SCIENTIFIC AMERICAN

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

Vol. XXXIV.—No. 5. [NEW SERIES.] NEW YORK, JANUARY 29, 1876. [$3.20 per Annum. [POSTAGE PREPAID.]

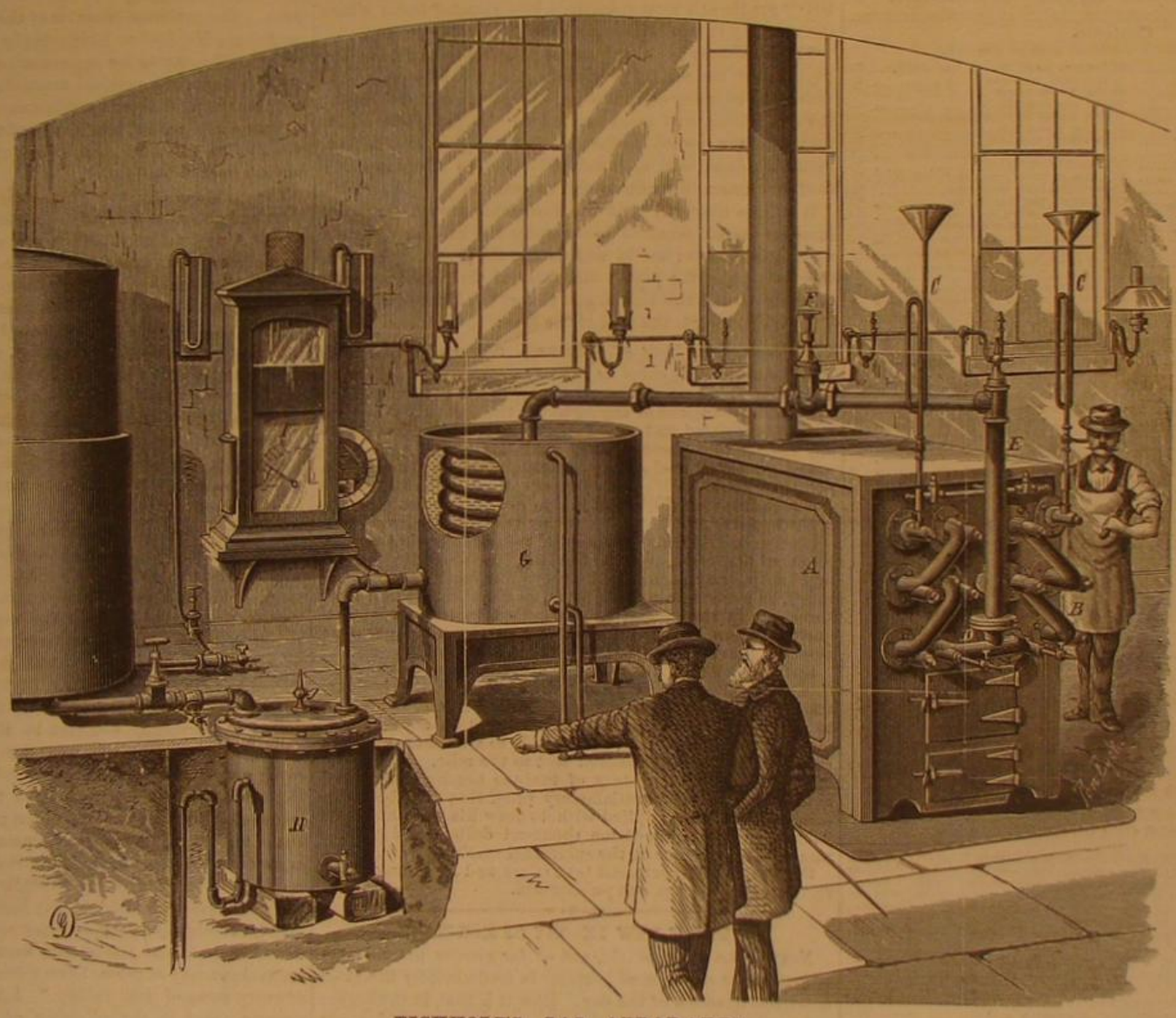
IMPROVED GAS APPARATUS.

The object of the invention herewith illustrated is to furnish private residences, country seats, hotels, railroad depots, and all large buildings with a cheap and efficient portable apparatus for the manufacture of illuminating gas. The engraving shows a front elevation of a complete gas works based on this system. A is the generator, which consists of a furnace and oven, made of a cast iron case and firebrick lining, in which are two series of three retorts each, contrived in a simple way, for graduating the heat to the different substances, according to the progress of the work. The retorts are made of cast iron, and can, it is claimed, be replaced at very little expense or labor. They are free from all danger of obstruction, and they can be used alternately for oil or steam, as desired; so that should the oil retorts, by any chance, become obstructed, the steam can be used to remove the obstacle immediately. At B are shown the outside connections of the retorts, and at C C the inlets for feeding the materials of which the gas is made. The outside connections of the two series of the retorts are at D, and at E is the standpipe, connected with the valve, F, which secures and shuts off the generator from the rest of the works. There is also a connection between the two upper retorts and the valves, between which is another connection leading by a T into the generator, for the purpose of blowing off (after the valve, F, is closed) the gas remaining in the retorts, after shutting down, by means of the superheated steam.

Inside the ash pit is a water pan for extinguishing any spark or coals which may fall through the grate bars, as a precaution against danger to the building if the generator is situated in one. By the pipe shown, connection is made with the cooler, G, from which there is a conduit to the drip box, H, in which any condensation is collected, and passed off directly to the sewer or drain pipe, by means of a self-acting seal. The gas from the drip box is led to the gasometer, and in the pipe is a valve to prevent any gas escaping back to the inlet pipe. Should any alteration or repair become necessary, this valve is closed, and the rest of the apparatus is disconnected without danger. The outlet pipe for distributing the gas, to the various pipes leading to rooms or streets, is also secured by a valve. Connected with the outlet is a branch pipe under seal, leading from the outlet to the drip box, to collect all condensation which has not before been gathered. Connected with the drip box pipe is a pressure gage which shows the pressure of the generator on the gasometer when manufacturing gas. There is also a pressure gage connected with the outlet, which shows the pressure carried by the gasometer. I is an improved jet photometer, by which the candle power of the gas is correctly shown at once. Test cocks are provided to test the hydrogen and carbon separately, and also o test them when mixed, as a fixed gas before cooling. This process, the inventor considers, may be adopted by large or small gas works throughout the country, with the result of producing better gas at less expense and with less labor. It requires but one man where ten are needed in the coal gas process. The inventor also claims the process to be absolutely and perfectly safe. There is no distillation or purification necessary; and during the coldest weather of 1875, the candle power was not in the least affected, and no condensation whatever found.

The apparatus needs no especial skill for its management, any ordinary laboring man being able to run it with perfect safety, after three days' experience. It can quickly be taken apart and put together, and it also occupies but small space, averaging about one fourth that required by a coal gas works of the same capacity.

Patented through the Scientific American Patent Agency, November 16, 1875, by Mr. John H. Eichholz For further particulars apply to Messrs. Eichholz & Green, 115 Freeman street, Brooklyn (E. D.), N. Y.



EICHHOLZ'S GAS APPARATUS.

Platinum and Iridium.

MM. Saint-Claire Déville and Debray have succeeded in preparing platinum and iridium in a state of purity hitherto unattained. They prepare platinum of a density of 21·5, and iridium of the still more considerable density of 22·4. Alloys of these metals have a greater density in proportion to the amount of iridium present. With 90 per cent of platinum and 10 of iridium, the density is 21·6; it reaches 22·38 if the iridium form 95 per cent of the whole.

Canal Steaming.

The use of steam on the Chesapeake and Ohio Canal is destined to increase the transportation facilities of that enterprise, and eventually make a larger quantity of Cumberland coal available. The Ludlow Patton recently made a round trip between Cumberland and Georgetown, including lockage, in four days and nineteen hours, said to have been the fastest time ever made on the canal. The owner of the Ludlow Patton claims that the simple and ingenious arrangement for submerging her propeller has conducted largely to her success. She has been running the entire season just closing, has consumed for fuel 4½ tuns of coal per trip, and the repairs to her motive power have thus far cost but 90 cents.

Mysterious Fires.

We are now arrived at a season of the year when fires are abundant, and mysterious fires especially so. The mystery of a fire is one of three kinds—the mystery of fraud, the mystery of carelessness, and the mystery of ignorance. The latter characterizes people of all ranks in life, and is, seemingly, as persistent as carelessness, and sometimes as culpable as fraud. For instance, how many people know precisely what a defective flue is? How many know anything about spontaneous combustion? How many know that hollow walls are actual flues, which have the power of carrying flames from the bottom of a house to the top, almost instantly? How many know that the heat of a stove, even when separated by some little distance from wood, will, in the course of time, so char it that a spark will fire it? How many know that, under favorable circumstances, fires will smolder for hours, ready to flash into actual flame when fanned by the opening of a door, or the slightest current of air caused in any manner whatever? In brief, how many know anything of a hundred and one circumstances that will cause mysterious fires, which a slight degree of practical knowledge might easily prevent?—*The Index.*

Working Men's Reading Rooms—One Result of Our Suggestion.

A few weeks ago we published a brief editorial about working men's reading rooms, suggesting that it would be an excellent idea to establish resorts of this kind in every village and town, and to furnish them with newspapers and other cheap reading and interest the men, while, at the same time, educating them and preventing their wasting their evenings in taverns and bar rooms. The seed we thus threw broadcast fell, in one instance at least, on fertile soil. At a recent meeting of a Good Templar's Lodge, in Plattsburgh, N. Y., a lady read our article, "little expecting," says the local journal, the *Plattsburgh Sentinel*, "that it would lead to any immediate practical result." The members, however, at once seized upon the idea; one, Mr. Thomas Armstrong, offered a room free of charge, and a committee was then and there appointed to carry out the project. The *Sentinel* says that a cheerful, well lighted, and well warmed room, well supplied with newspapers and other attractive literature, will be provided, and in every respect rendered a congenial and pleasant resort. We are very much gratified to learn of this result of our efforts, and congratulate the worthy Good Templars on their generosity and public spirit.

Sixty-Foot Rails.

The Edgar Thompson Steel Works have filled an order for 60 foot rails. Several advantages are claimed for rails of this length. They cost no more per pound than 30 foot rails; and as two crop ends are saved, the cost of production is considerably lessened—no way of using crop ends economically having yet been devised. The cost of laying is lessened; fewer fish plates, etc., are required; and as the hammering caused by the rolling stock in passing from rail to rail is lessened by one half, the wear and tear of rails and rolling stock must be greatly diminished. On bridges, also, the strain will be greatly reduced. The practical results of the use of these rails will be awaited with considerable interest. —*Chicago Railroad Review.*

How to Grow Fat.—It is said that a pint of milk, taken every night just before retiring to rest will soon make the thinnest figure plump. Here is a simple and pleasant means by which thin, scraggy women may acquire plump, rounded figures.

A good alloy for making working models is 4 parts copper, 1 part tin, and ¼ part zinc. This is easily wrought. Doubling the proportion of zinc increases the hardness.

Scientific American.

MUNN & CO., Editors and Proprietors.

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

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

TERMS.

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

Club Rates.

Ten copies, one year, each $2 70, postage included.....$27 00
Over ten copies, same rate each, postage included..... 2 70

☞ By the new law, postage is payable in advance by the publishers, and the subscriber then receives the paper free of charge.

NOTE.—Persons subscribing will please to give their full names, and Post Office and State address, plainly written, and also state at which time they wish their subscriptions to commence, otherwise the paper will be sent from the receipt of the order. When requested, the numbers can be supplied from January 1st, when the volume commenced. In case of changing residence, state former address, as well as give the new one. No changes can be made unless the former address is given.

If any of our readers fail to receive their numbers regularly; if the direction is not plainly written; if premiums are not received; or if there is fault of any sort at this office, we will thank our friends to send us postal card complaints, and repeat the same, if need be, until the remedy is effected. *Do not hesitate to complain.* We desire to keep all matters between ourselves and patrons right and satisfactory.

VOLUME XXXIV., No. 5. [NEW SERIES.] *Thirty-first Year.*

NEW YORK, SATURDAY, JANUARY 29, 1876.

Contents.

(Illustrated articles are marked with an asterisk.)

Air ship, the wreck of an..... 69
Air, temperature of, etc. (69)..... 75
Alloy for models..... 63
Alumina, fusible (41)..... 75
Alum in mucilage (33)..... 75
American meat in England..... 72
Ammonia for nickel plating..... 74
Aniline, discolored (72)..... 75
Annealing cast iron (50)..... 75
Answers to correspondents..... 74
Band sawing machine*..... 70
Beet cider..... 72
Bichromated gelatin (25)..... 74
Boilers, priming in (59)..... 75
Boiler tubes, corroded (7)..... 74
Bricks, Bath..... 68
Brushes, artists'..... 68
Business and personal..... 74
Butter, oils from (28)..... 74
Canal steaming..... 63
Canary seed (42)..... 75
Carraway seed (43)..... 75
Castings, cleansing (58)..... 75
Cement for roofs (72)..... 75
Centennial exposition, the..... 68
Chilblains (44)..... 75
Coining*..... 67, 68
Comet, what is the tail of a..... 69
Contagion in our schools..... 68
Copal, dissolving gum (30)..... 74
Copper edge tools (47)..... 75
Crab, the Buddha*..... 68
Ducks and terrapins..... 68
Eau de Cologne (61)..... 75
Engine, compression*..... 66
Engines for boats, etc. (66)..... 75
Engines, small, etc. ....(9) 74, (54) 75
Explosion of chromic acid, etc..... 72
Explosion of factory dust..... 69
Fat, how to grow..... 75
Fire plug, improved..... 66
Fires, mysterious..... 63
Force, Mr. Edison's new*..... 69
Force, the new..... 69
Friction in shaft and hub (53) 75
Frost on trees, effect of..... 72
Gas apparatus, improved*..... 63
Gas from steam boilers (11)..... 74
Gold, weight of (49)..... 75
Grinding machine*..... 70
Gun, the 81-ton (31)..... 74
Heating furnaces (64)..... 75
Heating houses by steam (15)..... 74
Heredity, new theory of..... 64
Ice and milk (3)..... 74
Infernal machines..... 65
Ink, green black (39)..... 75
Ink powders (45)..... 75
Ink stains on parchment (36)..... 75
Lake, a boiling..... 73
Leather, to clean..... 68
Lenses for magic lantern (15)..... 74
Licorice paste (46)..... 75
Lime in water, to detect (48, 66)..... 75
Machine shop economy..... 72
Magnet, the Jamin (22)..... 74
Mandrils, steel for (4)..... 74
Metal to resist phosphorus (21)..... 74
Needles floating on water (42)..... 75
Nickel-plating apparatus (26)..... 74
Oil for lubricating..... 74
One man's work..... 66
Patent decisions, recent..... 73
Patent matters in Congress..... 73
Patents, American and foreign..... 73
Patents, list of Canadian..... 76
Patents of 1875, the..... 72
Patents, official list of..... 76
Penguin family, the*..... 71
Pipes, burst steam (5)..... 74
Platinum and iridium..... 63
Potatoes in manufactures (40)..... 75
Rails, sixty foot..... 68
Reading rooms, working men's..... 63
Recipes, useful..... 73
Riveting steel plates (6)..... 74
Roofs, Gothic (67)..... 75
Rust from salt water, etc., (70)..... 75
Safe savings..... 65
Saw mandrels, long, etc., (61)..... 75
Seal flesh..... 68
Silvering glass globes (14)..... 74
Skin, cracks in the (75)..... 75
Skin, darkening the (34)..... 75
Smoke, to produce (29)..... 74
Soaps, coloring (52)..... 75
Springs, strength of '53)..... 75
Steam on the highways..... 64
Stencil paste (2)..... 74
Stereoscope, making a (24)..... 74
Sunlight, reflected, etc. (19)..... 74
Teeth, artificial, etc..... 72
Telegraphs in factories (17)..... 74
Water, lime in (35)..... 75
Water, rain, to clarify (23)..... 74
Water, tarry, etc. (57)..... 75
Water wheel invention, a..... 71
Zinc, brown patina on..... 72

THE SCIENTIFIC AMERICAN SUPPLEMENT.
No. 5.
For the Week ending January 29, 1876.

TABLE OF CONTENTS.

I. MECHANICS AND ENGINEERING.—With Nineteen Engravings.—The Wear of Metal Surfaces, by JOSHUA ROSE, 2 figs.—Willan's Three Cylinder Engine, 3 figs.—French Street Tramways.—New Safety Tweer, 1 Cut.—New York, New Haven, and Har. ford Railroad Shops.—Railways of the United States, January 1, 1876.—Fairlie's Double-Bogie Locomotive, Narrow Gage, 4 Engravings.—Military Rifles.—Pneumatic Telegraphy.—The Moncrieff Gun Carriage, 2 Engravings.—Theory of Stream Lines, by PROFESSOR FROUDE, 6 figs.

II. ELECTRICITY, LIGHT, HEAT, ETC.—A New Duplex Telegraph, 1 fig.—Phenomena of Induction, by PROFESSOR E. J. HOUSTON.—The Secondary Batteries of M. PLANTE, 4 figs.

III. THE CENTENNIAL INTERNATIONAL EXHIBITION.—With two Engravings.—The Machinery Hall, Elevation and Ground Plan.—The Centennial Depot.—The Leather Exhibition Building.—The Exhibition of Fish at the Centennial.—The Building for the Display of Carriages.

IV. PROCEEDINGS OF SOCIETIES.—American Geographical Society.—Royal Geographical Society.—Royal Astronomical Society.—London Mathematical Society.—Physical Society, London.—Society of Telegraph Engineers.

V. ASTRONOMY, 5 figures.—The Dislocation of the Heavens.—Supposed Changes of Nebulæ.—The Transit of Venus.—The Cause of the Aurora.

VI. CHEMISTRY AND METALLURGY.—The New Metal Gallium.

VII. TECHNOLOGY.—Art Works in Bronze.—Production of Phosphorus.—Plate Glass.—Pork Packing in Ohio.

VIII. MEDICAL.—Treatment of Bright's Disease, Diet, etc., at Bellevue.

IX. MISCELLANEOUS.—The Origin of our Numerals.—A New Pilgrim's Progress.—Fishing with Powder.—The Putrefaction of Eggs.—Long Range Rifle Shooting.—Pisciculture.

The SCIENTIFIC AMERICAN SUPPLEMENT is uniform in size with the 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 SCIENTIFIC AMERICAN SUPPLEMENT will be sent together for one year, postage free to subscribers, on receipt of $7.00.

Remit by postal order. Address

MUNN & CO., PUBLISHERS,
37 Park Row, New York.

☞ Single copies of SUPPLEMENT sent to any address on receipt of 10 cents.

A PRACTICAL dairyman sends the following about rendering winter churning easy: Strain the milk into pans and set them on a pot of boiling water on the stove. Heat the milk quite hot, but not so as to scald. Set away the pans, and in 36 hours thick cream will have formed. At each skimming stir the cream well together, and, when enough for a churning has accumulated, take care, in cold weather, to have the chill taken off the cream; then scald the churn, put in the cream, and churn gently; and if the butter does not come in less than ten minutes, you may judge that your cream is too cold.

STEAM ON THE HIGHWAYS--TEN THOUSAND DOLLARS REWARD.

The State of Wisconsin has taken a very practical initiative in the important matter of promoting the use of steam power on the highways, by offering a reward of ten thousand dollars to the inventor of any successful machine, to be tested as stated below.

This reward appears to be intended simply as a token of the importance of the matter to the State—a sort of recognition, merely, of the great benefit that the discoverer will bestow upon Wisconsin, to say nothing of the advantages he will confer upon the world in general.

We subjoin the text of the law, which is now in vogue, having been passed at the last session of the Legislature. We may add that it is to the efforts of Mr. G. M. Marshall, of Big Spring, Wis., a member of the Legislature, that the passage of the law is due. Mr. Marshall is a most enterprising, intelligent, and practical man, and we could wish that many more of such gentlemen were chosen to represent the people in our various State legislatures. There is undoubtedly a vast work to be done, an astonishing economy to be gained, by the adaptation of steam to highway traffic, and we commend the subject to the serious study of our inventive readers.

We will make but one suggestion, which is that, in the study of plans for machinery for this purpose, the inventor should endeavor to provide a practical method of increasing or diminishing, at will, the leverage of his engine upon the vehicle, so that, without changing the speed of his engine, he may be able to reduce or increase the velocity of the vehicle thus enabling him to surmount bad places and heavy grades at a slow velocity, while running faster where the roadway is level and smooth.

The provisions of the law are so plain and simple, and the payment of the reward so certain, that we have no doubt there will be many competitors; while the general benefits of the competition will reach far beyond the particular object for which the reward is offered. The study which this competition induces will unquestionably lead to many new and useful collateral discoveries and inventions.

It will be observed that the successful inventors of this machine are not required to surrender any of their rights in respect to patents: but in addition to the pecuniary reward, they may enjoy the patent monopoly of their inventions in all the States of the Union, and in fact in all foreign States.

The following is the text of the law:

The People of the State of Wisconsin, represented in Senate and Assembly, do enact as follows:

Section 1. There is hereby appropriated the sum of ten thousand dollars, out of any money in the Treasury not otherwise appropriated, to be used as a bounty, and to be paid to any citizen of Wisconsin, who shall invent and, after five years' continued trial and use, shall produce a machine propelled by steam or other motive agent, the object of which is a substitute for the use of horses or other animals on the highways or farm.

Section 2. The test of successful use shall be that any machine or locomotive, entering the lists to compete for the prize or bounty, shall perform a journey of at least two hundred miles, on a common road or roads, in a continuous line north and south in this State, and propelled by its own internal power, at the average rate of at least five miles per hour, working time.

Section 3. The said locomotive must be of such construction and width as to conform with or run in the ordinary track of the common wagon or buggy now in use, and be able to run backward or turn out of the road to accommodate other vehicles in passing, and be able to ascend or descend a grade of at least two hundred feet to the mile.

Section 4. The Secretary of State is hereby empowered and authorized, when satisfactory proof that the above conditions have been complied with, to draw his warrant on the Treasury for the sum of ten thousand dollars, and pay the same to the inventor of the successful machine.

Section 5. This act shall take effect and be in force from and after its passage and publication.

GALTON'S NEW THEORY OF HEREDITY.

Next to the origin of life, and of far greater practical importance, the question of heredity is preëminently the great biological question of the day. How is it that, in the higher orders of plants and animals, the offspring resembles not only the parent, but often, and in a more remarkable degree, some remoter ancestor? How are characteristics of figure, temperament, mental and moral traits, etc., carried over from generation to generation? More mysteriously, how are the peculiarities of the grandparent transmitted to the grandchild, skipping the intermediate link? And how do acquired traits become hereditary?

Like the author of pangenesis, Mr. Galton adopts the hypothesis of organic units as the necessary basis of the science of heredity. This hypothesis almost necessarily implies: First, that each of the enormous number of *quasi* independent units, which make up each and every organism, must have a separate origin or germ. Second, that the stirp (by which term he designates the sum total of the determining elements of the newly fertilized ovum) contains a host of germs, much greater in number and variety than the organic units of the structure to be derived from them; so that comparatively few germs are developed. Third, that the germs which are not developed retain their vitality, propagate themselves while latent, and contribute to form the stirps of the offspring. Fourth, that organization wholly depends on the mutual affinities and repulsions of the separate germs, first in their stirpal, and subsequently during all the processes of development. For proofs of the reasonableness of these postulates, the reader is referred to the arguments of Mr. Darwin. By means of them, and what to him appear to be their necessary consequences, Mr. Galton explains why it is that none of the higher races admit of being long carried on by any system of unisexual parentage; consequently the necessity of double parentage, and therefore of sex. This necessity in complex organizations is, he holds, the immediate consequence of a theory of organic units and germs.

Suppose, for example, a gardener takes the second bud of a plant and raises from it another plant, the second bud which is used in like manner, and so on consecutively. At each successive stage there is a chance of the dying out or omission of some one or more of the various species of germs in the stirp; and of course when they are gone, they are lost for ever. From time to time, this chance must fall unfavorably, causing deterioration of the race. If the loss be vital, the race will be extinguished at once: otherwise it will linger on until the accumulation of small losses becomes fatal. Exactly the same argument applies to every other unisexual process, all of which lead to deterioration and final distinction: subject, we should say, to the contingency of an origination *de novo* of organic units or their germs in the race. On the other hand, when there are two parents, the chance deficiency of any particular species of germ in the contribution from either parent will be likely to be supplied by the other, and the extinction of the family indefinitely postponed. And even if a few lines do run out, the remaining families fill up, only too easily, the gap.

