
Propeller, screw, S. T. Swasey	208,211
Pump, A. H. Ashley	208,054
Pump, bucket, J. M. Fate	208,080
Pump, force, O. K McIntire	208,132
Railway switch, A. E. McDonald	208,026
Razor strop, G. W. Brown	208,068
Refrigerating machines, Siddeley & Mackay	208,045
Refrigerator, A. Bettridge	208,148
Rope clamp, J. C. Covert	208,157
Sad iron holder, M. N Roberts	208,035
Sash fastener, S. Root	208,124
Saw sharpener, T. H. McCray	208,024
Scarf, M. Henschel	208,093
Scoop, I. Pierce	208,199
Screen, window, D. H. Metcalf	208,110
Seeders, device for the teeth of, Galloway & Larsen	208,014
Sewing machine shuttle, R. Leavitt	208,021
Shawl strap, N. R. Streeter	208,126
Ships' logs, rotator for, J. & G. H. Bliss	208,061
Shirt bosom and collar, D. McFarland	208,191
Shoe laces, clasp for exhibiting, Koch & Lynahan	208,018
Sign, J. L. Blackmer	208,060
Soap dish for iron sinks, W. C. Higgins	208,094
Spanner or wrench, W. R. Leeson	208,105
Spring, elliptic, J. Hargreaves	208,171
Square and rule, glaziers's, J. M. Kurtz	208,104
Stamping machine, etc., metal, J. T. Bedford	208,009
Steamer, feed, W. H. Allard	208,135
Stereotype plates, holding, A. N. Kellogg	208,181
Stirrup planing machine, W. W. Krutsch	208,183
Stove, fire place, N. McNamara	208,028
Stove, oil, P. Martin	208,109
Stove ovens, turn table for, T. V. Curtis	208,076
Syringe, Bliss & Davol	208,062
Tent pole, H. C. Cushing	208,158
Thrasher and huller, clover, L. V. Southworth	208,210
Tobacco package receptacle, H. N. Mann	208,187
Tooth powder box, H. Bell	208,145
Toy, A. M. Knapp	208,102
Toy building block, D. E. Stone	208,047
Trimming, G. Simon (r)	8,423
Truck, car, A. Berry	208,058
Truck, car, G. Vincent	208,215
Truck, hand, C. A. Harper	208,172
Truss, abdominal, J. V. Epple	208,079
Valve, stop, R. J. Thomas	208,214
Vehicles, spring side bar for, J. Tilton (r)	8,415
Ventilating cars, H. H. Wolfe	208,132
Victorine, I. Pick	208,034
Violin, P. M. Jacobus	208,017
Wagons, spring seat for, J. B. Gorrell	208,083
Washing machine, M. Puckett	208,121
Washing machine, Randall & Foster	208,201
Water trap for waste pipes, W. P. Austin	208,139
Weeder, K. P. Grant	208,084
Windmill, E. S. Smith	208,208
Wire tightener, Marsh & Bergqvest	208,022
Wrench, A. Beck	208,057
Wrench, J. S. Birch	208,059
Yoke coupling, neck, C. Eckes	208,012

TRADE MARKS.

Alcohol, C. H. Graves	6,582
Baking powders, Sherman Brothers & Co	6,597, 6,598
Canned edibles, The Hannibal Meat Company	6,583, 6,584
Car springs, Miller, Metcalf & Parkin	6,586
Cartridges and percussion caps, Eley Brothers	6,581, 6,591
Cigars, Krohn, Feiss & Co	6,572
Cigars, I. Teichman	6,577
Cigars, cigarettes, etc, P. Whitlock	6,600
Cigars, cigarettes, etc., S. Jacoby & Co	6,573
Cod liver oil, Ansar, Harford & Co	6,592, 6,593
Corsets and bustles, L. Schiele & Co	6,594
Elastic iron paint, A. O. Brummel	6,590
Hair tonic, W. E. Jervey	6,585
Medicine for dropsy, etc., W. E Clarke	6,575
Medicine for liver complaint, W. Condell	6,580
Medicinal preparation, A. E. Mintie	6,579, 6,587
Mustard, Sherman Brothers & Co	6,595
Piano fortes, A. Weber	6,599
Plug chewing tobacco, P. H. Mayo & Brother	6,574
Plug chewing tobacco, Musselman & Co	6,588
Preparation for removing grease, J. W. Cole & Co.	6,578
Proprietary medicines, H. C. Stewart	6,589
Spices, Sherman Brothers & Co	6,596
Toys and toy vehicles, C. W. F. Dare	6,576

DESIGNS.

Buttons, etc., J. W. Miller & I. M. Miller	10,830 to 10,833
Carpets, C. W. Swapp	10,835 to 10,838
Carpet, T. J. Stearns	10,839
Coffin screws, J. W. Rogers	10,834
Leg frames of sewing machines, E. S. Jones	10,829
Steam engine frames, C. Tyson	10,84

English Patents Issued to Americans.

From October 8 to October 15, inclusive.

Axles.—I. B. Boyce, Legun, Mass.
Cigarette.—C. G. Emery, Brooklyn, N. Y.
Cigarette package.—C. G. Emery, Brooklyn, N. Y.
Cleaning wool.—F. G. Sargeant, Graniteville, Mass.
Cloth napping machinery.—C. Woelfel *et al.*, Chester, Pa.
Compressing machinery.—E. G. Wheeler, N. Y. city.
Dovetailing machinery.—W. H. Doane, Cincinnati, O.
Electrical apparatus.—S. F. Van Choate, N. Y. city.
Furnace for steam boilers.—W. M. Fisher, Cincinnati, O.
Galvanic battery.—W. W. Griscom, Philadelphia, Pa.
Gaslight extinguisher.—W. W. Gibbs, Boston, Mass.
Horseshoe nail machinery.—T. H. Fuller, Boston, Mass.
Injector.—J. H. Irwin, Philadelphia, Pa.
Moulding machinery.—W. H. Doane, Cincinnati, O.
Movable intrenchments.—M. J. Wellman, N. Y. city.
Planing machinery.—W. H. Doane, Cincinnati, O.
Pianoforte.—Geo. Caddick, Allegheny, Pa.
Saw setting machinery.—W. H. Doane, Cincinnati, O.
Sleeping berth.—D. Huston, Boston, Mass.
Wrench.—J. W. Hyat, Newark, N. J.