From the rapidity of the visible changes in the substance of the newly fertilized ovum, it is inferred that the invisible germs in the stirp are in restless and eager pursuit of new positions of organic equilibrium, due, it may be supposed, to the unequal rates of development of some of the better nourished germs. Segregations occur as much as aggregations, repulsions concurring with affinities, doubtless, in producing them. The probable behavior of these germs under various conditions, Mr. Galton illustrates by analogy with political affairs. The successive segmentation of a cell is compared to the division of a political assemblage into parties, having thenceforward different attributes. Or the stirp may be compared to a nation, and the germs that achieve development to its foremost men, who succeed in becoming two nation's representatives.

The great dissimilarity frequently observed between brothers and sisters is similarly illustrated by a political metaphor. A uniform constituency will always have representatives of a uniform type; and this precisely corresponds with what occurs in animals of pure breed, whose offspring always resemble their parents and each other. On the other hand, when a constituency is very varied, trifling circumstances will change the balance of parties, and therefore, although there may be little real variation in the electoral body, the character of its political choice at successive elections may change abruptly. Similarly, in mongrel breeds, the greater the mixture, the greater the variety of the offspring. In like manner Mr. Galton explains why it is that the likenesses and differences of twins are more marked than those of ordinary brothers and sisters.

It is an essential condition in the theory of pangenesis that the developed portion of the stirp is the chief agent in maintaining the progeny of germs. Mr. Galton, on the contrary, holds that the developed part of the stirp is almost sterile, fertility residing in the non-developed residue, or rather in its progeny and representatives (whatever, or however numerous, they may be) at the time when the individual has reached adult life. In this way he explains why, although hereditary resemblance is the general rule, the offspring is frequently deficient in the very peculiarity for which the parent was exceptionally remarkable. "We can easily understand," Mr. Galton remarks, "that the dominant characteristics in the stirp will, on the whole, be faithfully represented by the structure of the person who is developed out of it; but if the personal structure be a faithful representative of the dominant germs, it must be an unfavorable representative of the germs generally, and therefore *a fortiori* of the undeveloped residue: nay, in extreme cases the person may be absolutely misrepresentative of the residue, the accidental richness of the sterile sample, in some particular valuable variety of germ, having drained the fertile residue of every germ of that variety." Instances of this sort frequently occur in the offspring of men of extraordinary genius, in which cases it is inferred that all the germs of genius were used up and rendered sterile in the structure of the parent, leaving the child exceptionally deficient. Another alleged result of the sterility of the developed elements of the stirp is the strong tendency to deterioration in the transmission of every exceptionally gifted race. By the same hypothesis, Mr. Galton explains the almost complete non-transmissions of acquired modifications through abruptly changing conditions, education, etc.

According to the theory of pangenesis, the germs or gemmules must freely circulate with the blood. On the strength of his experiments with rabbits, showing them to breed true after large transfusion of the blood of alien species, Mr. Galton holds that Darwin's theory demands too much: he is satisfied, however, that the segmentations of the stirp are not perfectly clean and precise, but that each structure includes many alien germs, whereby the progeny of all the contents of the residue of the stirp are distributed over the body, thus enabling the lower animals to replace lost limbs and the higher to restore wounded tissues.

Of the inheritance of non-congenital peculiarities, Mr. Galton is more than ordinarily sceptical. At most, "acquired modifications are barely if at all inherited, in the correct sense of that word." He accepts the supposition that they are faintly heritable, however, and accounts for such inheritance by a modification of pangenesis, to the effect that each cell may be supposed to throw off a few germs that find their way into the circulation, with a chance of occasionally finding their way to the sexual elements, and of becoming

naturalized among them: a process independent of the causes supposed mainly to govern heredity.

To illustrate the relationships of parents and offspring, Mr. Galton resorts again to a political comparison. The idea of such relationship being one of direct descent he holds to be quite untenable. From his point of view, the stirp of the child is to be considered as descended directly from a part of the stirps of each of its parents, while the personal structure of the child is an imperfect representation of his own stirp, and the personal structure of each of the parents is no more than an imperfect representation of each of their own stirps. The idea of filial relationship, which likens it to that which connects colonists to their parent nations, errs in making the relationship too close and strong. It resembles more that which connects the representative government of the colony with that of the parent nations. This is his first approximation. The second approximation consists in making allowance for the limited power of transmitting acquired peculiarities, that is, for the reaction of the personal structure upon the sexual elements and thereby upon the future stirp. This he allows for by supposing the governments of the parent states to have the power of nominating a certain proportion of the colonists.

INFERNAL MACHINES.

Recent European mails bring further details of the diabolical plot which accidentally culminated in the fearful dynamite explosion on the wharf of the steamer Mosel, in Bremerhaven. It seems that the igniting mechanism was a common clock, of strong construction, and with its works so arranged as to cause a thirty pound hammer to strike a blow every ten days. The dynamite was placed in four zinc boxes arranged one above the other, the clock and hammer being between the second and third. As to how the explosion was caused there is much difference of opinion, but it is probable that it was due to one of two causes: either the dynamite exuding out of its receptacles and being exploded by the concussion of dropping the box, or the premature fall of the hammer.

It is curious to mark how much mechanical ingenuity has been expended on these engines of destruction: ingenuity which, if devoted to honest ends, would have gained for its possessors far greater rewards than they ever might hope to obtain through the terrible crimes intended. Thomassen's apparatus, above described, is comparatively crude, notably so in view of the fact that he must have examined other devices before deciding upon its use. Take, for instance, the machine which, some three years ago, it was attempted to ship aboard one of the Messageries Maritime Company's vessels, at Bordeaux or Marseilles. As usual, a heavy insurance on worthless goods was the object of the plan. The principle of this arrangement was that of the needle gun. The needle was set in a bolt, which was acted on by a spring in a tube. In order to hold the bolt back, thus compressing the spring, a catch on the former engaged with a hammer-headed lever. The lever was also attached to springs, which tended to draw it away from the catch, but the operation of which was opposed by a large disk placed close against the lower part of the lever head and held in its place in front of the catch on the bolt. In the disk there was a notch deep enough for the lever head to drop into when that portion of the disk was suitably presented. The disk was rotated by a train of clockwork at a fixed speed, and its edge was spaced off so that two consecutive marks would come opposite a fixed point in exactly one day. Supposing, therefore, the disk to be marked in ten portions, and the machine to be required to explode in eight days, the lever would be set at the eighth mark from the notch. The clockwork started, the disk would revolve until, at the eighth day, the notch would come opposite the lever, and the latter would fall into it, so freeing the needle and exploding the cartridge. All of this mechanism was placed in a common packing box, and nitro-glycerin or other fearfully powerful explosive was used. Fortunately the scheme was discovered and frustrated in time.

The coal shell is another infernal device, the invention of which, the London *Times* intimates, may be attributed to some over-zealous supporter of Mr. Plimsoll's parliamentary endeavors to prevent the sacrifice of sailors' lives in rotten ships. Each shell was a hollow brass casting, resembling a moderate-sized lump of coal, and was simply filled with an explosive mixture. When coal was delivered to a vessel, it was intended (said the witness, who is supposed to have concocted the shell and the sensational story) to mix in a few of the shells, which, when carefully blacked, it would be impossible to distinguish. They would, with the coal, be shoveled into the furnaces, and instantly blow up, destroying the vessel, whose loss would probably subsequently be attributed to a boiler explosion.

Ingenuity of a much higher and hence more fiendish order has been brought to bear in the construction of "rats," which are of two species, one intended to operate on iron, the other on wooden ships. The iron ship rat consisted of a pig of iron, similar in appearance to that commonly used for kentledge or ship's ballast. Of course where several hundred of these pigs were carried next the keelson and on the floor of the ship, careful scrutiny of each would be altogether impossible. Into the block a hole was made, and in this a tubular boring tool, hollow and filled with acid, was placed. Above the tool a weighted lever was rigged, and so placed as to work to and fro horizontally in a space cut out of the top of the pig. The whole was carefully boxed in, and the surface of the iron restored. The rolling of the ship would cause the lever to sway back and forth, and so act on the tool as to carry it against the ship's side. A spring helped to push the tool, and the latter, aided by the acid, very slowly but surely made its way through the iron and opened a leak. The latter, being in a location very difficult to find or even to plug, unless closed in some way would cause the ship to fill and sink.

The wooden rat was much more complex, and certainly more ingenious. In a box were placed, at a distance of five feet apart, two vertical cylinders. Between these was a horizontal cylinder having a piston working in it, the rod passing through a stuffing box. The other end of the rod worked a weighted ratchet drill. The vertical cylinders were each half filled with water, and each connected by a separate pipe with opposite ends of the horizontal cylinder. When the ship rolled, the water, alternately leaving and returning to the vertical cylinders, acted on the piston, the reciprocating motion of which was converted into rotary motion at the auger, which thus worked its way through the vessel's side. After the hole was made, the auger was freed from its fastening and dropped through into the water, so that it neither choked the hole, nor remained as evidence of how the same was produced. The box, even if discovered, would indicate nothing save to a mechanical eye. Both of the rats, of course, required that their originator or a confederate should adjust them to their work.

The use of infernal machines for wholesale destruction, in order to gain insurance, is of comparatively recent date, as the old and common employment of these devices was, and still is in a measure, to destroy individuals obnoxious to the perpetrator of the crime. In 1838, it will be remembered, Fieschi devised an ingenious arrangement of twenty-five gun barrels (perhaps the prototype of the modern mitrailleuse), which were discharged all at once at the object of his hatred, Louis Philippe, without accomplishing the purpose intended, however. The Orsini bombs, designed for the slaughter of Louis Napoleon and his family, were small iron shells made in halves and screwed together. The interior was filled with powder, and the outside completely studded with nipples and percussion caps, so that it would be impossible to throw down the bomb without some cap exploding the charge. These, when tried, killed several people; but the Emperor escaped unharmed.

The simplest infernal machine is that peculiar to the New York rascal, who occasionally dispatches it per express to politicians who have fallen from his good graces. The last recipient we can recall was Comptroller Green, of this city. The arrangement received by this gentleman, luckily without injury, was a small innocent-looking box having a sliding lid. The interior of the latter was lined with sand paper, against which the heads of several matches (of the parlor or explosive kind) were placed. On withdrawing the lid, the friction of the sand paper would ignite the matches and then the powder of a heavy cartridge in the box. The effect would be to blind or severely injure the opener; but in the case above mentioned, nefarious designs were suspected, and thorough soaking in water allowed of the box being safely examined.

We had prepared drawings of some of the ingenious machines which, as above described, have been applied to such diabolical uses, and contemplated publishing engravings of the same in connection with the foregoing article; but on second thought, it seemed to us wiser not to do so. Crimes, say those who have made the evils of mankind a study, are epidemic; and there are minds so delicately poised that but a mere touch is necessary to turn them in the direction of evil. Mr. James T. Fields has recently had a lengthy conversation with that incarnate infernal machine, the Boston boy murderer Pomeroy, who so mercilessly mutilated his little playfellows; and as a result of his interview, Mr. Fields traces the boy's mania for blood, in some measure, to the perusal of the sanguinary yellow covered literature of the dime novel type. Doubtless the writers and publishers of the murderous adventures would be as much shocked as any other good members of the community would be, could the effect of their work on badly balanced and illiterate minds be demonstrated to them beyond doubt. So therefore we, desiring above all else to avoid even the remotest probability of working evil, think best to deny our pages to the semblance of the means whereby crimes so horrible and atrocious have been committed, for the harm caused might vastly exceed the advantage of such knowledge as the pictures might impart.

SAFE SAVINGS.—AN IMPROVEMENT NEEDED.

Our English cousins are fast reducing the problem of how to live cheaply and save money to a science. They have invented coöperative societies of which the members can buy the necessaries as well as the comforts of life at greatly reduced rates, and have long since brought annuity schemes and similar facilities for putting by funds to a high degree of perfection. The latest invention of this kind is the Provident Knowledge Society, an incorporate association whose professed object "is to endeavor to make regular weekly saving a national habit, and so increase the facilities for saving that it shall be as easy for a man to put by a small sum as it is now for him to spend that sum in beer or spirits." A high aim certainly, and one cannot but feel curious to know will be the practical result.

The association, it seems, works in two ways: First by advising people, either verbally or by letter, relative to forming schemes to encourage frugality, and second by issuing pamphlets, written in the simplest and plainest language, about various subjects of the same nature. Supposing, therefore, a workman can save a few pence a week, and has no idea how to do it, or what the result will be if he does, he sends a penny stamp to the society with his question, and back comes the necessary manual, telling him all he wants to know with official precision. There are pamphlets about life insurance, pawnbroking, saving banks, hints for working men, to general employees, and to servants, and suggestions how to start coöperative stores and penny banks, the details of which it is hardly necessary to go into, since in this country a very different condition of affairs in point of facilities for saving money, unfortunately perhaps, exists We say unfortunately, because there is really among us no definite and absolutely certain *system* whereby a man, after he has put by his savings, can be assured that they will always be his. He has a choice, to be sure, of depositing his funds in a bank and leaving them there idle, but subject to check at sight, or of placing them in a savings' banks, gaining a certain interest, or of buying an endowment or annuity policy from an insurance company. We refer, of course, to very small amounts, and therefore such investments as good mortgages or government bonds are out of the question. The difficulty with all three plans abovementioned is their lack of absolute security. Banks, flourishing one year, may find cause to suspend the next; saving institutions (as did several of the largest recently in this city) may suddenly collapse and sweep away the hardly earned savings in an instant; and insurance companies are by no means exempt from a like fate. So that, after all, the working man, who here puts his money out of his possession for *safe keeping*, does so with the knowledge of incurring a risk.

It has frequently occurred to us that a plan might be perfected whereby the government could be made the repository of the public's savings, and perhaps a system of post office savings banks devised, imitating that now in vogue in England. There every post office is a legal recipient for deposits of any sum over one shilling; the account of each and every depositor is kept at the head office in London, and, immediately after he pays in a deposit, he receives post free a letter from the metropolis announcing the placing of the sum to his credit. When he wishes to draw all or a portion of his funds, he notifies his postmaster, who reports to London the amount called for, and the depositor again receives a free letter, advising him of the fact and inquiring whether all is right. This letter he carries to the postmaster who, in return therefor, pays him the money. This plan effectually precludes every possibility of fraud by intermediate agents, and the depositor has the security of his government for the safety of his cash. He is provided with a bank book, and in other respects deals with the post office as if it were an ordinary savings' bank. Two and a half per cent interest is allowed him on his deposit. In conjunction with this system, the government sells annuities, so that any person can, by depositing a small sum for a certain period, purchase an annuity for the rest of his life.

In one of the pamphlets published by the society above mentioned, the inquirer is told what, under the annuity plan, can be done for eight pence (16 cents) a week. For that sum, paid from the age of nineteen to sixty, any man may obtain, on government security, a pension of five shillings ($1.25) a week for the balance of his life. For four pence (8 cents), paid during the same period, he may buy a pension of 60 cents a week, and more or less in proportion. If the depositor who begins at nineteen dies before he attains the age of sixty, say at forty years of age, the money that he has laid by is returned to his heirs at law in absence of a will, or to any one he may designate; it amounts to £35, or $175. If he dies at fifty, about $260 would be returned, and so on So that the arrangement is entirely different from an endowment life policy by an insurance company, which might be forfeited through failure to pay premiums. This advantage more than compensates for the comparatively small returns which the investment at first sight appears to yield. There is beside, under this pension or annuity arrangement, a provision for drawing out money in case of illness.

It will be seen therefore that the depositor may either use the government as a temporary depositary for his savings or he may buy from it, for a very small weekly sum, a pension sufficient to keep him from want in his old age. There are several circumstances which militate against the adoption of a scheme of this kind here, but we imagine that ultimately the objections might be overcome. The principal one lies in the fact that our post office is a non-paying institution, and is a charge instead of a source of revenue to the country. The question then arises of whether the increased burden which the post office savings' bank department would add, to that already existing, would be compensated for by the benefits gained. Again, this being a country of magnificent distances over which to send a free letter for each deposit or withdrawal, it would be an expensive proceeding; and it would be necessary to designate several cities where accounts for adjoining sections of the country could be kept. There are various other considerations which might be mentioned, relatively to adopting the system here. In England, however, recent statistics show that about one person in every seventeen of the population takes advantage of the facilities thus afforded, a fact which fully demonstrates the value and popularity of the plan.

There is no mistaking that the circumstance of the recent collapse of the savings' banks in this city has, for a time at least, shaken public faith in institutions of that character, and indicated moreover how little people examine into the affairs of concerns to which they entrust their funds. Whether the safe English system be adopted here or not, certain it is that a safer plan for poor people's savings is badly needed; and in modifying the English or devising another or better plan, our political economists and financiers will find a useful opportunity for the exercise of their abilities.

BATHE weak eyes before retiring at night with a little sugar dissolved in warm water.

IMPROVED FIRE PLUG.

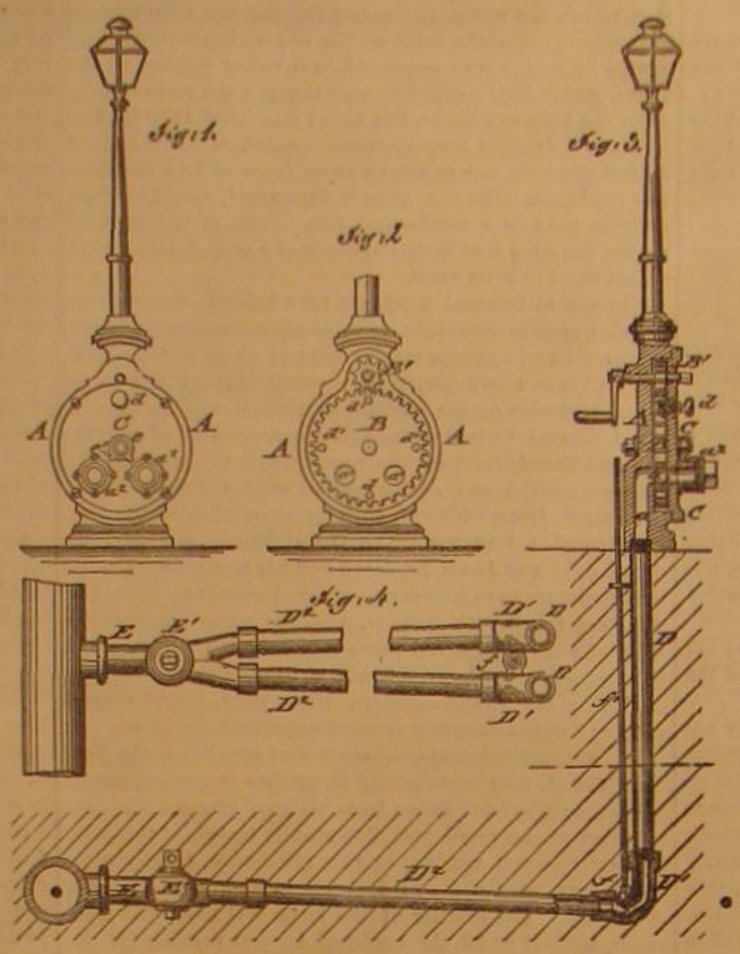
Mr. Christian Rapp, of Cincinnati, Ohio, has recently invented a new form of fire plug, which, for convenience sake, he prefers to locate in the base of a street lamp, as shown in Figs. 1 and 3 of our engraving. Fig. 1 represents a front elevation; Fig. 2, a front view of the interior, with face plate detached; Fig 3, a vertical transverse section of the same, showing connection with the main; and Fig 4, the connection of the main with the branch supply pipes of the plug.

The plug is constructed of a casing, an interior disk, and a front plate, with adjustable openings to establish connection with the supply pipes of the casing and the nozzles of the closing front plate, to open or close the plug, a spring stop locking the disk into position. A waste cock at the elbow of the supply pipes serves to drain any water from the same.

In the engraving, A represents the main casing, B the interior revolving wheel or disk, and C the outer face plate, secured to the casing by suitable fastening screws. The casing, A, is cast at the back with two supply openings, a, and turn at right angles toward two corresponding openings, a^1, of the disk, B, and the nozzles, a^2, of the front plate, C. The disk, B, turns on a central shaft that passes through perforations of casing and front plate, and is provided with screw nuts at the ends to tighten the parts closely to prevent leaking. The contact parts of casing, disk, and face plate are lined with soft metal to allow the tight packing of the same. The wheel, B, is turned by means of a pinion, B^1, at the upper part of the casing, the pinion being revolved by a crank applied to its projecting shaft. A spring stop device, d, of the front plate locks into recesses, d^1, of the disk, to secure the same either in closed position or with one or both holes open. The spring stop has to be released before the disk can be turned by the crank. A washer, e, with indicators, e^1, is keyed to the shaft of the disk in such a manner that the indicators follow the motion of the disk, and show the position of the exit holes of the same. The nozzles of the front plate are closed by screw caps, which are taken off when the hose is to be screwed on.

When the fire plug is constructed in connection with a lamp post, suitable arrangements for the gas pipes have to be made.

For the purpose of protecting the fire plug against frost in winter, after use in supplying fire engines with water, the stopcock is closed, so that by a few strokes of the engine the water in the supply pipes may be entirely pumped out. During the warm season the plug may be closed directly by the disk, as there is no danger of the plug being frozen.



RAPP'S FIRE PLUG.

THE RIDER COMPRESSION ENGINE.

We illustrate herewith a new motor, the operation of which is produced by the use of highly compressed cold air. This is heated thoroughly without change of volume, and its efficient expansion to a point at or below the pressure of the atmosphere utilizes all the force or mechanical effect possible. All these changes are consecutively and rapidly effected in this motor without the use of valves, springs, levers, or, in fact, any delicate parts whatever, the moving parts being reduced to the lowest possible number, namely, the pistons, shaft, and connections. As may be seen by the annexed sectional engraving, Fig. 2, the engine consists essentially of a compression cylinder, A, and a power cylinder, B, with their respective pistons, C D, and connections, and a regenerator, H. The lower portion of the compression cylinder, A, is kept cold by a current of water which circulates through the cooler, E, which surrounds the lower portion of the cylinder, while the lower portion of the power cylinder is kept hot by the action of the fire below the heater, F. The heating and also the cooling of the air is instantaneously effected by its alternate presentation to the surfaces of the heater and cooler in a thin annular sheet.

The compression piston, C, extends downward to the base of the engine, and is a trifle smaller than the interior of the cooler, E, thus leaving a thin space on all sides for the air to pass downward and become thoroughly cooled on its way to the bottom, and through which space it flows on its way back to the heater. The power piston, D, likewise extends downward into the heater, F, which presents to the action of the fire a narrow annulus all round the bottom. Within this heater is the telescope, G, which is a thin iron cylinder about one fourth of an inch less in diameter than the interior of the heater. It is fitted to the interior of the power cylinder, and extends nearly to the bottom of the heater. Its office is to cause the air which flows from the compression cylinder to be presented in a thin sheet all round the interior surface of the heater, and particularly at the lower and hotter portion. By this means the air is thoroughly and rapidly heated.

The same air is used continuously, as there is neither influx nor escape, the air being merely shifted from one cylinder to the other. Between the compression and power cylinders is situated the regenerator, H, composed of a number of thin plates slightly thickened at their edges, which, while affording a free passage to the air, sub-divides it into thin sheets. It is so placed between the cylinders as to be traversed by the air in its passage each way between the hot and cold cylinders.

The other portions of the engine are readily understood on inspection of the engraving. The two pistons are attached directly to the cranks, I I, by simple connecting rods, J J, and all the movements of the various parts are uniform, being solely derived from regular, circular, and rectilinear motion; and as there is an entire absence of all complicated parts and the irregular intermittent impulses which characterize caloric engines, a high rate of speed and smooth action may be safely and easily obtained. K K are the packings, which are in duplicate for each cylinder. The lower one has its lap downward to resist the escape of air below the piston, while the upper one has its lap upward to prevent the lubricating material from entering too freely into the cylinder. Between them is a patent relief ring to relieve the friction of the packings. L is a simple check valve which supplies any light leakage of air which may occur.

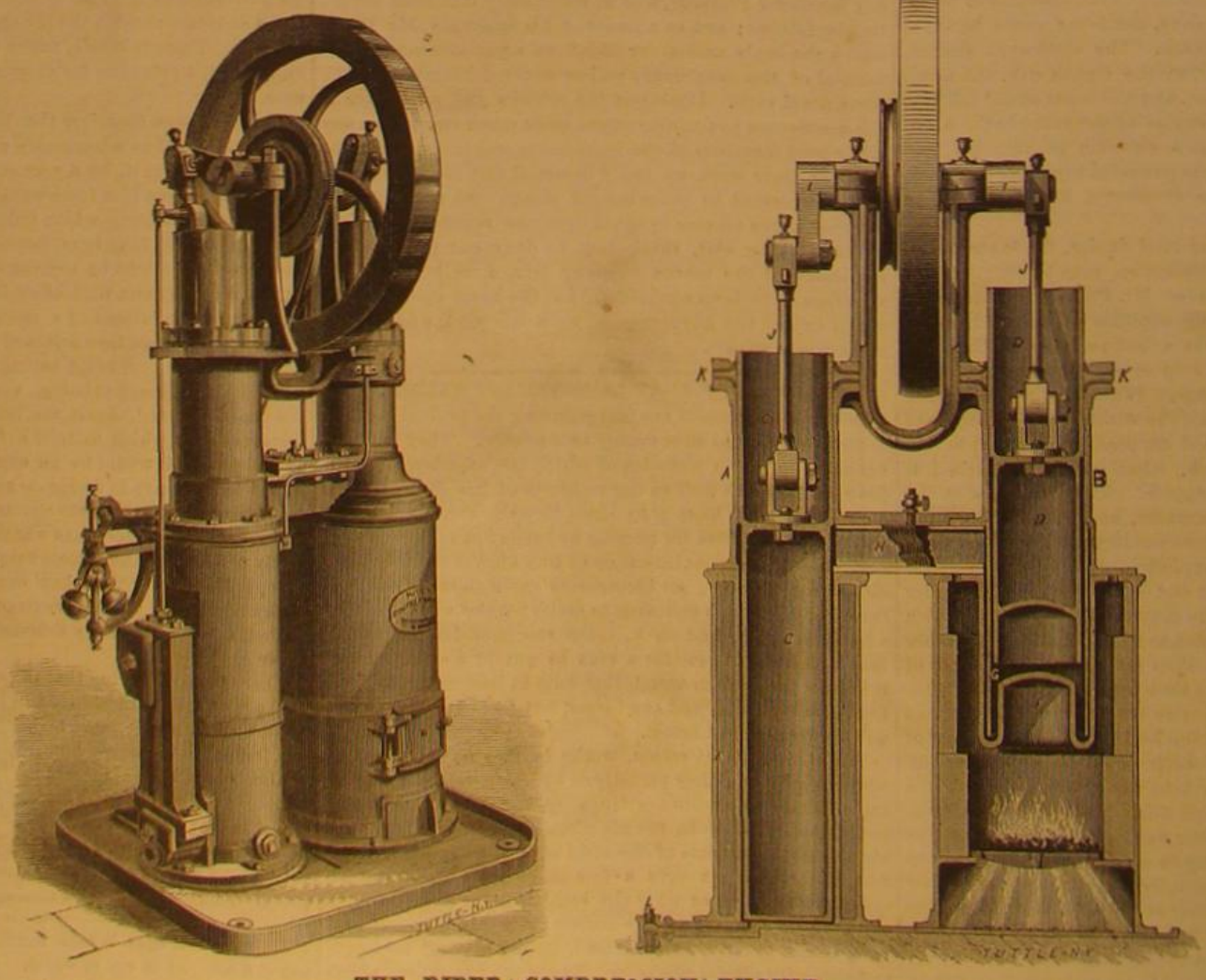
The operation of the engine is briefly as follows: The compression piston, C, first compresses the cold air in the lower part of the compression cylinder, A, into about one third its normal volume, when, by the advancing or upward motion of the power piston, D, and the completion of the down stroke of the compression piston, C, the air is transferred from the compression cylinder, A, through the regenerator, H, and into the heater, F, without appreciable change of volume. The result is a great increase of pressure corresponding to the increase of temperature, and this impels the power piston, D, up to the end of its stroke. The pressure still remaining in the power cylinder, and reacting on the compression piston, C, forces the latter upward till it reaches nearly to the top of its stroke, when, by the cooling of the charge of air, the pressure falls to its minimum, the power piston descends, and the compression again begins. In the meantime the heated air, in passing through the regenerator, has left the greater portion of its heat in the regenerator plates, to be picked up and utilized on the return of the air toward the heater.

These motors are valveless, noiseless, simple, and claimed to be absolutely safe; emit no heated air or unpleasant odor, as is the case with caloric engines; require no steam, cannot explode, do not increase risk of fire or cost of insurance, and can be operated by any one who can manage an ordinary stove.

They are well adapted for running all kinds of light machinery, printing establishments, etc., but are particularly valuable for pumping. One of these little six inch pumping engines (household size) has, we are informed, pumped for 6 months, without intermission or stoppage from derangement, each consecutive day of ten hours, 10,000 gallons of water to a hight of from 70 to 100 feet; and the engine required the services of an attendant less than thirty minutes each day, and consumed only 20 lbs. of coal per day, thus pumping 2,000 gallons of water 100 feet high at a cost of only one cent.

For railroads, city and suburban residences, French flats, hotels, boarding houses, etc., these engines are very desirable. As may be seen by Fig. 1, the pump is placed on the side of the cooler, and worked directly from the compression piston. All the water is passed directly through the cooler on its way to the tank or outlet.

For further information, address the agents, Stafford & Cammeyer, 93 Liberty street, New York city, at which address the engine may be seen in operation.

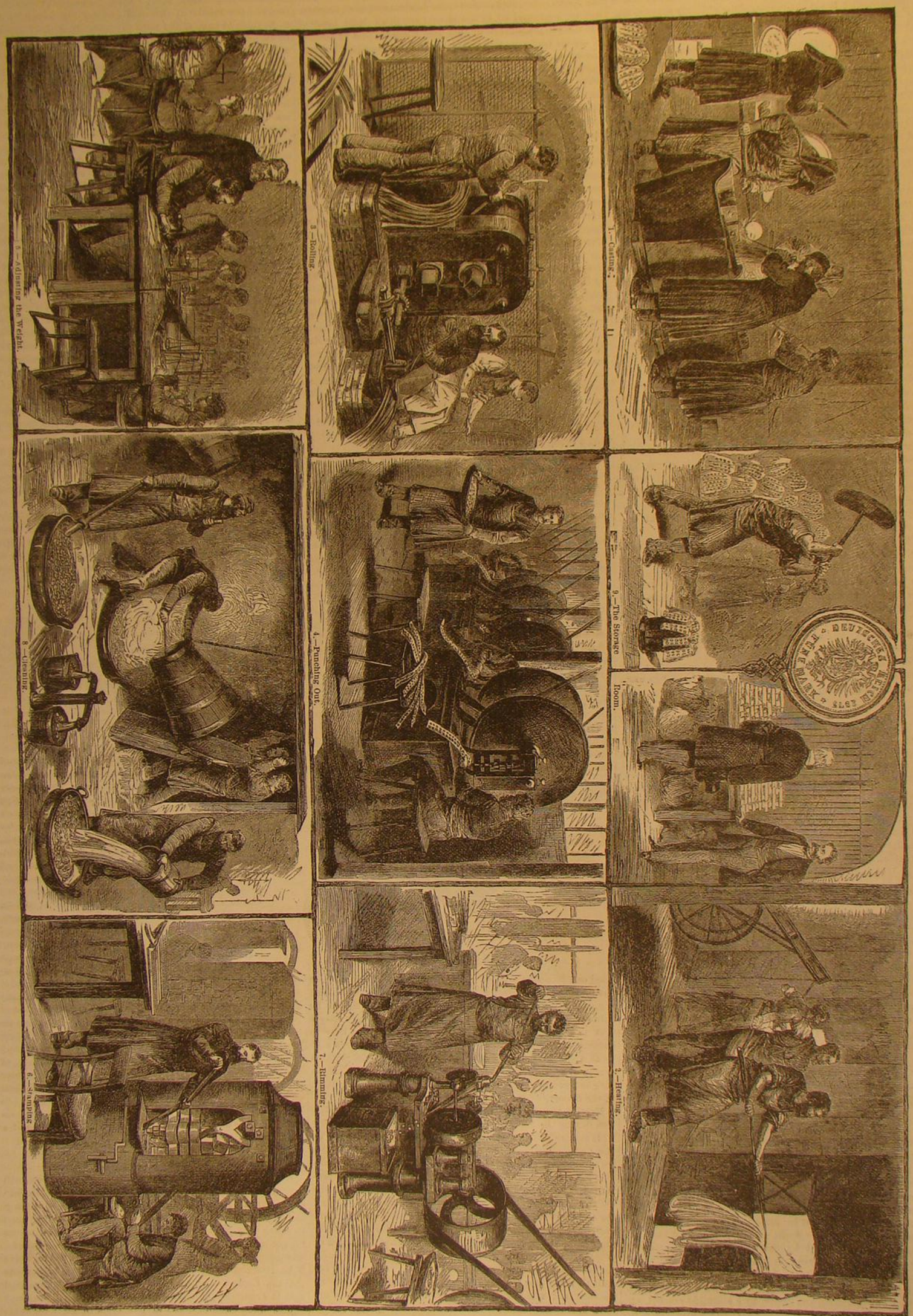


THE RIDER COMPRESSION ENGINE.

One Man's Work.

The enormous statue of Herrmann, the ancient German warrior, which was inaugurated some months ago by the Emperor of Germany, was entirely made by one man. The figure is of embossed copper, one hundred feet high, and every inch of the immense surface was hammered by hand. A Westphalian nobleman, Herr von Bandel, performed the entire work, from the preliminary modeling to the finishing with the hammer, many years of his life being devoted to the work. The statue stands near Detmold, the capital of the principality of Lippe, and the artist's workshop was located on the spot.

THE MANUFACTURE OF COINED MONEY.



COINING.

We publish on our previous page a series of engravings illustrating the various processes employed in the manufacture of money, a business which, being mostly in the hands of governments, is not in the category of ordinary manufactur ing operations, but which is, nevertheless, a very extensive and important trade. The amount of money annually minted is prodigious; and the necessity for perfect accuracy in weight and fineness of every coin gives the business the peculiar interest attaching to all minute and delicate operations conducted on a very large scale.

The first step is the mixing of the alloy, which in this country consists of 9 parts pure metal to 1 part alloy. The alloy for silver coin is copper; for gold, a mixture of silver and copper, the proportion of silver in the mixture being not more than one half. In practice, but a small portion of the alloy for gold is silver. The silver is readily prepared for coining; but the gold frequently is found to be brittle when cast into ingots, owing to the presence of impurities. Many of these foreign matters are diminished by treating the molten metal with a stream of chlorine gas. When the standard of purity is accurately adjusted, the metal is cast into ingots, long enough in proportion to their thickness to be rolled into strips of the required thickness (see Fig. 1). The ingots are then heated (Fig. 2) and rolled into long strips (Fig. 3). In our Fig. 4 is shown the operation of punching out circular disks from these strips; and this process is one of great nicety, as the disks require to be so nearly correct in weight that the final adjustment can be readily made. In Fig. 5, is shown the weighing room, where any trifling overweight on each disk is removed with the file, care having been previously taken to make the pieces over rather than under the correct weight. Fig. 6 shows the coining presses, in each of which are a die and a countersink, engraved with the devices for the obverse and reverse sides of the coin respectively. This operation completes the coin, except as to its edge, which is finished by the machine shown in Fig. 7, which raises the circumferential rim which protects the embossed face of the coin from abrasion by friction in use. This machine rims from 800 to 900 coins per minute; and words or devices can be embossed on the rim, when required, by a straight steel die, against which the coins are pressed with great force, and rotated. Milled edges are made by this machine, the die being properly cut for the purpose.

The coin is now finished, being perfect in value, weight, and form; and all that now remains to be done is to cleanse it from the dirt of the manufacturing processes, and give it the beautiful appearance which characterizes new money. This done by scouring and washing, as shown in Fig. 8; and the money is then put up in packages for storage, as shown in Fig. 9. The waste strips are readily beaten into ingots, as shown in the same engraving; and all filings and dust of the precious metals are carefully saved.

The series of illustrations gives a clear and accurate idea of the system generally in use; but of course the processes are varied in different establishments.

THE BUDDHA CRAB.

Rev. C. W. Everard writes to *Land and Water* that he was, two years ago, in the northeast of China, and was then told that the natives there not unfrequently caught some small crabs which have a most ridiculous face on one side. "They call them the Buddha crabs. I was very anxious to see some; and before I left, the two that I now have the pleasure of sending you, and which I beg you will accept, were brought me. One has, unfortunately, suffered in its long journeys, but the other is nearly perfect. The face is very distinct, and looks like a very jovial old fellow much given to wine."

In reply, the editor, Mr. Frank Buckland, says: "I now give a portrait of this remarkable crab; it is just the size of the top of the thumb; the claws are very small. The nearest approach to it is the masked crab (*corystes Cassivelaunus*), sometimes found in the British seas. One of these was exhibited alive in the aquarium of the Zoological Gardens, in 1860. I think it would puzzle even Mr. Darwin to account for this extraordinary resemblance to the human face on the back of a crab. This crab comes from China, and, strange to say, the markings on his back exactly resembled the face of an ugly old Chinaman. The eyes are closed, but they are oblique to the face, and are surmounted by heavy eyebrows. The nose is rounded and flattened; at each corner there is a warty projection. The moustache is curled exactly like the moustache we see on a Chinaman. The mouth seems ready to open and swallow any quantity of food."



THE BUDDHA CRAB.

Ducks and Terrapins.

Everybody, says the Baltimore *Sun*, has heard of Chesapeake canvas-backed ducks and diamond-backed terrapins, and a great many people know something of how they taste when served up for the table, but not a great many are acquainted with the manner in which they are handled by the dealers in those and other famed gastronomic luxuries. There is an establishment in Baltimore which has been fitted up especially for this trade, where canvas backs and all kinds of game are kept by the thousands in apartments where the temperature remains at 18° above zero, and where terrapins in multitudes live and grow fat on nothing. There are five large closets on the premises, built in the walls, similar to bank vaults, and these, by a scientific process, are arranged to keep their interiors at a very low temperature, by the use of ice, but in a different manner from the freezing process of a refrigerator. In one of these the canvas backs and other wild game are kept perfectly fresh; in another there are all varieties of fish, including shad from Savannah, white fish from the lakes, rock and perch from the Chesapeake tributaries, and blue fish, haddock, and codfish from the North. In another closet the smaller and more common fish are kept, and all of the closets are filled with some of the special products dealt in. For a month past shipments of canvas backs by the barrel have been made to London, Liverpool, and Paris by steamships from New York and Baltimore. The fowls are taken from the cold closets, and, when on board the steamers, are put in ice, and reach their destinations in excellent condition. Oysters in barrels are also sent to Europe, the oysters being packed with seaweed and corn meal. But the most novel feature of the house is the terrapin department. This room is kept warm, and the terrapins luxuriate in airtight chests, each from five to ten bushels capacity. These are packed full of terrapins, which number many hundreds in the aggregate. The most of them are of the Chesapeake diamond back variety, and all are at least seven inches across the under shell, that being the measurement which the terrapin must reach before, in the opinion of the epicure, it is fitted for the table. There are also kept, in some of the chests, hundreds of slider or red fender terrapins, a fresh water variety, chiefly from the James river. The habits of the terrapin have been made a study by the dealer. He keeps them in his airtight chests, without food, and says they not only exist deprived of air, but grow fat, and if kept in the chests for six months will each weigh four or six ounces more than when put in. If the terrapins are allowed to have liberty or free air, even in the most limited space, they become very poor, as they seem to draw sustenance from themselves, but do not take food. All the terrapins in the chests are enjoying vigorous existence, as proved by their movements when the lids were raised. The terrapins are principally sold to hotel keepers, and to be served up at extra junketings, and bring about $24 a dozen. During the terrapin season of 1874, one house in Baltimore sold a thousand dozen.

Contagion in our Schools.

The prevalence and spread of scarlet fever and diphtheria among the children of this city are facts which should awaken an anxious concern of the profession. It is unnecessary to say that the occurrence of these cases is explained by the fact of direct contagion. No matter what particular views may be advanced in regard to the *modus operandi* of the poison, we hardly believe there are any, at all acquainted with the diseases in question, who would be willing to say that they are not communicable, and hence not amenable to ordin ary preventive measures. But, notwithstanding this belief, a belief shared in by the most intelligent portions of the lay community, we have these diseases cropping out in the schools day by day, under the very eyes of the teachers, and without any apparent effort on their part to arrest the spread. When a child carries a contagious disease from his school to his home, there is always trouble and anxiety in the train, and not unfrequently death, besides the danger of the propagation to other members of the family and among the neighboring children. In the absence of sanitary inspection in our schools, it may seem hardly fair that we urge upon any extra duty to supply the deficiency; but we are convinced that, with very little trouble on their part, a great deal of good can be accomplished. And after all, in this particular the teacher is the fittest person to act, being always in direct communication with every scholar, and being the first to be informed of any illness. It would seem to be a very simple task to send the ailing child home, and at the same time to assume, especially during epidemics, that the sickness may be of a contagious character. Neglect of such precautions causes the sacrifice of many valuable lives yearly; and so long as teachers consider that they have no moral obligations in the matter, we can hardly hope for any change.

Even in the most contagious diseases the danger of infection during the initistory symptoms is comparatively slight. This certainly is the strongest possible argument in favor of the prompt quarantining of a suspicious case. But while we allow that, with the right disposition on the part of those who have charge of the children, much disease may be prevented, there is another element in the question, and one which it is more difficult to meet, because in a measure beyond the control of the teacher: and that is the premature appearance at school of those who have been the subjects of these infantile diseases. It is well known that the power of propagation lingers in many of these disorders long after convalescence has commenced; and as such a fact is one of the difficult things for ignorant parents to appreciate, there is no wonder that, many times, the most dangerous poisons are sown broadcast.—*Medical Record.*

TO CLEAN colored leather, use 1 oz. oxalic acid dissolved in 1 pint distilled water.

Seal Flesh.

Dr. A. Horner, surgeon to the Pandora, speaking of the Greenland Esquimaux, says: "From the length of time these people have inhabited this cold country, one naturally expects them to have found some particular food, well adapted by its nutritious and heat-giving properties, to supply all the wants of such a rigorous climate; and such is found to be case, for there is no food more delicious to the taste of the Esquimaux than the flesh of the seal, and especially that of the common seal (*phoca vitulina*). But it is not only the human inhabitants who find it has such excellent qualities, but all the larger carnivora that are able to prey on seals. Seal's meat is so unlike the flesh to which we Europeans are accustomed that it is not surprising that we should have some difficulty at first in making up our minds to taste it; but when once that difficulty is overcome, everyone praises its flavor, tenderness, digestibility, juiciness, and its decidedly warming after effects. Its color is almost black, from the large amount of venous blood it contains, except in very young seals, and is, therefore, very singular-looking, and not inviting, while its flavor is unlike anything else, and cannot be described except by saying "delicious!" To suit European palates, there are certain precautions to be taken before it is cooked. It has to be cut in thin slices, carefully removing any fat or blubber, and then soaked in salt water for from 12 to 24 hours to remove the blood, which gives it a slightly fishy flavor. The blubber has such a strong taste that it requires an arctic winter's appetite to find out how good it is. That of the bearded seal (*phoca barbata*) is most relished by epicures. The daintiest morsel of a seal is the liver, which requires no soaking, but may be eaten as soon as the animal is killed. The heart is good eating, while the sweetbread and kidneys are not to be despised.

The usual mode of cooking seals' meat is to stew it with a few pieces of fat bacon, when an excellent rich gravy is formed, or it may be fried with a few pieces of pork.

The Esquimaux make use of every part of the seal, and, it is said, make an excellent soup by putting its blood and any odd scraps of meat inside the stomach, heating the contents, and then devouring tripe, blood, and all with the greatest relish. For my own part I would sooner eat seal's meat than mutton or beef, and I am not singular in my liking for it, as several of the officers on board the Pandora shared the same opinion as myself. I can confidently recommend it as a dish to be tried on a cold winter's day to those who are tired of the everlasting beef and mutton, and are desirous of a change of diet.

Bath Bricks.

The annual importation of Bath bricks into the United States is estimated at 10,000 boxes, there being 24 bricks in each box. These bricks are manufactured from the deposits of the river Parrett, Bridgwater, England, where millions are made annually. Nowhere else are these deposits found, so that Bridgwater supplies the world, and Bath brick are as well known in America, China, and India as in England.

Artists' Brushes.

In a detailed description of the business of a large manufactory of artists' materials, in this city, a *Tribune* reporter gives the following interesting information in regard to the various sorts of hair used in brushes. The principal kinds employed are: Hog's bristles, which, being coarse and stiff, make good varnishing brushes; bear's fur, which is also stiff and hard, and used mainly for varnishing brushes; badger hair, which is long, soft, and elastic, and of which are made graining and gilding brushes; sable tail hair, which is very long and very elastic, and is made up into the finest and costliest of artists' brushes; camel's hair, also long and elastic, and second only to sable in fineness; and ox hair, which is pulled from the inside of cow's ears, and, being exceedingly long and elastic, makes good striping and lettering brushes. The skins of the animals mentioned are imported in bales, and boys with shears cut off the hair in handfuls, which are afterwards arranged by the brush makers. The denuded hides are then sold to glue makers. The value of some of the most costly kinds of hair exceeds that of equal weights of gold, so that each particular hair may be said to have its price, and great care is taken to prevent its loss. A double handful of sable tail hair, for instance, is worth $100, and camel's hair is only a little less valuable. The variety of brushes made is almost infinite, and artists sometimes order them made after some particular pattern or device of their own. More than a hundred different sizes and shapes are kept in stock, the finest consisting of a few long, delicate hairs, capable of making a mark as fine as the scratch of a needle point.

The Centennial Exposition.

A correspondent writes to point out that many persons will decline to exhibit at the Centennial because the Commissioners have made no arrangement to receive exhibits by railway and to place them in the proper situations in the department to which they belong. For an exhibitor to go there to put his goods on show, and again, 4 or 5 months afterwards, when the judges are making their awards, will be expensive if he live some distance from Philadelphia. He suggests that the Commissioners should appoint properly qualified men to undertake the removal of exhibits from the railroad depots to the buildings, and to put them in place for exhibition; and he states that exhibitors living at a distance from Philadelphia would gladly pay the expense of such an arrangement.

Correspondence.

Mr. Edison's New Force.

To the Editor of the Scientific American:

I have recently made some experiments with the so-called etheric force, the results of which will be found below.

As the subject is one which has attracted considerable attention of late, I have taken special care while making the tests, and have also carefully verified the results by repetition. You will notice that the indications tend continually in one direction, identifying the force with electricity: indeed, from what I had learned of the subject, I had little hesitation in pronouncing the phenomenon one of an entirely electrical nature. I was also led to believe that its origin was attributable solely to the induction of the battery current on itself, in the coils; but it remained to prove these conclusions correct, in order to settle the question so far as the development of a new force was concerned.

It has been stated that this force traverses with equal facility both good and bad electrical conductors, that it cannot be insulated, and that, in this particular at least, it is quite different from electricity. These statements seem strange in connection with another, which accompanies them, to the effect that manifestations have been transmitted through coils equivalent in resistance to many thousands of miles of telegraph wire. In a case of such apparent contradiction, the statements should certainly be qualified by some evidence that the manifestations traversed the wire rather than that they passed through the insulator. In any event, however, the first statements are wholly irreconcilable with the following tests, made a few days ago:

A short piece of wire was fastened to a brass ring on the end of a glass rod, the latter carefully dried. The wire was then placed in contact with the armature of a vibrator, or at least very close to it. Sparks passed readily between the wire and armature, and were plainly visible in daylight. Another brass ring was afterwards placed upon the rod, but not a single spark could be obtained from it until it almost, if not actually, touched the first. This was repeated several times, once when fifty cells of gravity battery were used to work the vibrator. Four cells were used most of the time.

The above experiment plainly indicates that the force can be insulated. The latter, however, is of a much higher tension than the battery current which produces it. When the piece of wire on the end of the glass rod is very short, sparks no longer pass between it and the vibrator. The same would be the case if an electrical machine, giving electricity of low potential, were used. But, unlike the electrical machine, the vibratingarmature seems to be oppositely polarized when the circuit is opened and closed. This sufficiently explains why Mr. Edison was unable to obtain galvanometer deflections by the methods which he employed; it is also just what we might expect would result from the extra current. I was thus led to try the plan represented in the accompanying diagram, Fig. 1. One wire from the galvanometer was connected directly with the armature of the vibrator; the other led to the binding post, A. The galvanometer was therefore in connection with the battery by one of its terminals only. When the vibrator was put in motion, deflections were obtained at once. Fearful, however, that the spark was sufficient to close up the gap between the armature and B, and thus shunt the galvanometer, and that by this means part of the battery current would pass through the galvanometer and cause a deflection, I closed all of the points (see Fig. 2). This gave me a deflection of 25°, and indicated approximately what might be expected in case the spark did actually close the gap. The adjustable points were then separated, and the armature allowed to vibrate. The spot of light immediately ran up to 50° or more. By carefully regulating the points, I was enabled to get a deflection of over 400°, and could obtain it either to the right or left. The deflection in the direction of the battery current, however, was somewhat greater than the opposite one. It was evident, therefore, that the battery current did not directly produce the deflections.