The Scientific American
EXPORT EDITION.

PUBLISHED MONTHLY.

THE SCIENTIFIC AMERICAN Export Edition is a large and SPLENDID PERIODICAL, issued once a month, forming a complete and interesting Monthly Record of all Progress in Science and the Useful Arts throughout the World. Each number contains about ONE HUNDRED LARGE QUARTO PAGES, profusely illustrated, embracing:

(1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its SPLENDID ENGRAVINGS AND VALUABLE INFORMATION.

(2.) Prices Current, Commercial, Trade, and Manufacturing Announcements of Leading Houses. In connection with these Announcements many of the Principal Articles of American Manufacture are exhibited to the eye of the reader by means of SPLENDID ENGRAVINGS.

This is by far the most satisfactory and superior Export Journal ever brought before the public.

Terms for Export Edition, FIVE DOLLARS A YEAR, sent prepaid to any part of the world. Single copies, 50 cents. For sale at this office. To be had at all News and Book Stores throughout the country.

NOW READY.

THE SCIENTIFIC AMERICAN EXPORT EDITION FOR OCTOBER, 1878, WITH SEVENTY-NINE ILLUSTRATIONS.

GENERAL TABLE OF CONTENTS

Of the SCIENTIFIC AMERICAN Export Edition for October, 1878.

Answers to Correspondents, embodying a large quantity of valuable information, practical recipes, and instructions in various arts.

Single numbers of the *Scientific American Export Edition*, 50 cents. To be had at this office, and at all news stores. Subscriptions, *Five Dollars a year;* sent postpaid to all parts of the world.

MUNN & CO., PUBLISHERS,
37 PARK ROW, NEW YORK.

To Advertisers: ☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost.

The Scientific American Export Edition has a large guaranteed circulation in all commercial places throughout the world. Regular Files of the Export Edition are also carried on ALL STEAMSHIPS, foreign and coastwise, leaving the port of New York. Address MUNN & CO., 37 Park Row, New York.

NEW PATENT LAW
FOR
Spain, Cuba, Porto Rico, etc.

By the terms of the New Patent Law of *Spain*, which has lately gone into operation, the citizens of the United States may obtain Spanish Patents on very favorable conditions.

The Spanish Patent covers SPAIN, and all the Spanish Colonies, including CUBA, Puerto Rico, the Philippine Islands, etc. Total cost of obtaining the Patent, $.00. Duration of the Patent, 20 years, 10 years, and 5 years, as follows:

The Spanish Patent, if applied for by the original inventor before his American patent is actually issued, will run for 20 years. Total cost of the patent, $100. It covers Spain, Cuba, etc. The Spanish Patent, if applied for by the original inventor not more than two years *after* the American patent has been issued, will run for 10 years. Total cost of patent, $100. Covers Spain, Cuba, etc.

A Spanish Patent of Introduction, good for 5 years, can be taken by any person, whether inventor or merely introducer. Cost of such patent, $100. Covers Spain, Cuba, and all the Spanish dominions.

In order to facilitate the transaction of our business in obtaining Spanish Patents, we have established a special agency at No. 4 Soldado, Madrid.

Further particulars, with Synopsis of Foreign Patents, Costs, etc., furnished gratis.

MUNN & CO.,
Solicitors of American and Foreign Patents,
Proprietors of the SCIENTIFIC AMERICAN,
37 PARK ROW, NEW YORK.

EXPLOSIVE DUST. A COMPREHENSIVE description of the Dangers from Dust in various Manufactures and the Cause of many Fires. How combustible substances can explode. Spontaneous Combustion of Iron, Charcoal, and Lampblack in Air. Flour Dust and Brewery Dust Explosions. Explosions of Coal Dust in Mines. Contained in SCIENTIFIC AMERICAN SUPPLEMENT No. 125. Price 10 cents. To be had at this office and of all newsdealers.

THE TECHNOLOGY OF THE PAPER TRADE. By William Arnot, F.R.S. Its Early History. Invention of the Beating Engine, Introduction of Soda, etc., and the First Machine-made Paper. Cameron's Machine; the Fourdrinier Machine. Interesting sketch of the Old Time Paper-mill vs. the Mill of Modern Times, the latter described at length, with all the Apparatus; the Sorting, Boiling, Breaking, Poaching, and Beating Processes; Progress of the Pulp through the Machine; the Draining, the Rolls, the Cooling Rolls, the Size-bath. Raw Fibrous Materials, their Characteristics and Treatment Preparatory to Pulping. Cotton, Straw, Linen, Hemp, Esparto, Wood. Instructive Account of the Numerous Chemical and Boiling Processes, etc. This treatise gives Practical Particulars on every Department of Papermaking, describing the Latest and Best Processes and Machines in use, with Statistics, Profit, etc. Contained in SCIENTIFIC AMERICAN SUPPLEMENT Nos. 109 and 110. Price 20 cents for the two. To be had at this office and of all newsdealers.

CAVEATS, COPYRIGHTS, TRADE MARKS, ETC.

Messrs. Munn & Co., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine Improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had OVER THIRTY YEARS' EXPERIENCE, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the Prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Trade Mark Regulations, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very moderate terms.

We send free of charge, on application, a pamphlet containing further information about Patents and how to procure them; directions concerning Trade Marks, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.

Foreign Patents.—We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world. American inventors should bear in mind that, as a general rule, any invention that is valuable to the patentee in this country is worth equally as much in England and some other foreign countries. Five patents—embracing Canadian, English, German, French, and Belgian—will secure to an inventor the exclusive monopoly to his discovery among about ONE HUNDRED AND FIFTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such that patents can be obtained abroad by our citizens almost as easily as at home. The expense to apply for an English patent is $75; German, $100; French, $100; Belgian, $100; Canadian, $50.

Copies of Patents.—Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at reasonable cost, the price depending upon the extent of drawings and length of specifications.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent.

A pamphlet, containing full directions for obtaining United States patents sent free. A handsomely bound Reference Book, gilt edges, contains 140 pages and many engravings and tables important to every patentee and mechanic, and is a useful hand book of reference for everybody. Price 25 cents, mailed free

Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
37 Park Row, N. Y.

BRANCH OFFICE—Corner of F and 7th Street Washington, D. C.