A still more decided test was next made, which I am disposed to regard as conclusive. The galvanometer wires were led directly to the rings on the glass rod already mentioned. The rings were slightly separated, and each provided with a short wire, between the ends of which the armature was allowed to vibrate, striking one wire at each vibration. Fig. 3 shows the arrangement. Sparks immediately appeared on each side of the vibrator in the very slight interval which separated it from the ends of the wire, and a deflection of 300° or 400° resulted. This was always in one direction, so long as the direction of the battery current and connections remained unchanged, but passed in an opposite direction when the poles of the battery or wires leading to the galvanometer were reversed. With fifty cells of battery, the spot of light was thrown entirely off the scale.

The vibrator used in these experiments consists of an electro-magnet about two inches long, with a thin piece of iron for the armature. The coil measured perhaps two or three ohms. Fig. 1 gives a fair idea of the instrument. The galvanometer was one of Thomson's mirror instruments, and contains something over 20,000 ohms resistance.

New York city. ELECTRON.

The New Force.

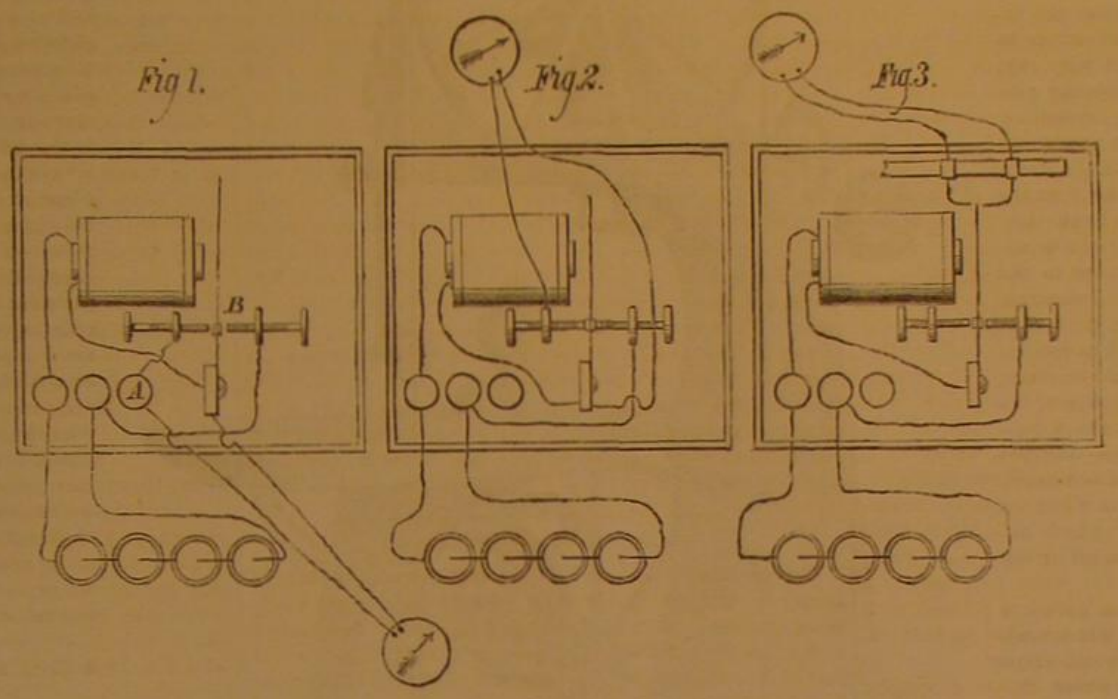
To the Editor of the Scientific American:

In your paper dated January 1, you publish a letter from Thomas A. Edison, in the last clause of which he describes an "inexplicable phenomenon," namely: "An uninsulated wire, proceeding from the source of power (highly insulated), was taken into the street and laid in the gutter around a whole block and back into my laboratory by another door, and up to the floor above the one where the generator was. Excellent sparks were drawn from that end of the wire, although the ground the wire laid on was wet, it having rained all night."

The "source of power" he speaks of, I take it for granted, means that source from which he derives what he terms the "etheric force." I see nothing inexplicable in that, as it does not conflict with the action of a current derived from the ordinary galvanic battery used for telegraphing. I have operated the relay and recording register through a naked wire, laid in sea water one quarter of a mile, as perfectly as it can be worked on an insulated air line. I then extended it to half a mile, when it worked so that I could read most of it, but the current was very weak. I then extended it to three quarters of a mile, when I could get only a slight deflection of the galvanic needle. At that distance the current did not perceptibly affect the relay. Electricity, however produced, is hard to return or bottle up. It always selects the road which has the best conductivity, without regard to distance. The relative conducting power of the uninsulated metallic wire and water will show that it requires about one mile of water to equal the better conductivity of the uninsulated wire.

I have no doubt that Mr. Edison will thoroughly ventilate his discovery, and hope that he will succeed in finding it both practicable and useful. J. P. H.

New York city.



EXPERIMENTS ON THE NEW FORCE.

What is the Tail of a Comet?

To the Editor of the Scientific American:

I have not been particular to note the date when my discovery, described below, of the origin of the tails of comets was made, that discovery being only an incidental result of some other investigations; and the explanation is so absurdly simple that I have waited several years for astronomers to make the assertion that I am about to make, and which almost any person can demonstrate without need of the complex apparatus by which it was incidently revealed to me.

Briefly: The tail of a comet is the light projected by its nucleus upon that portion of its hazy envelope which lies in the shadow cast by that nucleus when near enough to the sun to cast a shadow. The ordinary observer can prove the correctness of this statement by means of two lamps, differing only in size; while the more profound investigator can satisfy himself beyond question, through the mystery of the photometer and suitably prepared lights, the one consisting of an incandescent solid having a gaseous envelope to represent the sun, while the other or less light is of similar nature, with the addition of one or more outer envelopes exceedingly attenuated. By using suitable lamps, a multitude of spectators can be convinced of the truth of the theory on any misty or foggy night, if one lamp be moved about the other in an elliptical path; indeed the proof is so simple that I have never failed to convince the spectators by using two ordinary lamps.

Comets are originated whenever any sun, by eruption, ejects portions of its substance directly outward at a speed sufficient to overcome the attractive force of that sun's gravity. In the case of our sun, a speed of 380 miles per second is sufficient for the purpose.

The expelled mass flies outward into space, still under the influence of the sun's gravity, as the sun is the largest near object, and all matter is subject to gravity; and as the sun's outward course changes its position, it also causes the comet's course to deviate from a straight line, because it is constantly pulled aside by the sun. This deviation continues until the comet's course becomes momentarily parallel with the sun's course, after which it gradually curves toward the sun, the entire path of its movement being an ellipse, constantly approximating to a spiral circle. The comet's fiery mass having been projected as a fragment from a body revolving upon an axis, it also has an axial motion in conformity with a universal law, which also assists to convert its bulk into a spherical shape, as its own gravity acts upon its mass to concentrate it toward its center. Thus, in time, its mass comes to consist of a fiery nucleus, with various spherical envelopes of gaseous material, more or less separated from each other by gravity. Its matter being extremely attenuated, its bulk may be immense, while its weight is relatively small. It has an axial and an orbital motion. In this condition, it is observed by a spectator as a bright speck in space, which rapidly enlarges under continued observation as it approaches, its fiery nucleus illuminating its hazy envelope like a lamp in a globe, the whole revolving on its axis as an immense sphere of attenuated matter, perhaps 180,000,000 miles in diameter. As it approaches nearer, still revolving, it apparently increases, but less rapidly, in size; and as it gradually meets the increasing light of the sun, its own spherical glow, conquered by a superior light, gradually pales on the side nearer the sun; and it accordingly shows a tail of perhaps 90,000,000 miles (or half its diameter) in length in the solar shadow which its nucleus casts and illuminates, that being the only portion of its huge envelope which the eye is permitted to distinguish under the conquering influence of the sun's light

When still nearer, its head and its apparent tail become more defined; and if the conditions of the comet's envelopes permit, the appearance of more than one tail may be observed: this tail, or illuminated shadow, obeying the known laws of light, being projected as nearly in a direct line from the sun: that is, it forms a slight curve, because each ray of light reaches the observer from the point of its emanation, and not from the further point which the comet occupies at the instant of observation, as the comet has moved constantly from the exact point of light emanation during the time required for the light itself to reach the observer. As the comet nears the sun, and swings around it, its apparent tail swings too, that is, the illuminated shadow swings with terrific velocity, but with no exertion of force, repulsive or otherwise, as far as the shadow is concerned; and as the comet leaves the sun, its shadow necessarily goes before it and is as necessarily illuminated as that portion of fog lying in the path of a locomotive headlight moving away from a house on fire.

As the comet flies away, its spectacular phenomena are rapidly reversed, its apparent tail fades, and the luminous glow of its sphere expands and then diminishes to a mere disappearing speck of light. When, after many circuits, its elliptical orbit gradually becomes a spiral circle, and itself becomes a planet of more or less dignity, its apparent tail disappears by absorption of its attenuated gaseous envelope, which settles on its nucleus by gravity; and its possible apparent fail becomes too short for observation. Thus the true answer to the astronomical conundrum: "What is the Tail of a Comet?" is: "It has none," and this insignificant result is a good and sufficient cause for my inactivity in heralding the fact, which was know to me at a much earlier date.

Mohawk, N. Y. CARL MYER.

The Wreck of an Air Ship.

The Schröder air ship which, according to the inventor's claims, was going to carry fast mails between the principal cities of the country, and which subsequently would fly across the Atlantic in some incredibly short space of time, came to an unfortunate end recently. The machine, nearly finished, was carelessly left in an exposed situation overnight, on a common in Baltimore. A strong gale arising tore it from its fastening, and converted it into a useless and shapeless mass of broken boards and wicker work.

Another Explosion of Factory Dust.

The singular catastrophe which took place at the Pullman Car Works at Detroit, Mich., on November 10, 1875 (which was described on page 368 of our volume XXXIII, has been paralleled by an explosion which took place at Champion Mills, Chicago, Ill., on December 31, 1875. One of the millers was pouring some fine middlings down a chute, when the fine dust ignited on contact with the flame of a lamp which he held in his hand. A loud explosion followed, and his hands and face were terribly burnt. The building at once took fire, and property to the amount of about $4,000 was destroyed.

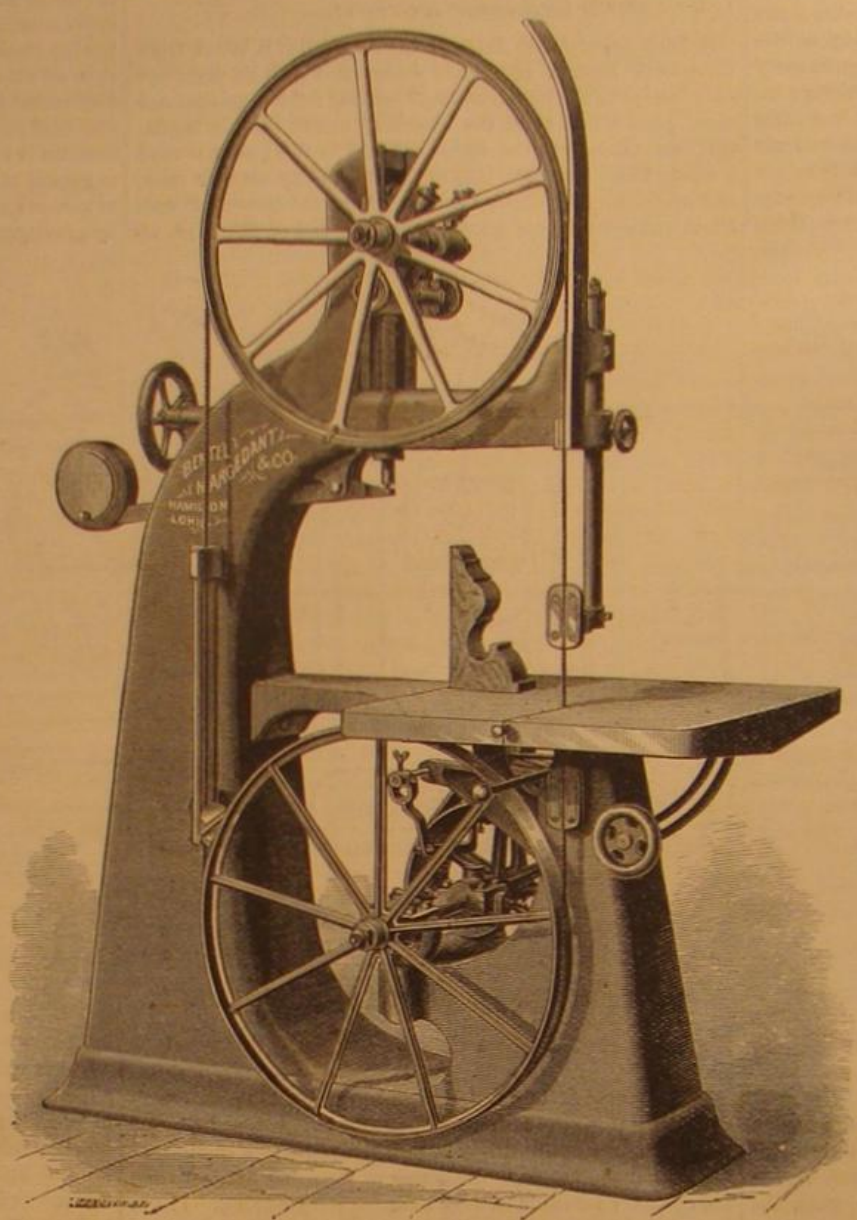
IMPROVED BAND SAWING MACHINE.

From the year 1809, when William Newberry, of London, England, constructed the first band saw, and up to the year 1862, that useful machine met with little favor at the hands of woodworkers, principally on account of the disadvantages encountered in the breakage of the saws and the difficulty of joining them. Since the last mentioned year, however, mechanics have found easy ways of attaching together the parts of the dissevered blade, and consequently thereupon the band saw has rapidly grown in usage; but in preventing the breakage, certainly a more important desideratum, little has been accomplished. Why band saws break is not difficult to understand. Forming, as the delicate thin ribbon of steel does, the sole connection between the pulleys over which it runs, it is obvious that, if one pulley be started into sudden motion, the saw must slip over the other pulley before the inertia of the latter is sufficiently overcome to allow of the imparting to it of a velocity, say, of 400 revolutions per minute. Slipping produces friction; friction, heat and crystallization of the steel blade, and hence conditions are determined which, coupled with the strain set up, ultimately may break the saw. At the same time further injury is done by the rubbing of the blade over the covering of the pulley. So also, when work is presented to the blade, its speed is retarded and the momentum of the upper driven pulley causes it to overrun the lower or driving one, and thus friction is again created between blade and surface; the same ensues on the sudden stoppage of the lower wheel. Various methods have been tested to avoid this trouble, and of these the most common is making the upper wheel less heavy than the lower one. In the machine which we now illustrate, a new plan enters, which admits of both wheels being constructed of the proper strength and weight.

In the rim of the upper cast iron pulley is formed a recess about $\frac{5}{16}$ inch deep, which has a number of projections that are ground to a circle corresponding to the diameter of the wheel. The space between the projections is filled with plumbago, and over all is located a band of steel or other material, rolled true to the diameter of the projections. The band is open, and after being placed in position is so closed as to allow of adjustability of its diameter. It is covered with leather or rubber as desired. With this device, when the lower wheel is started, before the inertia of the upper wheel is overcome, the band slides in the recess, rubbing on the projections, and thus the upper wheel is gradually set in motion without any friction taking place against the saw. As soon as its velocity equals that of the driving wheel, the pressure of the band is sufficient to maintain the same, since it requires more power to slide the band on the periphery than to run the wheel on its axis. Now, when a piece of wood is put to the saw, it is obvious that the effect of the band is to equalize the speed of the wheels: and so also, when the lower wheel is suddenly stopped, the upper one will expend its momentum in running on inside the band, the saw remaining at rest. It is usual to cover the upper wheel with elastic material which, to some extent, yields to the irregularity of motion. The manufacturers of the present machine point out that the band above referred to forms a very excellent elastic bed, as its tendency is to be thrown outward by centrifugal force, in opposition to which is the pressure of the blade. So that the band is in a condition of equilibrium, and constitutes a yielding surface to the saw.

The use of the band, it is further stated, permits the employment of a direct brake acting quickly and not endangering the lower wheel. To this end an improved clutch brake is arranged, which takes hold of the outside and the inside of the tight pulley rim, pressing at each side with equal force, so that its tendency is not to dislocate either pulley or shaft. By turning a small screw, friction may be increased or diminished, or wear compensated for. The saw guide consists of lateral and back thrust guides or supports. The former are flat pieces of wood on each side of the saw, which may be closed up to the blade and adjusted to compensate for wear. The back thrust guide consists of a series of chilled iron balls, with steel washers, balls and washers lying on each other alternately in a cylindrical inclosure drilled in the cast iron support. The back of the saw comes in contact with the balls through a groove in the cylinder; and as the balls rest only on the edge of small holes made through the supporting washers, all can be brought forward and adjusted to the back of the blade which, passing downward, rotates the balls without cutting them. Devices are added which cause the balls to revolve irregularly, presenting gradually the whole surface of the ball to the support of the blade. By this general arrangement, it is claimed, the friction of the fast passing blade is reduced to a minimum, while heating is avoided.

The last improvement, of the four which constitute the principal features of the invention, is the device for making the adjustment, for straining the saw blade, more sensitive to the varying length of the latter. The short arm of a weighted lever presses against a regulating screw, which passes through horizontal miter gear, and engages therewith, by means of a slot and feather, to a nut on the idler wheel carriage. By turning a hand wheel connected to the miter gear, the carriage is raised and lowered on the guide slide. For changing the plane of rotation of the upper wheel, the journal boxes are connected by a circular flange provided with circular V slides. The latter are engaged and held by a sliding cross head. Adjustment is made by a worm and screw, and is permanent and not affected by vibration. There are numerous other advantages of construction embodied in this machine. The principal ones are, however, before the reader; and if to them we add that the apparatus (which was patented through the Scientific American Patent Agency, November 30, 1875) is the manufacture of the well known house of Bentel, Margedant & Co., of Hamilton, Ohio, and received the first premium at the recent Cincinnati Industrial Exposition, no further statements relative to its remarkable excellence and value will be required.



BENTEL, MARGEDANT & CO.'S BAND SAWING MACHINE.

A SENSIBLE AND SUBSTANTIAL GRINDING MACHINE.

The engravings given herewith represent a grinding machine that is claimed to obviate a great many of the difficulties hitherto existing in this class of machinery. It is built to stand very firmly on the floor, its greatest length being in the direction of the motion of the wheels. Its journals are large and long, and can be placed in any position on the top of the machine or bed, or underneath by means of a slot placed in the top and bottom of the bed, in which the holding down bolts can be moved. This allows the wheels to be placed in any position, as the special work to be done requires. And if it is desired to use only one wheel, the pulley can be hung on the outside of the frame and the emery wheel inside, where the pulley is shown in the engravings. If only one wheel is used, and the boxes are hung underneath the bed, the wheel can be made to project above the top of the bed, and the side of the wheel can be used, the upper side of the bed forming a rest, upon which the work can be passed in grinding. Or the wheel can be lowered, so that the face of the wheel will only project through a table secured to the top of the bed, and in this manner a surfacing machine is made. It will be almost im-

Fig. 1

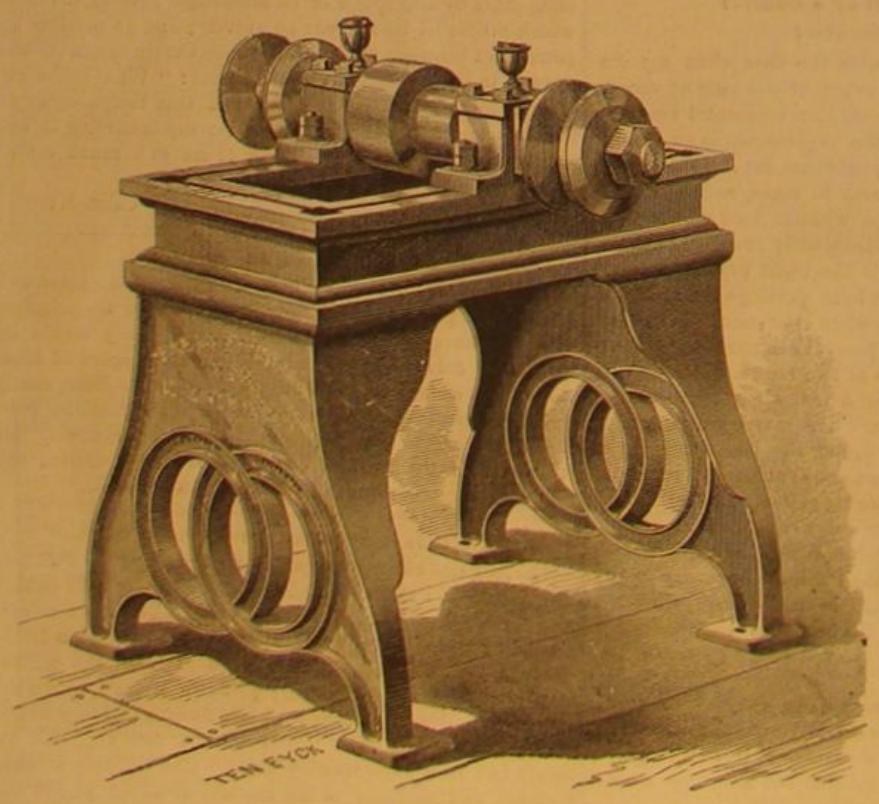
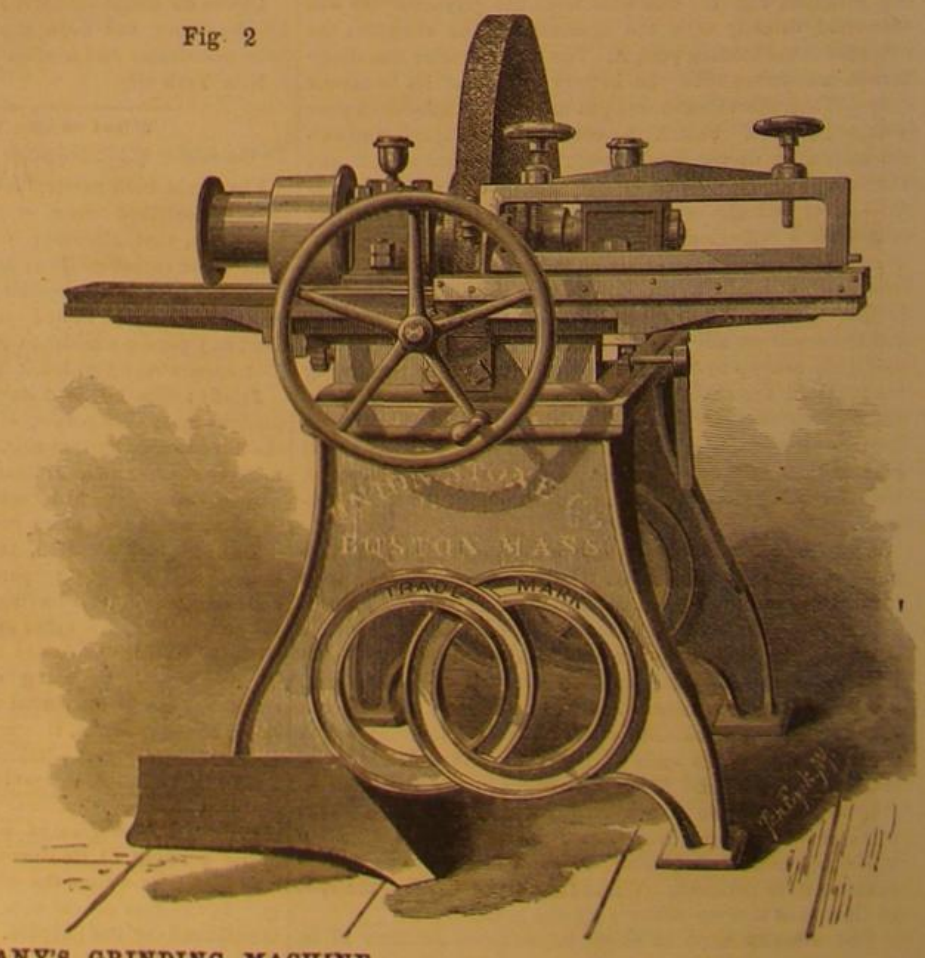


Fig. 2



THE UNION STONE COMPANY'S GRINDING MACHINE.

possible to give in detail the various positions into which the machine can be adjusted, but those acquainted with machinery will readily see that the apparatus will really form a foundation upon which almost any attachment for special work can be placed. The bed of the machine is very strong, and the slots in it can also be used to hold the various attachments; so that, without any alteration in the frame, the various devices can be put on or taken off at a moment's notice, and thus one machine can be made to take the place of several special machines. A number of attachments have already been applied to this machine, among them those adapted to the following purposes: Jointing plows (as shown in Fig. 2), beveling boiler plates, grinding the faces of pulleys, grinding car brasses, etc. Four different sizes of machines, after the style of the one illustrated, are made, with 1¼, 2¼, 3, and 3½ inch arbors, weighing about 600, 800, 1,000, and 1,500 lbs. each. The smallest are to carry small wheels to 18 inches in diameter: the largest, wheels to 6 feet in diameter.

Large emery wheels are more economical than small ones, when they can be used at all; and with substantial and heavy machines like the above, manufacturers will soon see that their interest lies in using emery wheels in place of grindstones, and large emery wheels in place of small ones.

A patent for this machine has been applied for through the Scientific American Patent Agency. For further particulars, address the Union Stone Company, 38 Hawley street, Boston, Mass.

THE PENGUIN FAMILY.

The penguins are a family of web-footed birds, with very imperfectly developed wings; they are found in immense numbers around the rocky coasts of the Southern Pacific Ocean, and on the *shores* of the Cape of Good Hope. The king penguin is one of the best known of the species; it belongs to the genus *aptenodytes*, being particularized by zoölogists as *aptenodytes Pennantii*. The bill is slender and curved at the points, which are acute; and the wings are very small, resembling fins in appearance, and having no quill feathers or plumes; they are therefore unfit for purposes of flight. Indeed, it would appear that this singular tribe is entirely unfitted for traveling through the air, as the bones have no air chambers, are filled with marrow, and are very heavy. The feet are very far back, and the posterior surface touches the ground as the bird walks.

Great numbers of these birds were found on Kerguelen's Island, a rocky island in the Indian Ocean, by the expedition which traveled thither to observe the transit of Venus, which took place on December 9, 1874. At a distance they appear as white stationary bodies; but on approaching, they are seen to be waddling along with an indescribably ludicrous gait, which is made still more absurd by the turned heads, as the birds look back distrustfully at their pursuers. As the body sways from side to side, the bird looks like an animated coat with empty, swinging sleeves. When attacked at close quarters, as shown in our engraving (which represents a scene on the coast of Kerguelen's Island), the penguins will use their beaks with considerable effect; but their sense of helplessness is strong, and they soon take to running away. Being clumsy and slow in walking, they frequently fall on their breasts, and move their wings (as if they were in the water) like fins. When congregated in numbers, they will unite to resist an attack, and will form a close phalanx. They are frequently killed for the sake of their skins, which are covered on the breast with fine, close feathers of remarkable softness, and are used, in place of furs, for wearing apparel. They are generally slaughtered by being knocked on the head with a club; but sometimes they are taken alive with a lasso thrown over the head. If they can reach the water, they can usually elude the pursuer, as they swim and dive with astonishing rapidity, remaining under water for some time and reappearing at a considerable distance from the place of first immersion.

The king penguin, the largest of the species, has an orange tinted breast, which becomes white near the abdomen. The back is grayish black, and the front and back are separated by a sharply definitive line of a steel gray color. They stand about 2 feet 9 inches high, and their plumpness gives them considerable weight. Their diet causes the flesh to be rank and fishy, but it is eaten by the natives of some countries.

Professor Osborne Reynolds as a Water Wheel Inventor.

Professor Osborne Reynolds, M. A., of Owen's College, England, has taken an English patent for what he supposes to be a new invention in turbine water wheels, which is engraved and described in a recent number of the *English Mechanic*. Briefly, the Professor's invention consists in using a double turbine, or two turbines in combination instead of one, the water passing necessarily through both.

The invention also consists in the use of what he terms curved movable vanes or plates, by which the water openings are enlarged or diminished, according to the head of water or the speed required. From the description given, it seems evident that Professor Osborne has simply reproduced some of the inventions already patented in this country. For example, the American patents of A. P. Conant, April 10, 1866, for turbine, of C. Shaw, February 15, 1870, and others that might be cited, appear to fully anticipate Professor Osborne.



KING PENGUINS ATTACKED BY A DOG.

SCIENTIFIC AND PRACTICAL INFORMATION.

ARTIFICIAL TEETH ON NATURAL STUMPS.

Mr. Moon has recently stated, in a communication to the English Odontological Society, that the stump of a tooth may be preserved as the basis of an artificial tooth, and rendered painless, by leaving the root canal empty and drilling a hole into it just below the edge of the gum. This hole becomes a permanent vent and thus saves the stump from disturbing influences, which, if deprived of means of escape, would ultimately destroy it by a painful process.

LIFTING EFFECT OF FROST ON TREES.

Dr. Lapham, State Botanist and State Geologist of Wisconsin, says that frost exerts a lifting power on full grown trees, so as to cause the impression on some that the tree begins to grow again after once attaining its full growth. When the land freezes expansion ensues, drawing the tree up with it, leaving of course a cavity whence the root was drawn. When the first frost comes, the moisture, carrying earthy matter, enters the cavity, and thus the root is prevented from returning to its original position. Dr. Lapham suggests that one of the chief offices of the tap roots may be to guard the tree as much as possible against this frost-lifting.

AMERICAN MEAT SOLD IN ENGLAND.

Quite a large quantity of American meat was recently sold in the Liverpool markets at paying prices. It was taken over by the steamer Illinois, in a large tank surrounded by ice and cooled by air driven in by a steam-worked blower.

BEET CIDER.

We mentioned not long ago that a cider made from beets was coming into use in France. We learn that it is prepared by adding 7 lbs. of red garden beet to every 2½ bushels of apples, pressing all together. The cider must not be used for about eight months, when it will be free from the beet flavor.

TO OBTAIN A BROWN PATINA ON ZINC.

A solution of molybdic acid, or molybdate of ammonia, in very dilute aqua regia, or a solution of molybdic acid in excess of very dilute caustic soda, produces, according to Kletzinsky, a very useful patina bath for articles of cast zinc. Zinc statues or other ornamental articles, when dipped into this bath, become covered with a very pleasing brown patina showing the prismatic colors. This covering is nothing but a thin film of oxide of molybdenum, which exhibits polarization colors and adheres firmly to the metallic zinc.

EXPLOSION OF CHROMIC ACID WITH GLYCERIN.

Explosive prescriptions are sometimes sent to innocent pharmacists by careless or ignorant physicians. The latest case of this kind is related by Austrian journals. The following mixture was ordered for external use: 7·5 grains chromic acid and 60 grains glycerin. The chromic acid was mixed with water in a flask and the glycerin mixed with it by shaking. Suddenly the contents of the flask exploded with a loud report, flying all about the shop, while the vessel remained unhurt in the hand of the astonished apothecary, and was covered with a black mass. This case deserves the more notice because the quantity was so small and the detonation so extremely violent.

Economy in Machine Shops.

The following suggestions, in regard to the care of tools and waste of oil in machine shops, are contained in a paper read before the New York Society of Practical Engineering, by James C. Bayles, editor of the *Iron Age:*

"The proper care of tools is always attended with an important economy. In small establishments this seldom receives due attention. As a rule, a tool belongs to anybody who happens to have it; consequently, no one is responsible for it. It is neglected, abused, mislaid, broken, stolen, or worn out before it has rendered half the service it is capable of performing. In some shops the time of one man, and sometimes two, is constantly lost in looking for missing tools and putting them in order for use when found; and a great deal of capital is wasted by the premature destruction of tools which, with proper care, should have lasted for years. In all manufactories there should be a place for tools not in constant use, and some one should have charge of them. A very good system, which I have always found to work well, provides for the charging of every tool in use to the man using it. When it is returned he receives a credit for it which balances his account with the tool department. For tools added to his individual kit, such as files and other implements supplied by employers, charge is made and no credit is given until the tool is returned broken or worn out, when a credit entry is made, with date, showing how long it has been in use. Such a record induces men to be careful of tools, and, by inculcating good habits in this respect, leads to economy in a direction in which waste and extravagance are easily overlooked.

"Another important saving in many shops would attend a more judicious oversight of the consumption of oil. In machine shops, and to a greater or less extent in all shops where machinery is used and iron worked, the amount of oil wasted constitutes a very large proportion of the total amount used. This waste results from a certain looseness of habit which most men acquire in handling materials which some one else pays for. When a drop of oil is needed, it is customary for the mechanic to pour a stream from his oil can, and wipe off the surplus with a wad of cotton waste. It is no exaggeration to say that half the oil used about many manufactories of machinery and metal goods is wasted, and the waste constitutes a serious item of expense. Oil is almost always used exclusively for lubricating purposes, especially in small establishments, yet there are other lubricants that might be kept constantly on hand, which are at once much cheaper and much better than oil, for such purposes as drilling, tapping, screw cutting, etc. There is also a great deal of oil wasted in applying it to machinery and shafting Whenever we see a drip pan that has not been attended to for a few days, we may be pretty sure of finding it half full of oil which has rendered no service, and which has become unfit for use, being gummy, foul, and filled with foreign impurities There is no need of this waste, which never occurs when the oiling of the shafting and machinery is properly looked after; but it is an evil against which the manufacturer can guard only by constant watchfulness."

THE PATENTS OF 1875.

[FROM THE FORTHCOMING ANNUAL REPORT OF THE COMMISSIONER OF PATENTS.]

Number of Patents issued by the United States Patent Office to Residents of the different States, Territories, and Foreign Countries, from Jan. 1, 1875, to Dec. 31, 1875.

[The proportion of patents to population is shown in last column.]

States, etc.	No. of Patents.	One to every	States, etc.	No. of Patents.	One to every
District of Columbia..	214	615	Nebraska.....	22	5,833
Connecticut.....	706	761	Texas	118	6,939
Massachusetts	1,846	787	Louisiana	103	7,057
Rhode Island.....	229	943	West Virginia	48	9,209
Colorado Territory....	36	1,107	Kentucky.....	132	9,303
New York.....	5,771	1,163	Montana Territory....	4	9,974
California.....	399	1,404	Tennessee.....	117	10,765
New Jersey.....	656	1,534	Virginia.....	101	12,130
Pennsylvania.....	2,034	1,728	Washington Territory	3	12,7.0
Illinois.....	1,098	2,313	Idaho Territory.....	1	14,999
Ohio.....	1,091	2,443	South Carolina..... .. .	46	17,513
New Hampshire.....	127	2,506	Georgia.....	63	18,795
Vermont.....	122	2,709	Utah Territory.... .	5	19,916
Delaware.....	44	2,841	Mississippi	38	21,787
Michigan.....	405	2,923	Florida	7	26,821
Maryland....	260	3,003	North Carolina.....	37	28,956
Minnesota.....	146	3,011	Alabama.....	31	32,161
Nevada.....	16	3,369	New Mexico Territory	3	37,101
Wisconsin.....	284	3,743	Arkansas.....	11	44,042
Iowa.....	315	3,790	U. S. Army	5	
Maine.....	158	3,964	U. Navy.....	1	
Indiana.....	378	4,462			
Oregon	22	4,631	Total for U. S....	15,698	2,412
Dakota Territory.....	3	4,727	To subjects of foreign governments....	590	
Missouri.....	362	4,754			
Arizona.....	2	4,829	Aggregate.... ...	16,288	
Kansas.....	66	5,521			
Wyoming Territory...	2	5,759			

RECAPITULATION.

Issued to citizens of—	
United States	15,698
Canada	150
Other subjects of Great Britain	221
France	91
Other foreign countries	128
Aggregate	16,288
Number issued in 1874	13,599
Increase over 1874	2,689

PATENTS EXPIRED.

Number of patents expired during the year 1875	579
Number of design patents expired during same time	782
Whole number of expirations	1,361
Less number of extensions granted	38
Leaving the actual number expired	1,323

SECTIONAL ANALYSIS.

An analysis of the table shows interesting facts. The geographical distribution of inventors, to whom patents were granted in 1875, appears by it to be as follows:

To the six New England States there were issued 3,188 patents, being one to every 1,094 people.

To the seven Middle States (including Delaware, Maryland, and West Virginia) 7,905, one to every 1,623 people.

To the nine Western States (including Missouri) 3,076, one to every 3,360 people.

To the twelve Southern States, 814, one to every 13,279 people.

To the three Pacific States, 437, one to every 1,699 people.

To nine Territories, 59, one to every 12,203 people.

And to the District of Columbia, 214, one to every 615 of population, being the highest ratio in the Union.

GAINS AND LOSSES.

All the States and Territories have held their own, or made gains over 1874 in the number of their patents, save the following, which show losses: Alabama, Arkansas, Florida, Georgia, Kansas, Mississippi, Nebraska, Oregon, Vermont (for a wonder), and Dakota, Utah, Washington, and Wyoming Territories.

New Hampshire and Nevada remained stationary, the former having 127, the latter 16 patents, the same as in 1874.

The principal increase was made in the following States: New York, 986; Pennsylvania, 390; Massachusetts, 340; Illinois, 164; California, 98: and the District of Columbia, 69.

Useful Recipes for the Shop, the Household, and the Farm.

A great many directions have been published for mending india rubber boots and shoes, most of which were worthless. The following can be relied on: Procure a small tin box of prepared rubber in a semi-liquid condition, which can be purchased for a few cents at almost any store where india rubber goods are kept for sale. The boot must be washed clean and dried. Then the surface around the rent is to be roughened a little with the point of a knife, after which the semi-liquid rubber is spread on with a spoon as thickly as it could be without flowing away. Then a neat patch is prepared and covered with one or two coats of rubber. When the prepared rubber is almost dry, the patch is applied and held on firmly for a few minutes.

It frequently happens that chemists and others desire to utilize pieces of broken glass apparatus by cutting the same into forms. The following is a simple method of this. Make a paste of ½ oz. gum tragacanth with water, and also ½ oz. powdered gum benzoin with alcohol. Mix the two compositions, and add powdered beech wood charcoal, forming a thick dough, which mold into little sticks about 4 inches in length and ¾ inch thick. The glass to be cut is first scratched deeply with a diamond, and then one of the sticks, previously ignited, is held against the crack. The glass will divide neatly as the end of the stick, which becomes a pointed glowing coal, is drawn over the diamond scratch.

S. A. T. says: To stick leather, paper, or wood to metal, to a gill of glue dissolved in water add a tablespoonful of glycerin.

The best treatment for slight burns is to apply cotton batting soaked with a liniment made of equal parts of linseed oil and lime water. Be careful not to break the blisters, should any form.

The finest quality of indigo has the least specific gravity, and floats upon water. It may also be tested by its not readily leaving a mark on drawing it across a piece of paper, and also by the clear blue which it imparts to water when dissolved

To prevent the skin discoloring after a bruise, take a little dry starch or arrowroot, merely moisten it with cold water, and place it on the injured part. This is best done immediately, so as to prevent the action of the air upon the skin. Invaluable for black eyes.

Excellent toy balloons can be made out of turkey's crops, in the following manner: Free the crop from the thick coating of fat, turn the inside out, and cleanse. Soak in water for two days, and then, with a blunt knife, scrape off the internal coating. Wash the crop well, and dry. Turn it right side out again, and make an incision through the external coats, carefully avoiding cutting the lining membrane. Draw the coats at one side over one neck of the crop, and tie the latter firmly with silk. Proceed at the other neck in the same way. Distend the bag thus formed with air, and hang it up to dry. A light coat of varnish may be added afterwards. Thus prepared, an ordinary crop will hold a gallon of gas and will weigh only 30 grains, which is considerably less than the weight of a bladder of similar capacity.

When a teaspoonful of any medicine is prescribed by a physician, it should be borne in mind that the quantity meant is equal in volume to 45 drops of pure water at 60° Fah. It is a good plan to measure off this amount in water in a small wineglass, and mark on the latter the exact hight of the fluid. This will give an accurate and convenient standard for future use. Teaspoons vary so much in size that there is a very wide margin of difference in their containing capacity. It is well to remember, also, that four teaspoonfuls equal one tablespoonful or half a fluid ounce. A wineglassful means four tablespoonfuls, or two fluid ounces; and a teacupful, as directed by cookery books, indicates four fluid ounces or one gill.

A good dentifrice, largely sold and advertised, is made of ½ drachm white Castile soap, dissolved in 1 oz. alcohol, ¾ oz. water, and ½ oz. glycerin. This is colored with cochineal and flavored with peppermint, wintergreen, and clove oils. The powder which accompanies each bottle is a mixture of precipitated chalk, powdered orris root, and carbonate of magnesia.

To make a handy snow shovel, take a light, tough, half inch board, twenty inches long and a foot wide. Sharpen one end, and over it rivet a strip of thin sheet iron, bent sharp to fit the edge; this forms the cutting edge. Across the other end nail firmly a piece an inch thick, five inches wide, and long enough to extend across the shovel board. Bore an inch hole through this, slanting downward and forward, so that the handle when passed through the hole will strike the board three or four inches in front of the cross piece. Bevel the end of the handle to fit the shovel board, and fasten it with a staple. The handle should be long enough to work without stooping, and the whole thing should be as light as possible.

The easiest way to burn stumps is to use a sheet iron chimney, big enough in diameter to fit over the largest stump, and some six feet in hight. An opening near the bottom answers for a door. The stump should be set on fire by placing around it some kindling wood inside the chimney, and the latter will produce a draft which will materially hasten the burning of the wood.

Black lead well mixed with white of egg is a good stove blacking. Lay on with a paint brush, and when dry polish with a hard brush.

To prevent flat irons from rusting, melt ½ oz. camphor and ½ lb. fresh hog's lard over a slow fire, take off the scum, and mix as much black lead with the composition as will bring it to the color of iron. Spread this over the articles for which it is intended. Let it lie for 24 hours, and then rub it well with a dry linen cloth. Or smear the irons over with melted suet, and dust thereon some pounded unslaked lime from a muslin bag. Cover the irons with baize in a dry place when not in use.

A farmer correspondent sends us an excellent wrinkle for finding the weight of horses or steers without scales. He says: "Make a weighing stall about 3 feet wide with a level floor. In the latter make a recess for the platform of the scales so that the platform will be flush with the planking. Now lead your horse or steer into the stall so that the forefeet of the animal rest on the platform and note the weight. Start him ahead until his hind feet are on the platform; note the weight again. Add the two weights thus taken, and the sum will be the total weight of the animal."

Leather pump packing requiring to be very tight, for small work, should not be more than $\frac{1}{32}$ inch thick, and not be bent up round the bore or sides of the barrel more than $\frac{1}{16}$ inch.

The cause of streaked butter is the imperfect working of the butter after it is salted. Salt in butter sets the color, or deepens and brightens it; so that if the salt is worked into the butter and not so fully worked as to salt every part, then the fresh butter retains the color it had when it came from the churn, and the salt butter grows so much darker that it is decidedly streaked. The remedy is to work the streaked butter more thoroughly.

Patent Matters in Congress.

Senator Frulinghuysen, of New Jersey, presented (on January 6) a petition from George W. Hunt, administrator of the estate of Walter Hunt, deceased, praying for an extension of Walter Hunt's patent for a paper collar-making machine. It was referred to the Committee on Patents.

Senator Eaton, of Connecticut, presented (on January 8) a petition from Ezra G. Cone, of East Hampton, Conn., praying for an extension of his patent for a sleigh bell. It was referred to the Committee on Patents.

Mr. J. H. Bagley, of New York, introduced (on January 11) into the House of Representatives a bill to protect the revenues of the Patent Office. It was referred to the Committee on Patents.

A Boiling Lake.

The discovery of a boiling lake in the island of Dominica has excited much scientific interest, and investigations of the phenomenon are to be made by geologists. It appears that a company exploring the steep and forest-covered mountains behind the town of Rosseau came upon the boiling lake, about 2,500 feet above the sea level, and two miles in circumference. On the wind clearing away, for a moment, the clouds of sulphurous steam with which the lake was covered, a mound of water was seen ten feet higher than the general level of the surface, caused by ebullition. The margin of the lake consists of beds of sulphur, and its overflow found exit by a waterfall of great hight.

DECISIONS OF THE COURTS.

United States Circuit Court---Eastern District of Missouri.

PATENT FIRE BRICK COMPOUND.—INTERFERING PATENTS.

ALFRED T. FOSTER vs. WM. M. LINDSAY.

[Before Treat, J.—Decided October 28, 1875.]

Treat, J.:

This is a suit in equity under section 4,918 of the Revised Statutes of the United States, concerning alleged interfering patents. The defendant's patent was prior in date to plaintiff's; also the application therefor. The plaintiff claims that the invention was by him; that he had, previous to any knowledge thereof by the defendants, not only invented the patented composition, but actually reduced it to a practical and successful test; that he had shown to the defendants the manufactured article, and when, as their foreman in the brick business, he was consulted thereafter about manufacturing fire-brick by means of which they could obtain a large and profitable order, he called their attention to the fact that he had exhibited to them before entering upon their service a specimen brick of the needed quality, that thereupon he, as their foreman, directed various experiments to be made at defendant's brick yard; that when the defendants suggested subsequently that they proposed to obtain a patent for that mode of making an improved fire-brick, he remonstrated against their doing so, claiming that he was the original inventor, and alone entitled to a patent, if one was obtainable.

On the other hand, the defendants claim that it was only after a series of experiments under their direction and supervision, in their own establishment, that the success of the mode patented was ascertained. *

The defendant in this case, among other defenses, has set up that the patented compound or process had been anticipated and in use before either of the interfering patents had been claimed or issued. The evidence fully establishes the fact. *

The plaintiff in this case contends that he has the prior and better right, although his application and patent are of subsequent date, and that the court is bound to adjudicate solely as between his and the interfering patent, leaving one of the patents to stand for subsequent adjudication when assailed in a proper suit. *

The controversy is between two patentees or those claiming under them. If neither has a valid patent, the court should adjudge both void, and thus end the strife. It is on this theory that the defendant was permitted to set up in his answer the lack of novelty, not of plaintiff's patent alone, but of his own. True, he might voluntarily have surrendered his patent, and contested the plaintiff's right in a suit for infringement; but why should he not, when sued, insist upon a full defense, whereby a second suit could be avoided? The power vested in the court to adjudge either of the interfering patents void, in whole or part, is held to confer full authority, where the evidence justifies, on issues fairly made, to decree, not one of the patents alone, but both to be void.

The court so adjudges in this case, and the decree will be accordingly at the costs of the plaintiff.—*St. Louis Central Law Journal.*

Recent American and Foreign Patents.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED RUNNING GEAR.

Lorenzo D. Hurd, Wellsville, N. Y., assignor of one half his right to Thomas Puller, of same place.—This is an entirely new construction of the running gear of wagons, which cannot be explained without detailed drawings. It however includes several simple devices of much strength, and also is so made that any one of the wheels may rise to pass over an obstruction or elevation, or sink to pass through a hollow, without affecting the other wheels or straining the reach.

IMPROVED TIRE.

Harry Thompson, Decatur, Ind., assignor to himself and George W. McConnell, of same place.—The invention consists of an outer and an inner rim or band forming the tire. The inner rim, having an inwardly projecting flange at each edge, protects the sides of the felly, and keeps the tire on the wheel. The outer one serves to bind the inner over fast to the wheel, and is kept on by a convex inner face, which shrinks into the concave outer face of the inner rim.

IMPROVED OPEN THILL.

Conrad H. Matthiessen, Odell, Ill.—The object of this invention is to enable the horse drawing a single or one-horse wagon or sleigh to travel in the regular track in roads where double or two-horse teams are principally used, and at the same time allow the vehicle to follow the regular track. The rear end of the thill is forked and connected with the axle. This brings the body of the thill about in line with the center of the vehicle, so as to be over the ridge between the two tracks in the road. The forward part of the thill is curved into U shape, so as to pass around the horse's breast and to the body of the thill. The free end of the thill has a joint formed in it, at such a distance from the end, and in such a way, that the said free end may be turned down to rest upon the ground to support the thill in proper position while bringing the horse into position, and harnessing and unharnessing him.

IMPROVED WINDOW SHUTTER.

Sofie Victor, New York city.—This is an improved window shutter that may be readily adjusted to combine the free circulation of air and shade of an awning with the protecting features of the common shutter. It consists of an outer shutter frame without slats, to the top part of which is hinged a separate shutter, that may be retained in outwardly inclined position by folding brace rods, and folded down to the open frame to be secured.

IMPROVED FOLDING CHAIR.

Frank A. Patch, New York city.—The side bars of the chair frame are curved, so that their lower parts may serve as the forward legs of the chair, and their upper parts as the posts of the back. The brace bars of the arms are curved and pivoted to the side bars; the rear bars are attached in similar manner. The seat is flexible, so that the whole forms a chair of strong and simple construction which may be folded into a small space.

IMPROVED SAW-SHARPENING MACHINE.