© 1878 SCIENTIFIC AMERICAN, INC.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

"DEFIANCE"

PRICE $1.00.

Spoke Shaves, No. 10.

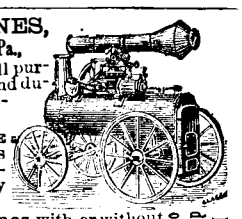
These Shaves have a screw adjustment for setting the cutter, and an improved double-iron, as illustrated in the SCIENTIFIC AMERICAN of Sept. 21st, page 189. They are the only Shaves with a cutter adjustment of any kind, and we confidently recommend them to mechanics and others as the best tools of their class in use Sent to any address, postage prepaid, on receipt of price.
Send for an illustrated circular of Mechanics' Tools to

BAILEY WRINGING MACHINE CO.,
99 Chambers St., New York.

50 Perfumed Chromo and Motto Cards, 10c. *Name in Gold and Jet.* Seavy Bros., Northford, Ct.

ARTESIAN
Well Drilling, Boring,
MINERAL PROSPECTING and QUARRYING TOOLS.
Highest award at Centennial Exhibition. Send for pictorial catalogue and price-list, free. Agents wanted. **$20 per day guaranteed.** Sand, boulders, and rock **easily handled.** Address, PIERCE WELL EXCAVATOR CO., 4206 Elm Ave Philadelphia, Penn

STEAM ENGINES,
A. B. FARQUHAR, York, Pa.,
Cheapest and best for all purposes—simple, strong, and durable. Also *Traction Engines* for common roads.



SAW, GRIST AND RICE MILLS, GINS, PRESSES AND MACHINERY generally. Inquiries promptly answered.

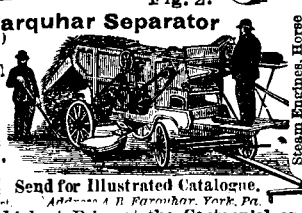
Fig. 1.

Vertical Engines, with or without wheels, very convenient, economical and complete in every detail, best and cheapest Vertical in the world. Fig. 1 is engine in use. Fig. 2 ready for road.

Fig. 2.

Boiler & fly-wheel larger than other makers. Send for Catalogue.

The Farquhar Separator
(Warranted)
Penna. Agricultural Works, York, Pa.
Lightest draft, most durable, simplest, most economic l, and perfect in use. Wastes no grain, cleans it ready for market.



Steam Engines, Horse Powers, Thrashers, all kinds Agric. Ploughs, Cultivators, &c., &c.

Send for Illustrated Catalogue.
Address A. B. Farquhar, York, Pa.

Awarded highest Prize at the Centennial and Paris Expositions.

A RECIPE FOR CURING **CONSUMPTION** given gratis by Dr. H. JAMES, 1032 Race St., Philada.

ACTIVE AGENTS GIVEN GOOD EMPLOYMENT EVERYWHERE
By over 200 responsible advertisers in this month's issue of the AGENTS' HERALD. Sample copies 10 cents, with sample card and full particulars of the AGENTS' DIRECTORY and a beautiful 10x14 eng. of the Smithography.
AGENTS' PUB. CO., Sansom St., Phila., Pa.

GET THE BEST.

Webster's Unabridged

3000 Engravings; 1840 Pages Quarto.
FOUR PAGES COLORED PLATES.
Published by **G. & C. MERRIAM,** Springfield, Mass.

Warmly Indorsed by

Bancroft,	Prescott,
Motley,	George P. Marsh,
Fitz-Greene Halleck,	John G. Whittier,
N. P. Willis,	John G. Saxe,
Elihu Burritt,	Daniel Webster,
Rufus Choate,	W. D. Howells,
Smart,	Horace Mann,
Ezra Abbot,	William T. Harris,

More than **fifty** College Presidents,
And the best American and European Scholars.

WEBSTER is the Dictionary used in the Government Printing Office." August, 1877.
Every School and Family should have it for constant use and reference.
Best FAMILY help in training children to become intelligent men and women.
Several years later, and has one-fifth more matter, than any other large Dictionary
The authorized authority in Courts of Justice, for the meaning of words.
Etymologies and definitions far in advance of any other Dictionary.
Recommended by U. S. Chief Justice Waite, as "the highest authority for definitions."

THE BEST

FACTS For Schools—recommended by State Supt's of **35** States, and by **50** College Pres'ts.
About **32,000** have been placed in Public Schools by law or by School Officers.
Contains **3000** Illustrations, nearly three times as many as any other Dictionary.
Three pictures of a ship, on page 1751, illustrate the meaning of more than **100** words.
Sale of Webster's is **20** times as great as that of any other series of Dictionaries.

Is it not rightly claimed that Webster is THE NATIONAL STANDARD?

IMPORTANT FOR ALL CORPORATIONS AND MANF'G CONCERNS.—**Buerk's Watchman's Time Detector,** capable of accurately controlling the motion of a watchman or patrolman at the different stations of his beat. Send for circular.
J. E. BUERK, P. O. Box 979, Boston, Mass
N. B.—The suit against Imhaeuser & Co., of New York, was decided in my favor, June 10, 1874. A fine was assessed against them Nov. 11, 1876, for selling contrary to the order of the court. Persons buying or using clocks infringing on my patent will be dealt with according to law.

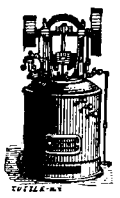
BURNHAM'S
STANDARD TURBINE WATER WHEEL.
WARRANTED BEST AND CHEAPEST.
N. F. BURNHAM, YORK, PA.

MINING MACHINERY. Engines, Boilers, Pumps, Coal and Ore Jigs, Dust Burning Appliances. Drawings and advice free to customers. Jeanesville Iron Works (J. C. Haydon & Co.). Address HOWELL GREEN, Supt., Jeanesville, Luzerne Co., Pa.

75 BEAUTIFUL CHRISTMAS AND NEW YEAR'S Cards (original designs), no two alike, for 15 1c. stamps. Agents wanted. H. Thomas & Co., Box 1637, Phila., Pa.

SURE CURE FOR SPLINT.

My remedy will positively cure splint without blistering or removing the hair. No change in diet or work. Price $1 for sufficient to cure. Address
WM. E. COUSINS, 551 Broadway, Albany, N. Y.