Wm. L. Covel, Beloit, Wis.—The object of this invention is to provide a machine for sharpening mill saws. It consists in an adjustable frame pivoted in the center and having parallel guide ways, in which moves a sliding block, to which the saw is detachably fastened. Through said sliding block passes a screw-threaded rod whereby the block and saw may be adjusted in the frame, and to the lower end of this rod is attached a lever, connected through a pitman with the crank of a slowly revolving shaft, by means of which the saw and block are together elevated and made to approach a revolving emery wheel each time a tooth is sharpened. At the top of the main frame is a pivoted latch feed controlled by a guide, which latch feed moves the saw by engaging with the face of the saw teeth for the purpose of bringing the teeth successively in position for the emery wheel.

IMPROVED MORTISING MACHINE.

Simeon Duck, Victoria, British Columbia, assignor to himself and Joshua Davies, of same place.—This embodies a novel construction of a machine for cutting square and angular mortises at any desired inclination. The device consists of a tilting bed, by which the material may be carried into any desired inclination to be mortised by a vertically operating tool. A cog segment and worm shaft tilt the bed frame on the rock shaft in longitudinal direction, while a lateral screw shaft admits its position in lateral direction. A longitudinally sliding frame is guided in the bed frame, and adjusted by rack and pinion, the adjustable heads of the same holding the material to the tool. One of the heads is arranged with a rotary chuck, with holes in its periphery for a pivoted spring clutch, that holds the materials for exposing it rotatively to the action of the tool.

IMPROVED IRONING TABLE

Lewis P. Lawrence, Port Morris, N. J.—This is an ingeniously constructed table, adapted to be attached to a ledge or window frame by a spring catch, and having an outside adjustable leg by which the outer end of the table may be placed at any desired hight.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED GAS BURNER.

Owen J. McGann, Chicago, Ill.—This invention has for its object to provide an improved mode of attaching the ring holder of a water lens or reflector to its burner, which latter is also provided with a socket, adapted to be detachably applied to the burner of an ordinary gas bracket.

IMPROVED SPRING SCALES.

Abram Harper and Laroy W. Cross, Edgerton, Ohio.—This invention consists of a contrivance of levers and springs for the support of the measure, so arranged that the weight of the contents of the measure will be indicated on a scale, the levers and spring being concealed in an inclosed base, which protects the apparatus from injury.

IMPROVED CARBON PHOTOGRAPH.

Claude Léon Lambert, Paris, France.—This is a new process for producing carbon photographs or sun pictures, produced in salts of chromium or other pigments, combined with gelatin or its equivalent, and rendered permanently insoluble by the action of light. The especial features of novelty consist, first, in a compound consisting of water, sugar, liquid ammonia, and permanganate of potassa, to form a bath in which a negative obtained from a transparent positive may be immersed, and thus intensified; and second, a process of obtaining double tinted prints in salts of chromium and on ordinary albumenized paper, by placing the sensitized paper in a press, the blank for the picture being covered with a black or yellow mask, and the whole being then precipitated by hyposulphite.

IMPROVED CONDENSER FOR ILLUMINATING GAS.

George W. Edge, Jersey City, N. J.—The invention relates to wheels having spiral vanes, and arranged in the pipe leading from the retort to the purifier, so as to be revolved by the current of gas. The impact and rubbing action of the latter on the vanes of the wheels effect the desired condensation of the tar and other heavy matters, which are thrown off by centrifugal force—the rotations being ordinarily near two hundred per minute—and are thus collected in the pipe, and thereby conducted to a suitable place for removal.

IMPROVED HORSE COLLAR.

Jacques Meyer, New York city.—This collar has metallic stiffening plates or hames, which are hinged at the top and locked at the side by means of a hinged piece of the hame entering a socket and spring lock of the other collar section. The terrets and trace fasteners are connected in rigid but detachable manner to the stiffening hames. The collar may thus be applied without straps, buckles, or other parts visible from the outside, while the ready opening and closing at the side of the neck allows its putting on without the animal stooping or bending down.

IMPROVED SIGHT PROTECTOR.

Marmaduke H. Mendenhall, Wabash, Ind.—This inventor now improves the sight protector for which letters patent were granted to him January 12 and April 20, 1875, so as to bring the light under perfect control as to quantity, direction, and distance, and at the same time protect the eyes from the glare, intensity, and heat. This is mainly done by the use of suitably adjustable plates of colored glass.

IMPROVED CIGARETTE MOUTH PIECE.

Diedrich Marquis, New York city.—This invention consists of a cigarette with tapering mouth piece, that is wound with an inner and outer spiral, decreasing in width, to which a wrapper of tobacco paper is connected in spiral shape, to be filled and closed at the end.

IMPROVED REMEDY FOR RHEUMATISM.

Aug. Severin, New York city, assignor to himself and Frederick Zarnfaller, of same place.—The proposed remedy is a composition of iodide of potassium, solid extract of aconite, wine of colchicum, morphine, and compound sirup of sarsaparilla.

NEW AGRICULTURAL INVENTIONS.

IMPROVED SHEARS FOR CUTTING HOGS' NOSES.

William H. Grow and Crawford M. Sloan, Rock, Kan.—One handle carries an inclined plate which rests against the hog's nose and supports the cartilage while the same is being cut by a blade on the other handle. The blade has an offset at its middle part, so as to leave a portion of the cartilage connected with the nose of the hog by a narrow neck. The end parts of the blade are curved about upon the arc of the upper side of the hog's nose, so as to cut off the rest of the cartilage close to its base.

IMPROVED POTATO BUG DESTROYER.

Isaac W. Griscom, Woodbury, N. J.—This is an apparatus mounted on wheels, and so designed as to be drawn over the plants. The poisonous powder is placed in a hopper, in which is a stirrer and other devices, which reduce the powder to a very fine state before it passes to a distributing device, which finally sprinkles it upon the plants beneath.

IMPROVED CLEVIS.

John G. Miller, Fredericksburgh, Va.—By this device the plowman, when he turns the team and reverses the plow, can, by means of a rod, shift the doubletree clevis from one to another of the notches of a notched clevis on the beam, to cause the plow to take more or less land, as may be desired.

IMPROVED SELF-RAKE FOR REAPERS.

Samuel B. Gilliland, Salisbury, Mo.—This rake is operated by a pitman, which connects with a lever operated by a grooved wheel on the axle. When the rake is pushed outward by the outward movement of the pitman, the teeth will be turned down beneath the platform, so as to pass beneath the cut grain lying upon said platform without disturbing it, and that, when the rake is drawn inward by the inward movement of the pitman, the teeth are turned up, so as to sweep the cut grain from the platform. The whole is a simple and doubtless efficient device.

IMPROVED HARROW ATTACHMENT FOR CULTIVATOR PLOWS.

Frederick D. Ladenberger, Glenbeulah, Wis.—This is a combined implement, comprising a shovel or breaking plow, two side plows, and two harrows, the two latter being connected to the former by eyebolts and brace rods, and made adjustable in width by means of a curved bar. The farmer is then provided with several useful implements in one.

IMPROVED PLOW.

Joseph Phillips, Smithton, Ill.—This is an improved cast iron upright for plows, having a flange formed upon its upper end. The lower end is forked, and a horizontal prong is formed upon it, having a longitudinal rabbet upon the rear part of its landside, and two longitudinal flanges upon its mold board side, to adapt it to receive the beam, the landside, the mold board, the share, and the handles.

IMPROVED BUTTER WORKER.

William H. Lilly, Bethlehem, Pa.—The chief parts or elements of this improved machine are a horizontal, continuously revolving bowl having a concave bottom, a revolving worker of peculiar construction, a stationary segmental block for pushing or transferring the worked butter from the side of the bowl towards the center of the same, and a central discharge tube for the buttermilk expressed from the butter. These parts, and the gearing necessary to operate such as rotate, are arranged in a frame having no peculiarity of construction.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED MANUFACTURE OF HEXAGONAL NUTS.

George Johnson, Haverstraw, N. Y.—The inventor claims that, by this improved system of manufacture, a stronger nut is obtained, any waste of iron in cutting avoided, and a convenient feeding of the bar to the nut-cutting machine is propuced. In the accompanying engraving, Fig. 1 represents a top view of the

Fig. 1.

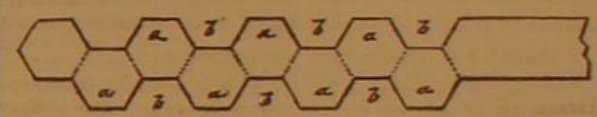
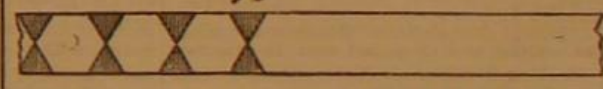


Fig. 2.



improved bar for making hexagon nuts, and Fig 2 shows the straight bar hitherto employed for making these nuts. The straight blank bar is passed through rolls or dies, and forced into such shape that alternating semi-hexagonal projections and recesses at both sides are produced. The recesses at one side are parallel, and correspond to the projections at the other side. The bar is fed in this shape (on its edge) to the nut machine, being turned after each cutting of the same to bring the nuts always into the same position for the tool. Cutting such nuts from straight bars, as shown in Fig. 2, produces a great waste of iron at the sides in the form of small triangular pieces, and disturbs the fiber of the iron, requiring also the frequent sharpening of the cutting tools, as there are for each nut four cutting planes.

IMPROVED LEATHER-DRESSING MACHINE.

Bart M. J. Blank, Jersey City Hights, N. J., assignor to Morris Rubens, New York city.—This inventor proposes an improved machine, by which the creasing and polishing of leather may be rapidly and uniformly accomplished. The invention consists of a revolving feed roller, in connection with a series of creasing or polishing dies, that are secured by gage and set screws to socket grooves of a hollow spring-cushioned tube. The latter is heated from the inside, and capable of being swung back to admit the ready insertion of the dies.

IMPROVED NAIL PLATE FEEDER.

William H. Field, Taunton, Mass.—In this invention, feeding jaws, in which the gripper rod rests, are made to close on the rod, and then move forward the breadth of one nail by a rod moved forward by the machine and backward by a spring. In its backward movement, the jaws open and travel along the rod for a new hold to feed again.

IMPROVED KEY FOR LOCK.

Warren H. Guthrie, Hudson City, N. J.—A common device of burglars for entering locked doors is to seize the key from the outside by a fine pair of nippers, turn it, and so draw back the latch. The present invention prevents this by means of a swinging staple-shaped guard hung to the key and surrounding the wards, so that, when the key is in the lock, each of the key holes will be filled by a wedge-shaped plate, which prevents the introduction of nippers or the planting of a drill.

IMPROVED WATER WHEEL.

Cloud Chalfant, Penningtonville, Pa.—This invention is an improvement in the class of horizontal outward-flow water wheels. The improvement consists chiefly in providing the wheel with vertical rising and falling buckets, and in adapting the wheel to be raised and lowered within the stationary case.

NEW HOUSEHOLD ARTICLES.

IMPROVED BED BOTTOM.

Elias Stillwell, Rockville, Mo.—The object of this invention is to provide a cheap, comfortable, and elastic bed bottom, without the use of slats or springs as ordinarily employed; and it consists in two inside detachable rails, over which a stretcher of canvas is placed. The said rails are kept apart by notched bars, and have arms which rest upon a subjacent support, and, when pressed down from the weight of the occupant, tighten the canvas. In combination with said rails are employed one or more bolts on each side, which pass through the bedstead rails, and also the detachable rails, to prevent the accidental displacement of the latter.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Alden Engine, 3 cyl. Com. Balance Piston, doubles power of Steam! Circulars free, Farrelly Alden, Pittsb'h.

"Wrinkles and Recipes" is the best practical Handbook for Mechanics and Engineers. Hundreds of valuable trade suggestions, prepared expressly by celebrated experts and by correspondents of the "Scientific American." 250 pages. Elegantly bound and illustrated. A splendid Christmas gift for workmen and apprentices. Mailed, post paid, for $1.50. Address H. N. Munn, Publisher, P. O. Box 773, New York city.

300 new and 2'd hand Machine Tools, Saw Mills, Planers, Wood Working Machines, Pumps, Water Wheels, Grist Mills, Engines, Boilers, etc., for sale. See first column of page 77, this number.

No. 2 Bogardus Mill for Dry Work for Sale at half price. A. C. Stebbins, 98 Liberty St., New York.

Wanted—Second hand Wrought Iron Gas and Steam Pipe, 4, 5, and 6 inch; also, Cast Iron Flanged Pipe, 6, 7, and 8 inch. Address, with full particulars as to quantity, price, &c., Leslie, care P. O. Box 3050, N. Y.

Book on Making and Working Batteries, Electrotyping, Plating, &c., 30c. T. Ray, Box 185, Ipswich, Ms.

Geo. P. Rowell & Co., the enterprising advertising agents of New York city, believe in making themselves a necessity to advertisers, and, in every way open to ingenious minds, they seek to attain that popular and profitable end.—Daily Herald, Elizabeth, N. J.

Agricult'l Works, Clinton, Ill. Mach. sold on Com.

Walrus Leather & Polishing Materials—Greene, Tweed & Co., 18 Park Place, New York.

For Sale, almost new, 425 gallon Copper Kettle, 4 ft. x4½ ft.. Weight, 1,650 lbs. Price $300. Perfect. Forsaith & Co., Manchester, N. H.

Abbe Bolt Headers, the best—Prices reduced; 2 sizes made. Palmer Power Spring Hammers, 10 sizes. See machines, or write for information before buying. S. C. Forsaith & Co., Manchester, N. H.

300 new and 2'd hand Machine Tools, Saw Mills, Planers, Wood Working Machines, Pumps, Water Wheels, Grist Mills, Engines, Boilers, etc., for sale. See first column of page 77, this number.

Piles—No matter of how long standing your case may be, or how many remedies failed, a cure is possible. Circulars free—cause—consequence and cure. Wonder Worker Medicines. Salem, N. J.

Pat. Repts. & Sci. Am., cheap. Box 185, Ipswich, Ms.

Steel Castings, from one lb. to five thousand lbs. Invaluable where great strength and durability are required. Send for Circular. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Wanted—To purchase the Patent of a good article of general use, or will manufacture and pay royalty. Address B. H. Robb & Co., Cincinnati, Ohio.

Use Yocom's Split-Pulleys on all Shafting, same appearance, strength and price as finished Whole-Pulleys. Shafting Works, Drinker St., below 147 North Second St., Philadelphia, Pa.

A valuable Folding Cradle Patent for Sale. Address the inventors, J. Welch & S. Jefferys, 504 West 28th Street, New York.

Designer or Draughtsman—Engagement wanted by an engineer of practical and scientific education. Woodworking Machinery a specialty. Best references. Address Civ. Eng., 322 East 55th St., City.

Blake's Belt Studs are the best and cheapest fastening for Leather or Rubber Belts. Save ten times their cost. Greene, Tweed & Co., 18 Park Place, N. Y.

Linen Hose for Factories—1, 1¼, 2 & 2½ inch. At lowest rates. Greene, Tweed & Co., 18 Park Place.

For Sale—No. 5 Blake Crusher, good as new, $900. 10 H.P. Loco. Boiler, $150. 15 H.P. Upright Boiler, $150. 6 ft. Planer, $275. 4 ft. Planer, $175. 17 in. x6 ft. Lathe, $125. 12 in. x6 ft. Lathe, $125. Shearman, 45 Cortlandt, N. Y.

Wanted—A partner with means to manufacture a Patent Hay Rake or Pea-Vine Puller for Southern use. Takes well. Address J. H. Randolph, Jr., St. Gabriel, La.

Tobacco Wafers—Patented. State Rights for Sale. Address D. A. Alden, Malden, Mass.

Manufacturers! Send for illustrated catalogue of Best Belt Pulleys made. A. B. Cook & Co., Erie, Pa.

Manufacturers of Improved Door, Sash, & Blind Machinery. Send circulars and prices to Noxon Bro's, Walkerton, Ontario.

For Sale—An upright Re-Saw, in good order. Can be seen running at 286 Market St., Newark, N. J. W. H. Kirk & Co.

Pine Castings and Machinery, 96 John St., N. Y.

For Sale—Second Hand Wood Working Machinery. D. J. Lattimore, 31st & Chestnut St., Phila., Pa.

Boult's Paneling, Moulding and Dovetailing Machine is a complete success. Send for pamphlet and sample of work. B. C. Mach'y Co., Battle Creek, Mich.

For best and cheapest Surface Planers and Universal Wood Workers, address Bentel, Margedar & Co., Hamilton, Ohio.

Small Engines. N. Twiss, New Haven, Conn.

300 new and 2'd hand Machine Tools, Saw Mills, Planers, Wood Working Machines, Pumps, Water Wheels, Grist Mills, Engines, Boilers, etc., for sale. See first column of page 77, this number.

Patent Scroll and Band Saws, best and cheapest in use. Cordesman, Egan & Co., Cincinnati, Ohio.

Solid Emery Vulcanite Wheels—The Original Solid 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, New York.

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. Frisbie & Co., New Haven, Ct.

Water, Gas and Steam Goods—Send eight stamps for Catalogue, containing over 400 illustrations, to Bailey, Farrell & Co., Pittsburgh, Pa.

The Baxter Engine—A 48 Page Pamphlet, containing detail drawings of all parts and full particulars, now ready, and will be mailed gratis. W. D. Russell, 18 Park Place, New York.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., or lithograph &c.

Hotchkiss & Ball, Meriden, Conn., Foundrymen and workers of sheet metal. Fine Gray Iron Castings to order. Job work solicited.

Peck's Patent Drop Press. Still the best in use Address Milo Peck, New Haven, Conn.

300 new and 2'd hand Machine Tools, Saw Mills, Planers, Wood Working Machines, Pumps, Water Wheels, Grist Mills, Engines, Boilers, etc., for sale. See first column of page 77, this number.

All Fruit-can Tools, Ferracute W'k's, Bridgeton, N. J.

American Metaline Co., 61 Warren St., N. Y. City.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon, 470 Grand Street, New York.

Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass.

For best Bolt Cutter, at greatly reduced prices, address H. B. Brown & Co., New Haven Conn.

Diamond Tools—J. Dickinson, 64 Nassau St., N. Y.

Temples and Oilcans. Draper, Hopedale, Mass.

Notes & Queries

H. H. will find a full description of jade on p. 49, vol. 34.—J. C. will find a recipe for cement for iron pipes on p. 185, vol. 33. Tempering millpicks is described on p. 202, vol. 31.—W. H. will find on p. 347, vol. 32, a recipe for an alloy fusible below 212° Fah.—D. G. F. will find good recipes for bronzing on iron on pp. 11, 85, vol. 33, and on brass on p. 51, vol. 33. "Electricity, its Theory, Sources, and Applications" is a good book on electro-plating.—H. A. H. will find on p. 139, vol. 31, a formuly for the lifting power of gas. The silvery coating on iron wire, given in our recipe, will wear well with careful usage. Steel wire is best for springs that are much used.—E. B. will find a description of leather pulp on p. 296, vol. 31.—E. T. C. will find directions for cleaning brass on p. 102, vol. 25.—J. C. Jr. will find Bloxam's "Chemistry" an excellent work for students' use.—W. S. S. will will find on p. 10, vol. 27, a full description of the phosphorus lamp. This also answers H. W. S.—T. E. will find on p. 11, vol. 31, a recipe for waterproof varnish, which he can apply to his bronzed work.—H. A. P. will find full directions for molding rubber on p. 283, vol. 29.—H. F. H. is informed that no boiler incrustation preventive can be recommended unless the nature of the feed water is known, as the impurities of water differ so widely in their nature.—W. F. McL. will find a recipe for marine glue on p. 42, vol. 32. Mix enough gutta percha with bisulphide of carbon to make a thick varnish.—J. S. is informed that a pump made of a tin pipe with a wooden plunger is commonly used to draw oil out of casks. Coal ashes do excellent service in earth closets.—F. K. will find a good recipe for baking powder on p. 27, vol. 34.—J. N. will find a description of soluble salicylic acid on p. 86, vol. 33.—B. F. will find a description of an apparatus for freezing water in bottles on p. 82, vol. 33.—J. W. will find a description of the Russian circular ship on p. 87, vol. 33.—F. J. C. will find a description of bisulphide of carbon on pp. 114, 283, vol. 30.—W. C. will find a recipe for cement for millstones on p. 251, vol. 31.—R. N. can ascertain the horse power of a small engine by the rules given on p. 33, vol. 33.—T. F. can harden screw plates and dies by the process described on p. 75, vol. 28.—R. J. W. can harden tallow by the process described on p. 202, vol. 24.—W. N. will find a description of the philosopher's or hydrogen lamp on p. 242, vol. 31.—W. N. K. will find, on reference, that the paper stereotyping process is described on p. 363, vol. 30.—M. P. is informed that the only way of ascertaining the power of a spring is by experiment.—J. C. W. will find directions for making spongy platinum on p. 330, vol. 25. Files can be hardened by the process described on p. 212, vol. 25.

(1) J. B. asks: 1. What is the cause of the sulphuric smell in a room where a register is used? A. Your description is too meagre; you should state the arrangements of flues, furnace, etc. 2. Can the air of a room be analyzed so as to find what gases it contains? A. It can, but it requires the tact and skill of a chemist to obtain accurate results.

(2) F. S. W. asks: Please give me a recipe for making blue and red stencil paste, which can be cast into cakes, to be used for branding flour barrels. A. Mix any of the ordinary pigments with sufficient chalk or carbonate of magnesia to form a paste of the required consistence.

(3) G. D. V. asks: What is the effect of ice on milk? I have been using a spring to prepare my milk for cartage over some fifteen miles of country roads, and find that it will churn somewhat in warm weather. I have thought of putting broken ice in the tank used for cooling, thereby lowering the temperature below that of spring water. Do you think this would be an advantage in helping the milk to withstand the shaking? A. A very low temperature, such as that obtained by a mixture of crushed ice and salt, might be of some advantage; but the only sure method is that of filling the vessels full, so that there can be no possibility of shaking.

(4) D. M. C. asks: Can we use cast steel for punching machine mandrils, and will it sustain great weight and not crush in such use? A. Steel castings are far preferable to forgings, and will suit your purpose admirably.

(5) J. M. S. says: One cool Monday morning our fireman, while firing up, burst the globe of the main valve and a quarter turn in the main steam pipe running from the boiler to the engine. The pipe was 20 feet in length and 4 inches in diameter, and took one turn downward: it was probably partly filled with water, the drip cocks not having been opened. Experts here explain that steam, thus let on to confined water, exerts ten times as much force as if the pipes were free from water, bursting the pipes on account of the non-elasticity of water. Is this so? A. There was probably ice in your pipes, and they burst from unequal expansion.

(6) R. S. B. M. says: I have often observed men riveting steel plates together with soft iron rivets. Will the resistance of the plates to the contraction of the rivet, as the latter cools off, lengthen the time occupied in cooling? A. Theoretically, yes.

(7) A. M. B. says: I put a set of tubes into a boiler, and in less than a year one of them gave out. They have been going out one at a time until 8 have given out. There are small holes in them, that look as though they had been drilled. I use nothing but rain water in the boiler, but the condensed steam drips back to the cistern of a condenser, and I use tallow in the cylinder. Can you tell me a remedy? A. There are possibly chemical impurities in the tallow. Try purifying it by the process given on p. 182, vol. 29.

(8) C. C. R. asks: Is there any objection to using the common expansion valve (on the back of the slide valve), worked by another pair of eccentrics and link, in order to have the exhaust independent, for locomotives? A. It would give no advantage.

(9) T. C. says: I have built a small steam engine with cylinder 1½x3 inches, and have an upright boiler 12x16 inches, with one 3½ inch flue in the middle. Boiler and flue are made of copper, of No. 18 wire gage. What is a safe pressure? A. Safe working pressure 30 lbs. per inch. 2. Will the boiler run two such engines? A. No. 3. What books would you advise me to study, to get a thorough knowledge of land, marine, and locomotive engines and boilers? A. Bourne's "Handbook" and "Catechism of the Steam Engine," Forney's "Catechism of the Locomotive," and Colburn's work on the "Steam Engine."

(10) W. A. B. asks: Which of the following oils are best for shafting and printing machinery: Black lubricating oil, lubricating castor oil, or light engine oil? A. Lubricating castor oil

(11) E. H. R. says: Last year I had trial gages to my steam boiler of a kind that worked with a hinge by raising the handle end. These handle ends, if raised too high, would drop out, letting the steam escape (if above the water level) until readjusted. One day I noticed, when the handle had become detached and a full head of steam was on, that, although there was the usual hissing by the escape steam (or what I thought should be escape steam) there was no steam visible, although the escaping gas was through an open door and with sufficient force to prevent, for some minutes, the readjustment of the handle. My curiosity was then excited, and I inquired of the engineer what was the reason that no steam was visible, only what appeared to be hot air or gas? He said he did not know. He only knew that, when mud was in the gage pipe, no steam was visible. When the pipe was clean, steam would issue. Now if this mud filtered all the steam out or decomposed the steam, what was this escaping gas, that seemed to have lost no force but to have entirely changed from steam to hot air or gas? The escaped gas did not deposit any moisture upon cooling. A. We have heard of many similar cases, and can afford no satisfactory solution of the question. We shall be glad to hear from any of our correspondents having had any experience in this matter.