The Genuine Baxter Steam Engines,

Made exclusively by COLTS FIREARMS COMPANY, of Hartford, Connecticut, and sold only by them and their authorized Agents. Sizes from 1 to 15 horse power, including Engine and Boiler and everything complete to run. Non-explosive; occupies less space and consumes less fuel than any other engine. Beware of imitations offered by other parties. For prices and particulars, apply to
THOMAS J. FALES, General Agent,
118 Liberty Street, New York.

The George Place Machinery Agency

Machinery of Every Description.
121 Chambers and 103 Reade Streets, New York.

Lathes, Planers, Shapers

Drills, Bolt and Gear Cutters, Milling Machines. Special Machinery. E. GOULD & EBERHARDT, Newark, N. J.

William Cullen Bryant's

LATEST AND GREATEST WORK,

Outselling all others combined. Richly Illustrated. Has the **NEW BRYANT BIOGRAPHY** and New Steel Portrait. *Sold only by Subscription.* **WANTED**—A gentleman or lady of tact and ability, with or without business experience.
FORDS, HOWARD & HULBERT, New York.

NEW METHOD OF ENGRAVING
Moss' Process.
Photo Engraving Co.
67 Park Place, New York.

L. SMITH HOBART, President. JOHN C. MOSS, Superintendent.

TYPE-METAL RELIEF PLATES.
A SUPERIOR SUBSTITUTE FOR WOOD-CUTS
AT MUCH LOWER PRICES.

Persons desiring illustrations for Books, Newspapers, Catalogues, Advertisements, or for any other purposes, can have their work done by us promptly and in the best style.

Our Relief Plates are engraved by photo-chemical means; are mounted on blocks type-high ready for use on any ordinary press, and will wear longer than the common stereotype plates.

They have a perfectly smooth printing surface, and the lines are *as deep, as even*, and *as sharp* as they could possibly be cut by hand.

Electrotypes may be made from them in the same manner as from wood-cuts.

Copy. The engraving is done either from prints or pen-drawings. Almost all kinds of prints can be re-engraved directly from the copy, provided they be in *clear, black lines* or stipple, and on *white* or only slightly tinted paper.

Pen drawings, suitable for engraving by us, must be made with *thoroughly* BLACK ink, on *smooth, white* paper. They should usually be made twice the length and twice the width of the plates desired.

When such drawings cannot be furnished us, we can produce them from photographs, pencil sketches, or designs of any kind accompanied with proper instructions. Photographs taken in the usual way, and of any convenient size, we can use.

Change of Size.—Wood-cut prints of the coarser kind may often be reduced to half their lineal dimensions, while others will admit of very little reduction, and some of none at all.

Most lithographic and steel-plate prints will admit of no reduction.

Very fine prints of any kind may be *enlarged* moderately without detriment.

Any prints which cannot be satisfactorily reduced or enlarged may be *redrawn* and thus brought to any desired size.

In all cases of reduction and enlargement, the relative proportions remain unchanged.

Proofs.—Whenever desired, we will furnish tintype proofs of the drawings made by us, for approval or correction, before engraving. A printed proof is furnished with each plate.

Time.—We cannot usually engage to fill an order for a single plate in less than from three to six days; larger orders will require longer time.

Estimates will be promptly furnished when desired. That these may be definite and correct, the copy to be used—whether print, photograph, sketch, or drawing—should always be submitted for our examination, together with a distinct statement of the size of plate wanted, and of any other details to be observed.

Terms.—To insure attention, all orders must be accompanied by an advance of half the price charged, the balance to be paid on delivery.

Electrotyping and Printing.—We have recently added to our establishment excellent facilities for making electrotypes, and also three power presses specially fitted for printing plates of all sizes in the finest manner.

Artificial Light.—We have just introduced this most important facility, which enables us to prosecute our work *in cloudy weather*, and to push forward hurried orders *in the night.*

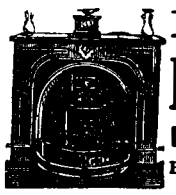
References.—Our plates are now used by the principal publishers in this city, and by most of the leading houses in every State in the Union.

Send stamp for illustrated circular.

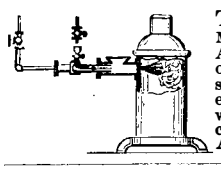
STEAM PUMPS.
HENRY R. WORTHINGTON,
239 Broadway, N. Y. 83 Water St., Boston.
THE WORTHINGTON DUPLEX PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water-Works Stations.
STEAM PUMPS—Duplex and Single Cylinder.
WATER METERS. OIL METERS.
Prices Largely Reduced.

65 **MIXED CARDS** with name, **10c.** and stamp. Agent's Outfit, 10c. L. C. COE & Co., Bristol, Ct.

U. S. PIANO CO.,
163 BLEECKER ST., N. Y.,
Manufacturers of strictly first-class Pianos. We sell **direct** to Families from **our own** Factory at **lowest wholesale** price. Beautiful **new** 7 1-3 Octave, Rosewood Pianos. Sent on trial. Thousands in use. **Heavy Discount to cash buyers DON'T** buy until you read our Catalogue. It will **interest** you—Mailed **free.**



BIBB'S
Celebrated Original Baltimore
Fire Place Heaters
Mantels and Registers.
B. C. BIBB & SON,
Baltimore, Md.
Best workmanship. Lowest prices guaranteed. Send for circulars.

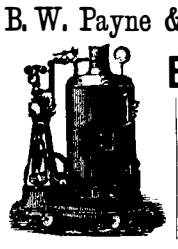


THE FORSTER-FIRMIN GOLD AND SILVER AMALGAMATING COMP'Y of Norristown, Pa., will grant state rights or licenses on easy terms. This system works up to assay, and recovers the mercury rapidly. Apply as above.

THE DRIVEN WELL.

Town and County privileges for making **Driven Wells** and selling Licenses under the established **American Driven Well Patent,** leased by the year to responsible parties, by
WM. D. ANDREWS & BRO.,
NEW YORK.

B. W. Payne & Sons, Corning, N. Y.
Established in 1840.



Eureka Safety Power.

h.p.	cyl.	ht.	space.	wt.	price.
2	3½x4	48 in.	40x25	900	$150
4	4x6	56	46x30	1600	250
6	5x7	72	72x42	2700	400

Also, **SPARK ARRESTING PORTABLES,** *and* Stationary Engines *for Plantations.* Send for Circulars.

$7 A DAY to Agents canvassing for the **Fireside Visitor.** Terms and Outfit Free. Address P. O. VICKERY, Augusta, Maine.

GOLD MEDAL

has been awarded at the Paris Exposition of 1878 to

J. & P. COATS,

for their best Six-Cord Spool Cotton, confirming the estimate placed upon their goods at all the World's Expositions, from that at London, 1862, to the Centennial Exposition of 1876, where they took a diploma for "SUPERIOR STRENGTH AND EXCELLENT QUALITY."

The Second Prize of a Silver Medal was taken by the Willimantic Linen Company, which claims to be the special champion of American Industry, and which has extensively advertised a Grand Prize at Paris.

NO GRAND PRIZES were awarded for Spool Cotton at PARIS.

Messrs. J. & P. Coats have established in Pawtucket, R. I., the largest Spool Cotton Mills in the United States. Every process of Manufacture, from the raw cotton to the finished spool, is conducted there. Their American-made Spool Cotton took the award at the Centennial, and while they have never claimed special merit for their American-made Spool Cotton over that manufactured in their Scotch Mills, we have the satisfaction of announcing that they have so identified themselves with this country, that

AMERICA, as represented by J. & P. COATS, is still
AHEAD IN SPOOL COTTON.

Auchincloss Brothers,
Sole Agents in New York for
J. & P. COATS.

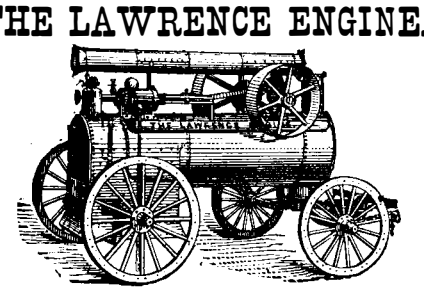
EXAMINE the WONDERS of NATURE! A MICROSCOPE that magnifies 1000 TIMES sent pre-paid on receipt of 25 CENTS. Size ⅝ by ⅝ inch, and being very handsomely nickel-plated, it makes a beautiful vest-chain ornament. MAMMOTH Catalogue of Novelties FREE. STENT & CO., 132 Nassau St., N. Y.

AMERICAN NOVELTIES
wanted for English trade. 1,000 Sewing Machines to be sold cheap. Apply
BRITANNIA COMPANY, Colchester, England.

Fine Pamphlets printed for **75c. a Page**
per 1,000. 1,000 Fine 9x12 Circulars, $2.50. Price list or estimate and samples for stamp.
"Local" Printing House, Silver Creek, N. Y.

FOR THE BEST UPRIGHT HAY-KNIFE *made,* composed of sections, address TURNER & HEATH, CAZENOVIA, N. Y. **Circulars free.**

THE LAWRENCE ENGINE.



THE BEST FARM ENGINE IN THE WORLD.
AUTOMATIC CUT-OFF.
LESS FUEL, LESS WATER, LESS REPAIRS THAN ANY OTHER PORTABLE ENGINE.
No Commission to Agents!
Bottom Price to Purchasers!
Engines for all purposes, with and without Wagons.
If you need Cheap Power, send for Illus. Catalogue.
ARMINGTON & SIMS, Lawrence, Mass.
Armington & Sims were lately with The J. C. Hoadley Co.

The Piano-ette.

The Latest Musical Wonder.
Price Reduced to $2.50 Former Price $5.00
Full Chromatic Scale.

Over 3,000 sold Christmas week. Purchasers always satisfied.

It is an entirely new article of Swiss invention, designed to take the place of a Piano, where one cannot be afforded, or to give a knowledge of piano playing before purchasing a piano or organ. The keys and tongues are of METAL, carefully tuned and pitched, and will never get out of order. The case is hard wood, finely finished. It will make a handsome ornament for any room. Any tune can readily be played upon it in less time than it takes to learn the scale on the piano. It is at once amusing, instructive and a great help to a musical education A more appropriate present cannot be made to any one. This Piano-ette we have just imported this month. It has a full chromatic scale, 81 keys, sharps and flats complete, enabling the most difficult and complex music to be readily played. It has two banks or rows of keys as does a real piano the upper one for sharps and flats, the lower row for natural notes. It is elegantly finished, over twice the size of the regular Piano-ette, and other dealers ask $5 for a much inferior article. Our price is $2.50 complete, every instrument warranted. Instruction book and twenty beautiful pieces, 25 cents extra. Sold only by C. HENRY SPAULDING, 93 Water Street, Boston, Mass. Beware of cheap imitations.

C. W. LE COUNT, SOUTH NORWALK, CONN., Mfr. of Lathe Dogs, Iron and Steel Expanding Mandrels of all sizes. A specialty made of Amateurs' Mandrels and Dogs.

BEST Terms to Agents ever offered Send stamp for samples. National Weekly, Washington, D. C.

Bell's Telephones,

Adjusted, ready to put on line, at $5.00 per pair. Magneto Bells, superior quality, $12.00. Battery Bells, $3 50. Battery, per cell, $1.20. Line Wire, No. 12 Galvanized Iron, $15.00 per mile. Brackets and Insulators, 10c. Office Wire, per pound, 75c. We are prepared to furnish complete outfit for Telephone Lines on short notice. C. E. JONES & BRO., Mfrs. and Dealers in Telegraph Supplies, Cincinnati, Ohio. State where you saw this.

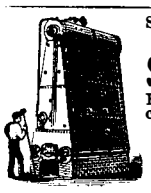
© 1878 SCIENTIFIC AMERICAN, INC.

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

MARVIN'S
FIRE & BURGLAR
SAFES
COUNTER PLATFORM WAGON & TRACK
SCALES
MARVIN SAFE & SCALE CO.
265 BROADWAY. N.Y.



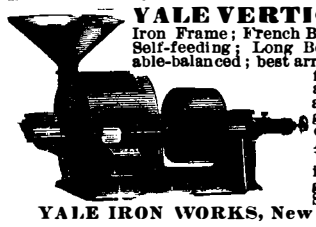
Send for Catalogue of the
FIRMENICH
SAFETY STEAM BOILER,
For burning smoke and all gases from coal and all kinds of fuel
Requires no Cleaning of Soot or Ashes.
J. G. & F. FIRMENICH, Buffalo, N. Y.