(12) J. H. asks: Is there anything with which a horseshoe magnet could be covered so as to stop its influence or attracting force, a wax or paint of any kind, for instance? A. No.

(13) C. D. P. F. asks: 1. Is it practicable to heat a house 40 by 50 feet, three stories high, a greenhouse 16 by 100 feet, a stable, and two small cottages by steam from one boiler? A. Yes. 2. How large should the boiler be, the buildings being within a circle of 500 feet radius, and a separate steam pipe leading from the boiler to each building? A. You do not give the hight of stories of the buildings, from which the cubic feet of air to be heated might be computed, and upon which the size of the boiler should be predicated. Assuming the stories to be of about the usual hight, the boiler would require to have about 185 feet of heating surface, or about 14 horse power. There should be two pipes leading to each building in order to secure a circulation—one for the return; and these may be about 2½ inches in diameter. They should be packed with a cement of asbestos and cattle hair to about one inch in thickness, to save steam by preventing the radiation of heat. 3. How deep should the pipes be buried in the earth? A. At least three feet, and the boiler should be set in a cellar or vault low enough to receive the return pipe above the bottom thereof. The greenhouse could be warmed to a more uniform and safe temperature by means of a hot water apparatus of its own.

(14) C. H. A. asks: How can I silver the inside of glass globes? A. Make a reducing solution of one fourth, and a silvering solution of one tenth, the strength as published in No. 22, vol. 33, SCIENTIFIC AMERICAN, and fill the globe with equal parts of each solution.

(15) G. A. A. asks: 1. What should be the length of focus of the pair of 4 inch plano-convex condensing lenses for a magic lantern? A. The crossing (or smallest) point of the beam of light when in use may be ten or twelve inches from the condensers. 2. What should be the diameter and power of the pair of magnifiers corresponding to the 4 inch condensers? A. The quarter size photographic portrait tube, of 1¾ inch aperture and 6 or 7 inches focus, works very well. 3. What is the advantage of having the condensing lens made up of two glasses? A. That the focus may be made sufficiently short, and not lose too much light by reflection.

(16) J. F. asks: What kind of ammonia is used in a nickel bath to keep it neutral? A. The sulphate is preferable.

(17) C. C. M. asks: 1. Can I use a small telegraph machine for striking bells in different portions of my factory with simply the use of two wires? A. If you mean what telegraphers call a sounder, yes. 2. Will it be necessary to have a coil below the bell, so as to make the bell a magnet? A. No.

(18) J. D. B. says: The teacher of our astronomy class says that, were it not for the reflecting power of the atmosphere, we could see nothing not in direct sunlight. I claim that the reflection from the earth and adjacent objects would be sufficient to enable us to see many things not in the direct rays of the sun. Am I not right? A. Yes.

(19) W. H. A. asks: Has electricity been used in deep sea soundings? A. We do not recal any instance where it has been used for this purpose.

(20) J. A. S. says: If we had a material which was a non-conductor of magnetism, wrought into thin slips, which could be used as an interposer to cut off magnetic influence suddenly, and at regular intervals, would we then be able to propel light machinery by the power derived from common steel magnets of good quality, that is, could we utilize the power in magnets? A. Certainly, but if such a substance existed no economical advantage would result; work must be done to operate it, and this would more than overbalance any power which it would give.

(21) D. J. C. asks: Is it possible to make an aqueous solution of rosin? A. No.

(22) A. H. T. says: 1. I have constructed a Jamin magnet, but was unable to magnetize it on account of its peculiar shape and form. I was unsuccessful in the attempt, because I could not apply the electro-magnet to the surface of the steel ribbons. How should I proceed to make a magnet of great power? A. You ought to be able to magnetize it with an electro-magnet of the bar or curved form. Use one wound with No. 14 or 16 copper wire, and charged with two or three Grove cells.

(23) R. J. S. asks: How can I settle rain water taken from a pond, so as to make it clear for culinary purposes? A. Mix with a small amount of lime water, and allow to settle until clear.

(24) L. L. asks: 1. Which is the best way to make a stereoscope? A. For what purpose is it to be used? 2. What lenses are the best? A. Double convex, with one side thicker than the other. 3. How many times should they magnify? A. About twice. 5. What should be the distance between the lenses and the picture? A. About six or seven inches, for ordinary eyes. 5. How are the endless chains to hold the pictures in revolving stereoscopes made? A. Formerly they were made of either cloth, leather, or rubber belts, as wide as the picture is long. Across them were fastened narrow strips of wood, with wires at each end for holding the views. The latest improvement is a hinged metal band, but the principle is the same in each case.

(25) P. D. S. asks: How can I make bichromated gelatin? A. Make a hot saturated solution of bichromate of potash in water, and in another vessel make a strong solution of gelatin. Then pour them together, stir well, and allow to cool. Or flow your plate with gelatin in the usual way, and then place it in a bath of bichromate of potash for a short time.

(26) F. C. S. says: Please give me directions for nickel-plating apparatus. A. Take a wooden box and line the inside with sheet lead, having about one quarter of an inch between the box and lead. About midway between the ends place two upright copper poles, and across these lay a copper wire, upon which hang the articles which are to be plated. Insulate the copper wire or rod from the lead cell and connect it to the zinc pole of the battery. The positive pole should terminate in a nickel anode placed in the solution.

(27) F. W. B. asks: What metal will most cheaply and effectually resist the action of phosphoric or phosphorous acid, and the vapor arising from the oxidation of phosphorus? A. Gold or platinum.

(28) W. T. says: I have a quantity of butter from 3 to 5 years old, which is of no use except for grease. How can I get the oil out of it, to use for lubricating purposes? A. Butter is a mixture of several fats. You can obtain these free from salt and other impurities by digesting for a short time in hot water, and then allowing to cool. We do not know of any method by which these fatty bodies may be economically separated.

(29) W. M. M. asks: What chemical preparation can be burnt to produce a dense smoke? A. Try pastilles.

(30) E. B. asks: What is the best solvent for gum copal? A. Copal dissolves in turpentine, which is the usual solvent employed for the gum. Oil of rosemary is said to be one of the best solvents; ether is probably the best solvent, but it evaporates so rapidly that the varnish cannot be equally spread. The oils of spruce and lavender have also been used as solvents. It is almost insoluble in alcohol.

(31) C. asks: In speaking of the 81 ton English gun, is the ton 2,000 or 2,240 lbs? A. 2,240 lbs.

(32) S. G. C. asks: How can I remedy a trouble with a large stationary pot in a furnace? It was used for washing, making lard, etc., without the least trouble: now it is unfit to use, as it makes the water black. How can it be cleaned? A. We are as much at a loss to explain the strange action as yourself. You should have stated whether the pot is of iron or other metal, and if there is any incrustation, in which case please send a sample. State whether or not the water

used is from the same source as formerly; and if so, whether it may not have suffered some change. If the latter is at all probable, send us a small sample of the water also.

(33) J. B. J. says: In your issue of December 11, 1875, you give a recipe for mucilage, requiring 30 grains sulphate of aluminum. Will common alum (in equal quantity) do? The latter contains sulphate of potash and water in addition to the sulphate of alumina. A. Probably not so well. Try the experiment for yourself.

(34) F. P. L. C. asks: Is there any chemical composition that may be used for darkening the skin without injury? A. We know of none. Dyes can be applied, but they always affect the normal condition of the cuticle, and for this reason cannot be recommended. Organic solutions cannot be made use of, as they are readily taken up by the system, and most solutions of the metals have a very injurious effect upon the adjacent muscles, etc.

(35) A. M. asks: Is water having a limey taste injurious to the system, when used for drinking and cooking? A. Generally speaking, it is not injurious. On persons unused to drinking such waters, it sometimes acts, producing temporary derangement of the bowels.

(36) J. A. asks: What will remove ink stains from parchment? A. It would be necessary to know what kind of ink, in order to give a definite answer. Try a little pure diluted muriatic acid or cyanide of potassium.

(37) S. L. G. asks: Is water which has burnt gunpowder and tar in it dangerous or unwholesome to drink, or to use for cookery? A. It is not dangerous, but it is less wholesome than common rain or river water.

(38) C. F. asks: Can you give me a good recipe for making and polishing artificial malachite? A. Send a specimen of the malachite which you are confident is artificial, and we shall make the requisite examination.

(39) L. H. says: I tried your recipe for green black writing ink, published in your issue of October 23, 1875. The color is all right, but the stands and pens get all covered with a hard substance (see inclosed). What is the matter? A. This ink should be used with a gold or quill pen. The white powder is sulphate of iron.

(40) I. F. B. asks: Can potatoes be used for manufacturing purposes? A. Yes. They are used on a great scale in the manufacture of starch.

(41) R. B. W. asks: Is alumina fusible before the oxyhydrogen blowpipe, or by any other known heat? A. Alumina ($A_2 O_3$) melts into a colorless glass when exposed to the oxyhydrogen blowpipe flame; and when thus ignited it is found to be soluble in acids with great difficulty.

(42) H. M asks: Why does a magnetized needle float on water? A. Any needle will float on water if it be carefully laid on the surface. A certain amount of impact is necessary to break the surface of the water, and then the needle will sink, whether it be magnetized or not.

(43) G. R., Groningen, Holland asks: 1. What is canary seed (*phalaris canariensis*) used for? A. To feed canaries and other small birds. 2. What is caraway seed (*carum carui*) used for? A. For flavoring cakes and other articles of cookery. It is also used for preparing a liqueur, called in Germany *kummel*

(44) F. W. A. H. says: Can you tell me of a remedy for itching, not suppurating, chilblains? A. Take oil of turpentine 2 ozs., camphor 3 drachms, and oil of cajeput 1 drachm. Mix, and rub in with gentle friction.

(45) W. L. asks: Can you give me a recipe for a black ink powder that can be mixed up with water for immediate use? A. Take Aleppo galls 3 lbs., copperas 1 lb., gum arabic ½ lb., white sugar ¼ lb.; powder and mix. Put 1 pint boiling water on 2 ozs. of this mixture, and your ink will soon be ready for use.

(46) R. M. asks: How is licorice paste made? A. Dissolve common stick licorice in water, strain the solution, and add a little refined sugar. Then evaporate till a stiff paste is obtained, and press into shape.

(47) T. H. C. asks: 1. Is copper now in use anywhere for edge tools? A. Yes, in China and elsewhere. 2. Would the discovery of the art of hardening copper, so as to make it suitable for tools, be of any great value to the world? A. Not unless steel becomes unattainable.

(48) W. & S. ask: 1. How can we detect the presence of lime in drinking water? A. By blowing into the water through a straw. If the water becomes cloudy, lime is present. 2. How can we make a filter for drinking water? A. Make a wooden cistern, with a false bottom a few inches above the base, and screw a faucet into the cistern to draw the water from the intervening space. Bore some holes in the false bottom, and put in some coarse gravel, then some fine gravel, then some sand, then some crushed charcoal, and your filter is ready for use.

(49) P. S. asks: What is the weight of a cubic foot of gold? A. 1204-1284 lbs. avoirdupois.

(50) G. M. R. asks: How can I anneal cast iron? A. Malleable iron castings are enclosed in iron boxes filled up with pounded ironstone or common lime. The boxes are then luted, rolled into the oven or furnace, submitted to a good heat for about five days, and allowed to cool in the furnace.

(51) C. F. asks: How can I make *eau de Cologne*? A. Take oil of lavender 4 ozs., purified benzoin and oil of rosemary each 2 ozs.; dissolve these in stronger alcohol 9 gallons. Add successively oil of neroli, oil of young orange (called by the French *huile de petits grains*), oil of lemons, each 10·4 ozs.; oil of sweet orange, oil of lime, and oil of bergamot, each 20·8 ozs., and a little tincture of the flower of rose geranium. This is a good imitation of the *eau de Cologne* prepared by the Farinas, and is said by some to be that of the original formula.

(52) J. E. asks: How can I color fancy soaps? A. For red, use tincture of orchil; for yellow, tincture of turmeric or annatto; for brown, burnt sugar or umber. Other colors can be produced by using simple vegetable pigments.

(53) N. S. asks: Will the elasticity and strength of the following spring be nearly permanent? The spring is 15 inches long, 2 inches wide, and of 17 B. W. G. It is used to push the bodies of scalded hogs, so that they protrude 4 or 5 inches within the circle of a revolving spring, about 60 times a minute for 10 hours a day. A. Your spring is too light for the duty, and hence is liable to set.

In the arrangement of a sliding shaft through a hub under pressure, which presents the least friction, a feather in the shaft and slot on hub, or pin through shaft and slot through hub? A. A feather in the shaft.

(54) J. R. B. asks: What solution will clean brass or iron after brazing, while hot? A. We know of none.

Can a governor be made to regulate the speed of an engine, 2x4 inches? A. Yes.

Of how many horse power should an engine be to give power equal to 10 horses in driving a thrashing machine? A. Twelve.

(55) H. M. W. says: I want to divide a circle into 9 parts; these 9 parts are to be subdivided by 10, and again by 10, making in all 900 divisions. Is there a rule by which I can divide a circle in this way? A. The necessary instructions would occupy too much space. The subject will shortly be treated in "Practical Mechanism."

(56) L. S. says: I have been firing a 30 or 32 tun Baldwin locomotive, which always had a thumping on the left hand hind driver. The engineer made some experiments by setting the driving box wedges and wrist pin brasses, but could not stop the thumping. Lately the engine was taken out of shop; the driving boxes were paralleled; brasses, wedges, drivers, and wrist pins were all turned off, and now the thumping is on the opposite side. It can be heard when running either slowly or fast, but mostly when she is drawing a heavy load. Can you explain it? A. Not without examining the engine.

(57) I. D. H. says: We have some heating stove patterns that are too light. We want to thicken them up, so as to enable us to take off another set of patterns of proper thickness. Is there any material that can be painted or smeared on the patterns, so that, by repeated applications, they could be thickened up evenly and neatly? A. No.

(58) W. W. McK. & S. asks: Can you inform us how to soften our scrap iron in the cupola, so that it can be bored and turned without using pig iron? Some shops use nothing but scrap, and soften it by putting in certain materials. What are they? A. We think you are mistaken as to scrap iron being softened by anything but the addition of new soft iron.

How can we make a good arrangement for vitrioling castings? A. A shallow tank, sunk in the ground, covered with a movable lid, and placed near a water supply, is all you require to wash castings.

(59) H. G. asks: Can you tell what is used to stop boilers from priming or foaming? A. Plenty of boiler power and steam space is the best general remedy we know of.

(60) J. M. M. G. Jr. says; We have an engine of 20 horse power which last year ran two gin stands very well with 30 lbs. steam. We stopped it in the spring, and did not run it any more until this fall, and now it takes 50 lbs. to run it, and that very slowly. It is clean and well oiled. We got a machinist to examine it, and it was in perfect order. I am afraid to raise more than 60 lbs. steam on boiler, as we have had it 22 years. It has been repaired and a new head put in at one end. What is the matter? A. It would be impossible to say without an examination of the engine.

(61) C. C. G. asks: Does it take more power to run a saw on a long mandrel than on a short one, not counting the extra weight? A. Yes, because of its vibration.

(62) H. C. asks: Is there any practical difficulty in running two engines on the same shaft, in a steamboat, under the following conditions? One cylinder is 14 inches x 30, the other 15 inches x 36. They are to be connected by link motion. A. No, unless the other conditions (situation of engine, etc.) prevent.

(63) J. S. asks: How can I temper butcher's steels for sharpening knives, without injuring the silver color? A. It cannot be done.

(64) A. L. O. says: We have been troubled with the bad working of our furnaces. It is impossible to keep one room comfortable. If we opened two registers, a cold stream would rush down one, while a feeble current of warm air would be coming up the other, and *vice versa*. The weather was very cold, accompanied with a high wind from the north and west. What is the remedy? A. When the air is heated in your furnace, it expands and produces a pressure; the register being open, it finds less resistance in the rarefied air of the rooms than in the dense cold air at the mouth of the cold air box; it therefore rushes out of the registers into the rooms, displacing the air in the rooms by driving it out through the joints and crevices or the doors, windows, etc. Now, if it is supplied to two rooms on opposite sides of the house, when the wind is blowing upon one side it interposes a certain pressure from without upon the joints and crevices, and so prevents the air in the room upon that side from being displaced. The result is that, the usual outlet being closed, no warm air can be forced into the room; but on the leeward side, the pressure from without being entirely removed, the warm air enters with increased rapidity. This difficulty might be alleviated by providing weather strips on your doors and windows, and by ventilating by your chimney flue, having a weather cowl upon the top of it.

(65) J. Y. asks: What is a good architectural book, with plans, specifications, and elevations? A. Woodward's "National Architect" fulfils the conditions you require. "Wooden and Brick Buildings" is a more extensive and later work, but does not include specifications. You can probably obtain both or either by addressing A. J. Bicknell & Co., No. 27 Warren street, N. Y.

(66) W. B. M. asks: I have a 5½ x 8 inches vertical engine; at what speed ought it to drive a boat 38 feet in length by 7 feet 4 inches beam? Would this boat be rightly proportioned for that size of engine? Would a vertical boiler 6 feet high by 30 inches in diameter, with 33 two inch tubes, 4 feet *long*, be of proper size for engine? Would a screw propeller, 36 inches in *diameter*, of 5 feet pitch, be proportioned to the above? A. The boiler is rather small, and the other proportions are very fair. You should realize a speed of 6 miles an hour.

By what chemicals can you detect the presence of carbonate of lime in water? A. Add lime water, which will precipitate carbonate of lime, giving the water under test a milky appearance.

(67) R. H. M. asks: 1. How long must my rafters be for a house 16 feet wide, to have a Gothic pitch? A. There is no set pitch of roof in the Gothic style of architecture. The pitch is generally steeper than in the other styles. 2. What is half Gothic pitch? A. The term is evidently a provincial one among builders. 3. How much must I raise the roof in the center so that it will be a Gothic pitch? A. Make the length of your rafter equal to the width of your house, and you will have a pitch that will be suitable for the Gothic style.

(68) W. H. S. says: In a trunk or flume are placed four 20 inch turbine water wheels, 7 feet apart, the whole being under a head of 33 feet. The power drives at present a 29½ feet overshot water wheel, 3 feet wide in the clear. Can I derive more power by using the water on 4 wheels than I could by applying it all to one wheel at the bottom of flume, the wheel being also 20 inches in diameter? Could I in either case obtain more power than I can with an overshot wheel? A. If you have a good overshot wheel, we do not think you will gain any material advantage by making such a change.

(69) F. M. R. asks: Given 1,000 cubic feet of atmospheric air at a temperature of 30° Fah., how much in volume would it be increased if heated 20°, and again by steps of 20° each to 250° Fah.? A. It can be determined by the following rule: Let p=pressure of air at temperature 32°, v=volume of air at temperature 32°, P=pressure of air at temperature T, V=volume of air at temperature T. Then $P \times V = p \times v \times [1+(T-32) \times 0{\cdot}0020276]$. If T is greater than 32 the *plus* sign is to be used, and the *minus* sign is to be taken when T is less than 32.

(70) M. H. T. & Co. ask: 1. Does it impair the strength of an iron chain to galvanize it? A. No. 2. Does it impair the strength of hooks to galvanize them? A. No. 3. We make hooks in two ways: Out of round iron, pointed and bent to shape, and out of square iron, drawn and bent to form the eye, then welding the ends of iron together, and bending to shape. Which is the best way to make them for strength? And which would you prefer to use, a hook made entirely by hand or one made under a trip hammer? A. We think these two questions could be better decided by experiment.

Does air from over salt water rust metals more than air from over fresh water? A. Yes.

(71) H. E. W. asks: What is the best method to kill the sound or echo in a hall or church? A. On p. 356, vol. 29, you will find an illustrated article on this subject, and on p. 324, vol. 30, there is a communication from Mr. J. M. Allen, of Hartford, Conn., which gives a careful statement of experiments, resulting in the discovery of a successful remedy for the echo in churches.

(72) J. H. L. J. asks: What is the reason that Portland or Roman cement cannot be made to answer the purpose of so many worthless compositions for a good roof? A. The reason is to be found partly in the unstable nature of the boarding upon which roof coverings are usually laid, and partly in the friable nature of the cement itself, which is not impervious to water unless laid in large blocks, impracticable for roofing generally.

(73) W. M. B. says, in reply to D. S. C.'s query as to discoloration of aniline: The darkening of the aniline is due to the turpentine in the varnish. I have been experimenting on these most fugacious colors. If some one will tell me of a varnish that will not kill aniline red, I will make my fortune.

(74) C. W. J. says: The upper rock being the runner (the weight being the same when at rest as when in motion) why is it that the runner is more easily raised by the regulating screw when the mill is in motion? This question may appear to you as absurd, but I have failed to convince an opponent that gravitation is not destroyed by motion, and that any speed may be given the runner in question without its being lifted, in consequence of speed, from the spindle MPS. rests. A. We would like to be assured that it is a fact before attempting to explain it. If you have ever made any experiments to verify it please send us a record.

(75) H. M. W. says, in reply to I. G. S.'s query as to cracks in the skin: A good application is: Tincture aloes ½ drachm, glycerin 4 ozs. The alcohol should be evaporated from the tincture before mixing.

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

A. A. D.—It is a variety of clay. The whitewash can hardly be as durable as if made of lime. —J. J. N.—If the specimen referred to was in a small round box, it is yellow hematite, an ore of iron.—E. L. C.—It is a fine earth, apparently of infusorial origin.—G. D.—They are andalusite, composed of silicate of alumina, found in many places in the United States.—J. F.—It is a variety of indurated clay, not especially valuable.—W. H. O.—No. 1 is impure hydrated sesquioxide of iron, with silex and alumina. It is not worth assaying. No. 2 is blue clay, and exists in great quantities in many localities.—C. N. G.—Your description is too incomplete to enable us to identify the specimen. —J. M.—It is galena or sulphuret of lead.—F. M. J. —It is decomposed mica.—J. H. S.—It is quartz containing some silicate of copper or chrysocolla. —C. W. McC.—Nos. 1 and 3 are water-worn siliceous pebbles. No. 2 is ferruginous quartz. No. 4 is water-worn silex. No. 5 is pink quartz. No. 6 is blue quartz. No. 7 is drusy quartz.—J. W.—Ordinary spelter is cast zinc. One of the specimens consists of copper and zinc. The black powder is black oxide of copper, formed by oxidation aided by heat. Your plan of cleansing is good.—U. H. —It is sulphuret of iron, and is injurious rather than otherwise to the coal.—V. P. E.—It is green mica, along with iron pyrites. It is of no value. —A. O. F.—It is white quartz with scales of mica. No metal.—C. H. G.—No. 1 is clay containing hydrated sesquioxide of iron. No. 2 is silicate of alumina with silex. No. 3 is arenaceous sand rock. No. 4 is magnetic iron sand. No. 3 is clay with anhydrous oxide of iron. No. 6 is a gold-bearing quartz.

C. asks: 1. What is the weight of the 20 inch gun that was made some years since, at Pittsburgh, I believe? 2. What do the 15 inch guns weigh?—A. H. asks: What is the best way of preparing burnt cork for the face, for theatrical purposes, so that it will easily rub off?—P. A. K. asks: Who got up the first railroad sleeping car, and put it into practical use, and when?—T. H. R. asks: Can you tell me of a cure for kleptomania in a child?—W. G. A. asks: What is the deepest penetration, by the best shot guns that are made, with No. 4 shot, in a white pine board at 35 yards range?—L. C. asks: What is the capacity of the largest flouring mill in the United States?—A. M. M. says: I notice in your issue of January 1 an article on the weight that the threads on ⅜, ½, and ¾ inch wrought iron pipe will sustain. Can any one tell me the weights that different sizes from ⅛ inch pipe to 10 inch pipe will sustain?

COMMUNICATIONS RECEIVED.

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

On Cold Vapor. By R. M. O.
On Crime Cure. By F. S.
On Acadie. By A. A. B.
On Railway Signals. By L. S. W.
On Home Science. By J. J. B.
On Precession. By J. H.
On Belts. By T. F. B.
On a Centennial Problem. By J. L. A.
On Trisecting an Angle. By E. C.
On Life-Saving Appliances. By H. R.
On Bees. By L. E. C.
On the Etheric Force. By J. R.
On Vaccine Virus. By B.
On Dullness of Trade. By B. M.
On Some Electrical Experiments. By M. B.
On Boiling Down. By C. J. T.
On Raising Sheep. By H. G. O.
On Snowfalls in Colorado. By S. H.