Mill Stones and Corn Mills.
We make Burr Millstones, Portable Mills, Smut Machines, Trackers, Mill Picks, Water Wheels, Pulleys, and Gearing, specially adapted to Flour Mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

DIAMOND ROCK DRILLS
The only Machines giving a solid core showing exact nature of rock passed through.
THE AMERICAN DIAMOND ROCK BORING Co.
SEND FOR PAMPHLET. NEW YORK.

TO INVENTORS.
Wanted—some valuable patent, either in wood or iron, suitable for the hardware trade, to make and sell on royalty. If of iron, parties must furnish pattern. Must have entire control. By parties who have the best facilities for introducing. Address
MANUFACTURER, Lock Box 18, Providence, R. I.

H.W.JOHNS' ASBESTOS
LIQUID PAINTS, ROOFING, BOILER COVERINGS,
Steam Packing, Sheathings, Fire Proof Coatings, Cements.
SEND FOR SAMPLES, ILLUSTRATED PAMPHLET AND PRICE LIST.
H.W.JOHNS M'F'G Co., 87 MAIDEN LANE, N.Y.



YALE VERTICAL MILL
Iron Frame; French Burr; Self-oiling; Self-feeding; Long Bearings; Adjustable-balanced; best arranged, made and finished, *cheapest*, and for quality and quantity ground no superior in the world. Also the Yale Vertical and Horizontal Steam Engines and Boilers. Send for Circular.
YALE IRON WORKS, New Haven, Conn.

PARENTS, GIVE YOUR CHILDREN A TRADE. The Engraver's Model Cabinet free for stamp.
G. C. LOEWENTHAL & CO., 722 Sansom St., Phila., Pa.

FOR SALE—A VALUABLE PATENT for an article in the household line. Can be manufactured cheap. For particulars, address H. M. AVERS, Patentee, Room 1, 87 Washington St., Chicago, Ill.

THE INGERSOLL
ROCK DRILL Co
1½ PARK PLACE N.Y.

SECOND-HAND ENGINES,
Portable and Stationary, at Low Prices.
HARRIS IRON WORKS, TITUSVILLE, PA.

BEST AND CHEAPEST FOOT POWER SCREW CUTTING
$100. **ENGINE LATHES**
SEE FULL DESCRIPTION IN SCIENTIFIC AMERICAN, JULY 27
SEND FOR ILLUSTRATED CATALOGUE
GOODNOW & WIGHTMAN
176 WASHINGTON ST BOSTON MASS.

FOR ALL KINDS OF MACHINERY—Apply to S. C. HILLS, 78 Chambers St., New York.

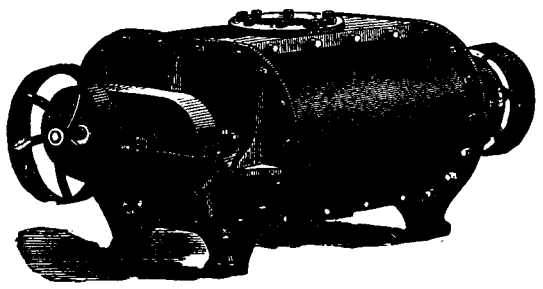
PATENTS AT
AUCTION.
Regular Monthly Sales by George W. Keeler, Auctioneer. For terms, address NEW YORK PATENT EXCHANGE, 67 Liberty Street, New York.

DAMPER REGULATORS **BEST** AND WEIGHTED GAUGE COCKS.
MURRILL & KEIZER. 44 HOLLIDAY ST., BALTIMORE.

Working Models
And Experimental Machinery, Metal or Wood, made to order by J. F. WERNER, 62 Centre St., N. Y.

JENNINGS' WATER CLOSETS
PRICES REDUCED SEND FOR CIRCULAR
94 BEEKMAN STREET NEW YORK

ROOTS' FORCE BLAST BLOWER.



FIRST PREMIUM
AWARDED
AT
PARIS AND VIENNA.

SPEED ONLY 100 TO 250 REV. PER M. SAVES HALF THE POWER REQUIRED FOR FAN.
P. H. & F. M. ROOTS, Manuf'rs, CONNERSVILLE, IND.
S. S. TOWNSEND, Gen'l Ag't, 6 Cortlandt St., NEW YORK.

J. LLOYD HAIGH,
Manufacturer of
WIRE ROPE
of every description, for Railroad and Mining Use, Elevators, Derricks, Rope Tramways, Transmission of Power, etc. No. 81 John St., N. Y. Send for price list.

PORTLAND CEMENT,
ROMAN & KEENE'S. For Walks, Cisterns, Foundations, Stables, Cellars, Bridges, Reservoirs, Breweries, etc. Remit 25 cents postage stamps for Practical Treatise on Cements. S. L. MERCHANT & CO., 53 Broadway, N. Y.

Every Man His Own Printer! THE EXCELSIOR **$3 Press** Prints labels, cards etc. (Self-inker $5) 9 Larger sizes For business, pleasure, young or old Catalogue of Presses, Type, Etc., for 2 stamps. KELSEY & Co. Meriden, Conn

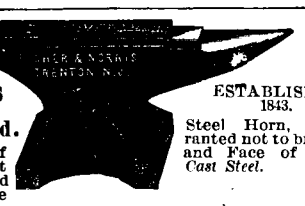
Pond's Tools,
Engine Lathes, Planers, Drills, &c.
DAVID W. POND, Worcester, Mass.

SCREWS
of every variety for machine builders made to order at low prices. Send for new catalogue.
L. F. Standish & Co., 26 Artizan St., New Haven, Conn.

WOOD ENGRAVING
At Photo-Engraving Process Rates, by
T. P. DONALDSON, 33 Park Row, N. Y.

FIRE ON THE HEARTH
Stoves and Heaters. Three things in one—Fireplace, Stove, Furnace. Silver Medal Paris Exposition 1878. For description, send to
OPEN STOVE VENTILATING CO., 115 Fulton St., N. Y.

TO ADVERTISERS! We fill orders for the insertion of advertisements in the newspapers of the United States and Dominion of Canada. To furnish advertisers with reliable information concerning newspapers and their rates, and thus enable the most inexperienced to select intelligently the mediums best adapted to any particular purpose, WE ISSUE SEMI-ANNUAL EDITIONS OF
AYER & SON'S MANUAL FOR ADVERTISERS. 164 8vo. pp. Gives the names, circulation, and advertising rates of several thousand newspapers in the United States and Canada, and contains more information of value to an advertiser than can be found in any other publication. All lists carefully revised in each edition, and where practicable prices reduced. The special offers are numerous and unusually advantageous. It will pay you to examine it before spending any money in newspaper advertising. The last edition will be sent postpaid to any address on receipt of 25 cents by N. W. AYER & SON, ADVERTISING AGENTS, Times Building, Philadelphia.

Retail

9 Cents Per Pound.
ESTABLISHED 1843.
Steel Horn, warranted not to break, and Face of *Best Cast Steel.*
Warranted of the hardest temper, and *never* to settle
Better than any English make, and only one that is fully
!! WARRANTED !!
50 sizes, from 1-2 lb. to 800 lbs.
Catalogues furnished on application.

BIG PAY.—With Stencil Outfits. What costs 4 cts. sells rapidly for 50 cts. Catalogue *free*.
S. M. SPENCER, 112 Wash'n St., Boston, Mass.

American Standard Gauge and Tool Works,
PHILADELPHIA, U. S. A.
Standard Gauges and Measuring Implements, Hardened Steel Turning Mandrils, Adjustable Blade Reamers, Patent Tool Holders, Lathe Drivers.
JOHN RICHARDS & CO.,
22d and Wood Streets, Philadelphia. 7 Blackfriars Street, Manchester, Eng.

WROUGHT IRON BEAMS & GIRDERS
THE UNION IRON MILLS. Pittsburgh. Pa.. Manufacturers of improved wrought iron Beams and Girders (patented).
The great fall which has taken place in the prices of iron, and especially in Beams used in the construction of FIRE PROOF BUILDINGS, induces us to call the special attention of Engineers, Architects, and Builders to the undoubted advantages of now erecting Fire Proof structures; and by reference to pages 52 & 54 of our Book of Sections—which will be sent on application to those contemplating the erection of fire proof buildings—THE COST CAN BE ACCURATELY CALCULATED, the cost of insurance avoided, and the serious losses and interruption to business caused by fire these and like considerations fully justify any additional first cost. It is believed, that, were owners fully aware of the small difference which now exists between the use of Wood and Iron, in many cases the latter would be adopted. We shall be pleased to furnish estimates for all the Beams complete, for any specific structure, so that the difference in cost may at once be ascertained. Address
CARNEGIE, BROS. & CO., Pittsburgh, Pa.

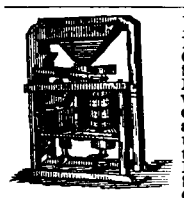
MACHINISTS' TOOLS.
NEW AND IMPROVED PATTERNS.
Send for new illustrated catalogue.
Lathes, Planers, Drills, &c.
NEW HAVEN MANUFACTURING CO., New Haven, Conn.

WATSONS NON CHANGEABLE GAP LATHE HAS GREAT FACILITIES FOR LARGE OR MEDIUM SIZE WORK JAMES WATSON MANR 1608 S FRONT ST PHILA PA

ICE AT $1.00 PER TON.
The PICTET ARTIFICIAL ICE CO., LIMITED,
Room 51, Coal and Iron Exchange, P. O. Box 3083, N. Y.

Pyrometers, For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Superheated Steam, Oil Stills, etc.
HENRY W. BULKLEY, Sole Manufacturer, 149 Broadway, N. Y.

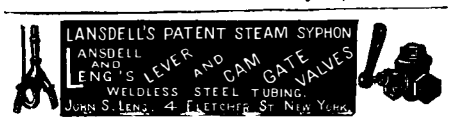
Wood-Working Machinery,
Such as Woodworth Planing, Tonguing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, and Wood-Working Machinery generally. Manufactured by
WITHERBY, RUGG & RICHARDSON, 26 Salisbury Street, Worcester, Mass.
(Shop formerly occupied by R. BALL & CO.)



B. T. TRIMMER'S PAT. Improved Excelsior Smutter, Grain Scouring, Polishing, and Separating Machine (see cut). Millers say it is the best in the world. Pat. Disintegrator "unequalled" for grinding bones and all refractory substances. To keep up with the times you must have these mills—"Warranted." Mill Furnishings, Saw-Mills, Mill Stones, Pat. Portable Mills for Grain, Paint, Spices, Drugs, etc.
KREIDER, CAMPBELL & CO., Manufacturers, 1030 Germantown Ave., Philadelphia, Pa.

LAP WELDED CHARCOAL IRON Boiler Tubes, Steam Pipe, Light and Heavy Forgings, Engines, Boilers, Cotton Presses, Rolling Mill and Blast Furnace Work.
READING IRON WORKS, 261 South Fourth St., Phila.

Telephones.
How made, adjusted, and operated by any person. Send stamp for full and interesting description, with illustrations and instructions. One pair first-class Telephones complete, except diaphragms, sent to any address upon receipt of $5. J. H. BUNNELL, Electrician, 112 Liberty St., New York.



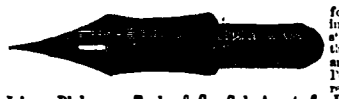
Screw Cutting Machinery For Sale.
The subscriber, having sold his tools and business, offers for sale at cost a few of the Babbett Bolt Cutters recently made; also the Patent therefor.
P. HICKEY. Auburn, N. Y.

CAMERON Steam Pumps
For Mines, Blast Furnaces, Rolling Mills, Oil Refineries, Boiler Feeders, &c.
For Illustrated Catalogue and *Reduced* Price List send to Works, Foot East 23d St., New York.

WIRE ROPE
Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

THE BIGELOW Steam Engine.
BOTH PORTABLE AND STATIONARY.
The CHEAPEST AND BEST in the market. Send for descriptive circular and price list.
H. B. BIGELOW & CO., New Haven, Conn.

PERRY & Co.'s STEEL PENS.
A sample box, for trial, containing our leading styles, including the famous "U" and "Falcon" Pens, mailed on receipt of 25 cts.



Ivison, Blakeman, Taylor & Co., Sole Agents for U.S., New York.

THE TANITE CO.,
STROUDSBURG, PA.
EMERY WHEELS AND GRINDERS.
GEO. PLACE, 121 Chambers St., New York Agent.

ROCK DRILLING MACHINES AND AIR COMPRESSORS.
MANUFACTURED BY BURLEIGH ROCK DRILL Co.
SEND FOR PAMPHLET. FITCHBURG MASS.

ESTABLISHED 1844.
JOSEPH C. TODD,
ENGINEER and MACHINIST. Flax, Hemp, Jute, Rope, Oakum and Bagging Machinery, Steam Engines, Boilers, etc. I also manufacture Baxter's New Portable Engine of 1877. Can be seen in operation at my store. A one horse-power portable engine, complete, $125; two horse-power, $225; two and a half horse-power, $250; three horse-power, $275. Manufactured exclusively by
J. C. TODD,
10 Barclay St., New York, or Paterson, N. J.

BAXTER $100 1 HORSE ENGINE OF 1877.
For State Rights to manufacture above, apply to
A. VAN WINKLE. Newark, N. J,

Patent Portable Chuck Jaws.
Improved Solid Emery Wheels, for grinding Iron and Brass Castings, Tools, etc. Manufactured by AM. TWIST DRILL CO., Woonsocket, R. I.

60 Chromo and Perfumed Cards (no 3 alike), Name in Gold and Jet, 10c. CLINTON BROS., Clintonville, Ct.

Woodward Steam Pumps and Fire Engines.
G. M. WOODWARD,
76 and 78 Centre Street, New York.
Send for catalogue and price list

MEDAL & PREMIUM AWARDED TO
ALCOTT'S TURBINE WATER WHEELS
MANUFACT'D AT MOUNT HOLLY N.J.

SPARE THE CROTON AND SAVE THE COST.
Driven or Tube Wells
furnished to large consumers of Croton and Ridgewood Water. WM. D. ANDREWS & BRO., 414 Water St., N.Y., who control the patent for Green's American Driven Well.

It pays Agents to sell our Rubber Printing Stamps. Sample free. J. M. MITTEN & CO., Cleveland, O.

Cigar Box Lumber,
MANUFACTURED by our NEW PATENT PROCESS.
The Best in the World.
SPANISH CEDAR, MAHOGANY, POPLAR.
Also thin lumber of all other kinds, ⅛ to ¼ in., at corresponding prices. All qualities. Equal in all respects to any made, and at prices much under any to be obtained outside of our establishment. Send for price list.
GEO. W. READ & CO., 186 to 200 Lewis Street, N. Y.

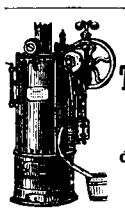
Diamonds & Carbor
Shaped or Crude, furnished and set for Boring Rocks, Dressing Mill Burrs, Emery Wheels, Grindstones, Hardened Steel, Calender Rollers, and for Sawing, Turning, or Working Stone and other hard substances; also Glaziers' Diamonds. J. DICKINSON, 64 Nassau St., N.Y.

PARIS EXHIBITION PRIZES. FULL Official List of the Awards in the American Department, enumerating Exhibits and Names and Addresses of Exhibitors, with kind of Prize awarded in each case. SUPPLEMENTS 149, 150. Price 10 cents each.

EAGLE TUBE Co.,
614 to 626 W. 24th St., New York.
BOILER FLUES of all the Regular Sizes,
Of Best Material and Warranted.
☞ ORDERS PROMPTLY EXECUTED.
No Payment Required till Tubes are Fully Tested and Satisfactory.

FIRST-CLASS CHUCKS. PRICE LIST: Geared, 2¼ in. diam., $3.50; 3 in., $5.50; 4 in., $7 00; 5 in., $8.50; 6 in., $10. Lever, 2½ in. diam., $2.50; 3½ in., $4.50. Sent by express on receipt of list price.
Address HARTFORD CHUCK CO., Hartford, Ct.

STEAM AND HYDRAULIC
Passenger and Freight Elevators,
STEAM ENGINES AND BOILERS,
WHITTIER MACHINE CO., Boston, Mass.



Domestic Semi-Portable Engine,
2 and 4 horse power, and
The Peerless Portable Steam Engine
for Agricultural and other purposes, from 6 to 10 horse power.
Nothing cheap but the price. Send for descriptive catalogue and price list to
F. F. & A. B. LANDIS, M'f'rs, Cherry St., Lancaster, Pa.

THE PROPERTIES OF IRON AND STEEL. By DANIEL ADAMSON, C. E. A paper read before the Iron and Steel Institute, with 58 figures and 2 diagrams How Testing Machines impose False Conditions. Endurance of Iron and Steel under Concussive Force. Thirty Experiments upon Plates. Annealed Steel. Effects of Sulphur, Phosphorus, and Cinder. Tensile Strength of Iron and Steel. Drilled and Punched Holes Rule to Find the Power Required to Punch Steel Plates. The Ten-inch Test. Welding of Steel Boiler Plates. A thoroughly Practical and most Valuable Paper, giving Results of Numerous Tests on Bessemer Mild Steel, Best-best Boiler Plate, Martin-Siemens Steel, Crucible Steel, Sub-carbonized Steel, Swedish Bar Iron, Mild Rivet Steel, Best Merchant Iron, Tuchoe Crown Iron, etc., embracing 40 varieties of Iron and Steel. These Tests are illustrated by two full Pages of cuts showing the Behavior of the Metal under Torsion, Tension, and Concussion, with the Effects of Punching. The Results embraced in one page of Tables, giving Size of Specimen, Permanent Set Induced, Maximum Strain per cent of Elongation, Final Breaking Strain, Bending, Drifting before and after Annealing. Composition of Specimen, and all Particulars Corrosion Tests. Concussion resisted best by Mild Steel. Corrosion of Iron vs. Steel by Sea Water. Steel for Shipbuilding. Best quality for Steel Rails. Best varieties for Gun Barrels. Injury done by Finishing at Black Heat by Hammering. Making Steel Fly Shafts, etc., and other Valuable Practical Conclusions. SUPPLEMENT 150. Price 10 cents.

THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts., Philadelphia, and 59 Gold St., New York.

© 1878 SCIENTIFIC AMERICAN, INC.