Also inquiries and answers from the following:

S. W.—S.—A. O. W.—H. S.—S. P. B.—J. W. S.—A. S —C. T. S.—E. L. C.—G. S.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who does photo-lithography and heliotypy? Whose is the best steam threshing machinery? Who makes traction engines in America? Who makes small ice machines? Who puts up lightning rods? Who makes loom shuttles? Who sells tools for marking wood rules? Who makes gutta percha plates for electrical machines? Who makes lathes for turning curtain rollers, etc.?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

December 28, 1875.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Annunciator, electric, E. Gray (r)	6,825
Anti-incrustation compound, A. Chavasse	171,599
Atomizer, H. R. Spencer	171,637
Bale band tightener, cotton, S. H. Gilman	171,560
Barrel heater, cooper's, W. N. Moore	171,489
Belt, power, S. M. Clark	171,505
Blind slats, forming ends for, S. M. Sherman	171,535
Blind stiles, boring, J. Boe	171,546
Bolts, dressing heads of, etc., W. E. Ward	171,493
Boot, W. Biddle	171,498
Boot-sewing machine, Keats *et al*	171,622
Boot wood shanks, making, W. N. Sprague (r)	6,828
Bridle bit, J. Stanley	171,587
Brush, dust, L. A. Stoll	171,488
Buckle, W. E. Aston	171,543
Bungs, turning, E. Gunther	171,511, 171,512
Burner, lamp, F. A. Taber	171,638
Butter, preserving, F. H. L. C. Sace	171,532
Cabinet, business, Ransom and Peugh	171,530
Car-brakes, operating, J. Kirby	171,504
Car coupling, H. W. Chase	171,591
Car, refrigerator, A. Thomas	171,491
Car, refrigerator, J. Turner	171,611
Car ventilator, G. F. Godley	171,581
Cars, runner for railroad, L. O. Root	171,539
Cartridge belt, D. Taylor	171,639
Chairs, book supports to, F. P. Musser	171,528
Chair head rest, dental, E. T. Starr	171,584
Cigar cutter, J. Shepard	171,583
Clock striking mechanism, A. Schmidt	171,496
Clock lock work, R. T. Andrews	171,586
Collar ends, etc., pasting, C. Spofford	6,827
Compass, mariner's, E. S. Ritchie (r)	171,606
Cork stopper, J. I. Flanagen	171,593
Cultivator, J. W. Chase	171,501
Door screen, A. A. Carter	171,549
Door spring, A. B. Chatfield	171,523
Drying wheel, steam, Medbery *et al*	171,629
Engine, rotary, C. H. Kurtz	171,573
Engine, rotary steam, C. W. Floeckher	171,576
Engine valve gear, steam, C. H. Breed	171,500
Excavator, locomotive earth, A. Hawley	171,564
Fabrics, measuring, S. C. Talcott (r)	6,829
Fats, rendering, H. Halvorson	171,613
Feather renovator, Ballard and Wirt	171,544
Feed water apparatus, B. W. Felthousen	171,603
Felly joint clip, D. T. Bowerman	171,547
Fence, flood, E. C. Huffaker	171,567
Filter, T. R. Sinclaire	171,635
Fire arms shell extractor, O. F. Cole	171,506
Fire extinguisher, S. S. Newton	171,628
Fireplace, D. Hayes	171,565
Fireplace heater, W. D. Guseman	171,612
Firemen, helmet for, J. E. Spear, Jr	171,636
Flour bolt, W. J. Merritt	171,525
Fruit picker, J. Mooney	171,482
Furnace, steam boiler, C. E. Robinson	171,632
Game tables, waiter for, G. W. Marble	171,624
Gas generator, W. McKnight	171,578
Gas machine, T. B. Fogarty	171,607
Gas stove, H. D. Hawley	171,617
Gate, farm, W. J. Hollis	171,478
Globe stand, E. G. Durant	171,472
Gold washer, J. S. Calvert	171,597
Grain binder, J. F. Appleby	171,465
Hay loader, G. E. and A. S. Peck	171,484
Heel-polishing machine, Joint and Dunham	171,515
Hook, snap, J. B. Tainter	171,590
Horseshoe, A. Moffit	171,626
Horseshoe and swage, S. N. Stephenson	171,588
Hydrant, S. Blackie	171,499
Implement, combined, L. Schaeffer	171,487
Indicator, station, J. P. Rhoades	171,531
Kiln, brick, A. Morand	171,627
Kiln, firebrick, W. T. Christy	171,600
Knitting machine, C. J. Appleton	171,466
Lamp, A. French	171,608
Lamp, C. F. Spencer	171,537
Lamp, G. M. Stevens	171,540
Lamps, lighting street, Faloon and Isminger	171,555
Lance, bomb, P. Cunningham	171,553
Land, leveling, T. R. Lowe	171,522
Leather-rolling machine, Linsley *et al*	171,574
Letter file cabinet, W. A. Amberg	171,495
Letter sheet and envelope, R. W. Barnes	171,497
Lime kiln, Brockman and Stueve	171,468
Locomotive signal light, A. Dick (r)	6,823
Loom, fringe, C. R. Saatweber	171,582
Loom picker fastening, L. J. Labounty	171,520
Loom shuttle box, I. G. Chandler	171,598
Looms, warp beam apron for, L. J. Labounty	171,519
Lubricating compounds, H. V. P. Draper, 171,508,	171,509
Mail bag, G. O. Clark	171,469
Mat, table, C. Weber (r)	6,830
Mattress and bedstead, J. J. Bowen	171,596
Mechanical movement, G. Juengst	171,572
Mining machine, A. Crombie	171,470
Needle, sailmaker's, H. M. Jenkins	171,620
Organ attachment, reed, H. R. Moore	171,527
Padlock, G. R. Cutbirth	171,471
Pan, frying, B. Morahan	171,580
Paper box machine, R. Grimm	171,476
Paper collars, cutting, H. J. Medbery	171,524
Paper cop tube, J. McCausland	171,577
Pavement, W. W. Hubbell (r)	6,826
Pavement, wood, S. Houston	171,619
Pegging machines, L. Goddu	171,609, 171,610
Photographic head rest, J. J. Hayes	171,614
Picture and letter block, J. Dennis, Jr	171,507
Picture exhibitor, L. H. Sheppard	171,585
Pin, safety, N. M. Phillips	171,529
Pipes, etc., package for tobacco, I. Demuth	171,554
Planing machine, Frank and Spire	171,510
Planing machine, L. Houston	171,480
Plow, A. Hall	171,477
Plow jointer, H. Gale (r)	6,824
Plow, steam, B. S. Benson	171,595
Potato masher, R. Crane, Jr	171,603
Pots, strainer for coffee, R. E. Clark	171,601
Press, cider, L. O. Rockwood	171,633
Printing press register, Schofield and Baker	171,534
Pulley, Betts and Howie (r)	6,822
Pulmonary diseases, remedy for, J. O. Slemmons	171,536
Pump, W. Barnes	171,545
Pump, double-acting, H. Van Doren	171,592
Pump piston, force, G. W. Gilmore	171,475
Purifier, middlings, A. Crabtree	171,551
Purifier, middlings, J. L. Williford	171,542
Railroad bulletin box, W. T. Jacoby	171,571
Railroad switch, S. E. Linton	171,575
Rice hulling machine, J. Jouet	171,516
Roller and marker, land, J. M. and G. R. Hunter	171,569
Sash holder, H. T. Milchsack	171,526
Sausage machine, H. P. Rankin	171,631
Saw mill head block, S. White	171,494
Saw teeth, circular, A. F. Dimond	171,604
Seeder yielding teeth, etc., C. P. Hewett	171,566
Separator, seed, Catchpole and Stidolph	171,502
Sewing machines, J. E. A. Gibbs, 171,557, 171,558,	171,559
Sewing machine, A. Pioss	171,483
Sewing machine needle, H. M. Jenkins	171,621
Signaling device, H. Kinnersley	171,517
Skirt adjuster, A. S. Gear	171,474
Snow-melting machine, J. Cody	171,602
Soldering apparatus, L. McMurray	171,625
Spark arrester, D. Allard	171,594
Spike, G. N. Sanders	171,484
Stones, gathering, M. Miller	171,579
Stove, S. Wood	171,640
Stove gas, M. Q. Hawley	171,617
Stove grate, G. R. Moore	171,483
Stove polish, C. E. Teets	171,490
Straw cutter, J. Grimm	171,562
Table leaf support, D. Jackson	171,570
Table met, C. Weber (r)	6,830
Thrasher and huller, clover, G. J. Utendorf	171,492
Tobacco curer, J. C. Millner	171,481
Toy building block, L. Schmetzer	171,533
Trunk, J. A. House	171,6 8
Truss pad, I. N. Foote	171,473
Twisting machine, J. Capstack	171,548
Umbrella stand, C. A. Laurence	171,521
Under garment, L. P. Bonney	171,467
Velocipede, G. W. Marble	171,623
Veneering, wood for, Spurr & Prang	171,538
Violins, chin rest for, H. W. White	171,541
Wash board, L. M. Crosby	171,552
Washboard, A. J. Hull	171,568
Washing machine, W. Goforth	171,561
Washing machine, D. Louis	171,576
Water closet valve, J. P. Hyde	171,514
Wells, petroleum, W. L. Hardison	171,563, 171,615
Wells, constructing, C. Holtz	171,513
Wells, packer for oil, W. L. Hardison	171,616
Wells, packer for oil, L. Stewart	171,589
Windmill, A. T. Page	171,630
Windmill, W. F. Veber	171,593
Window, J. A. Holmes	171,479
Wire rope, F. W. Roebling	171,634
Wrench, screw, J. H. Coes	171,550

DESIGNS PATENTED.

8,866.—GLASS SHADES.—T. B. Atterbury, Pittsburgh, Pa.

8,867.—BAND COMBS.—F. Britton, New York, city.

8,868, 8,869.—INKSTANDS.—B. Brower, New York city.

8,870.—INKSTAND BASE.—J. V. Brower, New York city.

8,871.—BEAD.—S. Cottle, New York city.

8,872.—BAND COMBS.—E. M. Drake, New York city.

8,873.—FLAG.—W. A. Duff, Philadelphia, Pa.

8,874, 8,875.—CARPETS.—H. F. Goetze, Boston, Mass.

8,876.—PRINTING SILK, ETC.—S. Huber, Philadelphia, Pa.

8,877.—PICTURE FRAME.—R. Minshull, Pittsburgh, Pa.

8,878.—BREASTPIN.—S. Pfaelzer, Philadelphia, Pa.

8,879.—STATUARY.—J. Rogers, New York city.

8,880.—CIGAR LIGHTERS.—F. R. Seidensticker, West Meriden, Conn.

8,881.—SODA APPARATUS.—F. H. Shepherd, Boston, Mass.

8,882.—COFFIN HANDLES.—W. M. Smith, West Meriden Conn.

8,883.—CARPETS.—T. J. Stearns, Boston, Mass.

SCHEDULE OF PATENT FEES.

On each Caveat	$10
On each Trade mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On application for Design (7 years)	$15
On application or Design (14 years)	$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, December 23, 1875

5,529.—E. P. Richardson, Lawrence, Mass., U. S. Pegging machine. Dec. 23, 1875.

5,530.—G. W. Kennedy, Hatley Township, P. Q. Combination stove heater. Dec. 23, 1875.

5,531.—F. B. H. Saxton *et al*, Strathroy, Ont. Seed, corn and bean planter. Dec. 23, 1875.

5,532.—J. C. Smith, Dunkirk, N. Y., U. S. Manufacturing paint. Dec. 23, 1875.

5,533.—W. Dorr, Gardner, Me., U. S. Railway car coupling. Dec. 23, 1875.

5,534.—S. R. Marsh *et al*., Brasher Falls, N. Y., U. S. Cattle stall. Dec. 23, 1875.

5,535.—R. O. Paterson *et al*., Cheltenham, England. Process for obtaining salts of ammonia. Dec. 23, 1875.

Advertisements

Back Page - - - - - - $1.00 a line.
Inside Page - - - - - - 75 cents 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 Friday morning to appear in next issue.

"Platform" Clothes Wringers.

A Wash-bench, provided with Standards that support the rolls, is covered by a lever platform. The weight of tub and water makes ample pressure for wringing. Perfectly self-adjusting. Runs easy. Embraced in patents issued to J. R. DUGDALE, of Whitewater, Indiana. Send for circulars.



RAPID

ADDITION!

Wonderful Invention!

A RT of Adding Figures from Left to Right: or from Middle either way: or Six Columns at one time! Done as Quick as Thought! Sent to any

Address on receipt of Price, 50 Cents.

Agents Wanted WILLIAM FURNISS,
Post Office Box 1,149 Batavia, N. Y.

A Rare Chance FOR Advertisers!

☞ THE FIRST EDITION OF

Wrinkles and Recipes

being nearly exhausted, a second edition will shortly be issued. A limited number of advertisements will be received for insertion in all copies printed during the Centennial year. The rapid sale of the first edition, and the immense demand which now exists for the book, enable the Publisher to assure advertisers of a wide circulation, as well as a permanent and lasting value to their announcements.

☞ Terms $30 per page; $20 per half page. Immediate attention is necessary to secure space.

Address H. N. MUNN, Publisher,
P. O. Box 772. 37 Park Row, New York.

IRON BRIDGE BUILDING—A complete description, with dimensions, working drawings, and perspectives of Girard Avenue Bridge, Philadelphia, Pa. With foundations of piers. Ten engravings. Price 30 cents. Contained in Nos. 1, 2, and 4 of SCIENTIFIC AMERICAN SUPPLEMENT. 10 cents per copy. To be had at this office, and of all news agents.



NONPAREIL

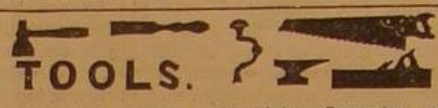
FARM AND FEED MILLS.

Bone, Drug, and Spice Mills. 10 sizes for Hand or Power. Conical French Burr Stone Flouring and Corn Mills. Illust'd Pamphlet free. Address, L. J. MILLER, 181 E. Front St., Cincinnati, O.

THE BEST HEATER IN USE.

"Over eleven years ago, I had one of your Gothic Furnaces placed in my house, situated on high ground, near the Capitol on State St., Albany, N. Y. It has done more than I expected, warming my house, which is 25x60, and 4 stories above the basement. I have had no repairs except a grate." GEO. S. WEAVER,
162 State St., Albany, N. Y.

To ALEX. M. LESLEY, 286 West 23d St., New York, who will send Catalogues by request. Special rates given for churches.



TOOLS.

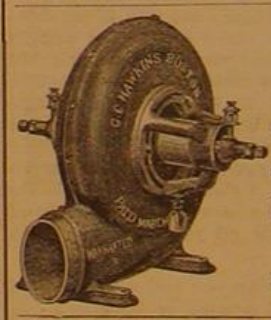
Of all kinds for Amateurs, Machinists, Carpenters, and all classes of Mechanics. Illustrated Catalogue free to any address. GOODNOW & WIGHTMAN,
23 Cornhill, Boston, Mass.

VISES.

IMPROVED, CHILLED-BEAM. Warranted Superior to any in the market. A Standard for strength, weight, durability, and cheapness.

JAW.	WEIGHT.	PRICE.	JAW.	WEIGHT.	PRICE.
2 inch	15 lbs.	$3.50	5 inch	80 lbs.	$12.50
3 "	30 "	$6.00	6 "	125 "	$17.00
4 "	45 "	$8.00	7 "	200 "	$22.50

Liberal discount for wholesale orders.
Address, for circulars, H. B. SMITH,
Manufacturer of all kinds of Wood-Working Machinery, &c., Smithville, Burlington Co., N. J.
See description, page 54, Jan. 22, 1876.



Blowers

FOR

All Purposes

The CHEAPEST and BEST now in use. ALL WARRANTED. EXETER MACHINE WORKS, Sole Makers, 140 Congress St, Boston, Mass.

ON THE CAUSES OF KNOCKING IN HIGH PRESSURE ENGINES. By Joshua Rose. With Nine Engravings. A valuable practical treatise. Price 20 cents. Contained in Nos. 1 and 2 of "Scientific American Supplement," to be had at this office, and of all news agents.

SCIENCE RECORD For 1876.



SCIENCE RECORD is a splendid book of 600 pages, published annually, about the 15th of January. Illustrated with many engravings. Price $2.50.

THE Volume for 1876 will be published about January 15th. Its contents will embrace the most Interesting Facts and Discoveries in the various Arts and Sciences that have transpired during the preceding year, exhibiting in one view the General Progress of the World the following Departments:

CHEMISTRY AND METALLURGY,
MECHANICS AND ENGINEERING,
ELECTRICITY, LIGHT, HEAT, SOUND,
TECHNOLOGY, THE USEFUL ARTS,
BOTANY AND HORTICULTURE
AGRICULTURE,
RURAL AND HOUSEHOLD ECONOMY,
MATERIA MEDICA, THERAPEUTICS, HYGIENE,
NATURAL HISTORY AND ZOOLOGY,
METEOROLOGY, TERRESTRIAL PHYSICS,
GEOGRAPHY,
GEOLOGY AND MINERALOGY,
ASTRONOMY,
BIOGRAPHY AND NECROLOGY.

Every person who desires to be well informed concerning the Progress of the Arts and Sciences should have a copy of SCIENCE RECORD for 1876. It will be a most Interesting and Valuable Book, and should have a place in every Household and Library.

600 pages Octavo. Handsomely Bound. Many Engravings. Price $2.50. Sent, post-paid, on receipt of price.

All the preceding volumes of SCIENCE RECORD may be had separately at $2.50 each, or $10 for the five volumes, 1872, 1873, 1874, 1875, and 1876.

MUNN & CO., PUBLISHERS,
37 Park Row,
New York city.

COMMON SENSE CHAIRS AND ROCKERS—Quaker Sewing, Union Arm, Old Puritan and Old Point Comfort Rockers. Unequaled for style, comfort finish and durability. Send for Illustrated Price-List to F. A. SINCLAIR, Mottville, Onondaga Co., N. Y.

FOREIGN PATENTS AND *THE CENTENNIAL.*

There is no doubt that our Centennial Exposition will attract to our shores multitudes of representative people from all parts of the world, and they will take home with them many of our best improvements to introduce into their own manufactures.

An unusual opportunity will be offered for selling to these people such foreign patents as have been secured on good American inventions in the respective countries from which these visitors come.

At the reduced prices for which patents are obtained abroad, our people will lose a chance not likely to occur again, if they do not avail themselves of the opportunity of securing their inventions in foreign countries at once, so as to have their patents ready to negotiate the coming summer.

For cost of patents in the different countries and the conditions on which they are granted, send for pamphlet containing full information.

Address MUNN & CO.,
37 Park Row, New York.
BRANCH OFFICE, cor. F and 7th Sts.,
Washington, D. C.

HOME-MADE TELESCOPES.—Directions for their construction, with engravings showing the proper arrangement of lenses and tubes. By Prof Van Der Weyde. Price 10 cts. Contained in No. 1 of SCIENTIFIC AMERICAN SUPPLEMENT, to be had at this office, and of all news agents.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and Molding, Tenoning, Mortising, Boring, Shaping, Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-Off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty Street New York.

SCREW PROPELLERS, THEIR SHAFTS AND FITTINGS. By Hamilton W. Pendred, M.E. An able treatise, shewing the present practice, its advantages and defects. With 25 figures. Price 10 cents. Contained in No. 4 of SCIENTIFIC AMERICAN SUPPLEMENT. To be had at this office, and of all news agents.

BIG PAY to sell our RUBBER PRINTING STAMPS. Terms free. TAYLOR & HARPER, Cleveland, O.

10 **DECALCOMANIE,** or TRANSFER PICTURES, with book of 24 pp., giving full instructions in this new and beautiful art, sent post-paid for 10 cts, 100 ass'td pictures, 50 cts. They are Heads, Landscapes, Animals, Birds, Insects, Flowers, Autumn Leaves, Comic Figures, &c. They can be easily transferred to any article so as to imitate the most beautiful painting. Also, 5 beautiful GEM CHROMOS for 10 cts.; 50 for 50 cts. Agents wanted. Address J. L. PATTEN & CO., 162 William Street, New York.

DO YOU WANT MONEY Male or female. Send your address and get something that will bring you in honorably over $150 a month sure. **Inventor's Union,** 173 Greenwich Street, New York.

FOR SALE, IN ROCKVILLE, IND.—Foundry and Machine Shops, Tools and Machinery, which are running on full time. Price $8,000. Address ISAAC Mc FADDIN, Rockville, Park Co., Ind.

COAL.—A grand opportunity for Capitalists—An extensive Coal Mine for Sale in the West. For further particulars, address DEP. P. M., OCATE, New Mexico.

ELLIPTICAL GEARING. By Prof. C. W. MacCord, of the Stevens Institute of Technology. With Eight Engravings. A most clear and excellent exposition of the subject. Price 10 cents. Contained in "Scientific American Supplement," No. 2. To be had at this office, and of all news agents.

FOR SALE—THE MACHINERY, BELTING, Shafting, etc., in the Factory of the Cleveland Furniture Co., No. 99 Scranton ave., Cleveland, O., consisting of planers, shapers, stickers, band saws, scroll saws, ripping, cutting-off and squaring-up saws, lathe, boring, tenoning, doweling machines, blower, etc., with line shafting, counter shafting and belting, steam holster, etc., comprising a complete assortment of wood-working machinery, and in first class condition; with lease of steam and steam power, dry house and yard room, railroad track facilities and stock of black walnut and hardwood lumber.

Address communications and proposals to C. M. VORCE, Assignee,
4 Rouse Block, Cleveland, O.

FOR SALE, LOW—One 40 H.P. Hor. Engine and Ret. Flue Boiler, 6 8in. large steam dome. One 30 H.P. Beam Engine and Boilers. One 40 H.P. Novelty Iron Works Eng. and Two Cy. Boiler. Twin Engines 16x36 and Two Ret. Flue Boilers. One Upright Boiler, 12 ft. high, 54 in. dia. One Tug Boat Boiler, 70 H.P. All Boilers sold under State or Hartford Ins. Co. inspection. T. SHANKS, Shanks' Building, Baltimore, Md.

Horse Shoe Nails.

The undersigned desire to improve their Machinery for the Manufacture of Horse Shoe Nails by use of a Pointing Machine, and to arrange with competent, reliable, and experienced machinists to take the works, when complete, and manufacture nails on a guarantee of quality and price. Undersigned will furnish Room, Power, Machinery, Iron and Coal, and take the product of the works. Proposition for machinery and the manufacture of the nails solicited. Parties proposing to manufacture will require sufficient capital to pay labor and incidental expenses. We also solicit correspondence with parties having patented articles pertaining to the Hardware Trade, and desiring them manufactured, on royalty or otherwise. For further information, address PRATT & CO., Buffalo, N. Y.

WHIPPLE'S Patent Door Knob.

Awarded a Bronze Medal at the American Institute Fair for 1874. The Judges say: "We consider this method of fastening DOOR KNOBS a great improvement over anything yet invented for the purpose, as it obviates the use of side screws and washers, and can be regulated to suit any thickness of Doors." Send for Circular.

THE PARKER & WHIPPLE COMPANY,
West Meriden, Conn., or 97 Chambers St. N. Y.

Established in 1853.

LOVEJOY, SON & CO.,

ELECTROTYPERS and STEREOTYPERS,

15 Vandewater Street, New York.

BOILER MAKERS' MACHINERY.

Wanted, new or good second hand, Power Shears, Punch, and Bending Rolls. Send photo and price to Box 1653, Portsmouth, N. H.

$5 to $20 per day at home. Samples worth $1 free. STINSON & Co., Portland, Maine.

BARGAINS IN MACHINERY,
New and Second Hand.

MACHINE TOOLS.

Planer, 12 ft. x36 in. x32 in., $800; Planer 11 ft. x30 in. sq., $700; Planer 8 ft. x15 in. sq., $340; Crank Planer, 3 ft. bed, 14 in. stroke, 16x18, $325; 24 in. Putnam Gear Cutter, $500; 24 in. combined Gear Cutter and Milling Machine, new, $450; Heavy Milling Machine, new, $297; Upright 52 in. Drill, $345; Upright 36 in. Drill, $250; Upright Spinner, 5 in. stroke, $80; Large Power Press, $400; No. 4 Morrell Press, $197; Taft Improved Press, $145; 8 ft. x44 in. Pulley Chucking Lathe, $225; Large Power Press, $200; No. 4 Wiley Bolt Cutter and Driller, $170; Heivse or Trip Hammer, $90; Back-geared screw-cutting Engine Lathes, as follows: New 25 ft. bed by 36 in. swing, $1,500; 16 ft. x 31 in., $650; 16 ft. x34 in., $660; 15½ ft. x30 in. $600; 12½ ft. x30 in., $500; 12 ft. x24 in., $465; 15 ft. x30 in., $460; 8 ft. x17 in., $240; 6 ft. x15 in., $220; 8 ft. x17 in., $225; 6 ft. x18 in., $217; 6 ft. x15 in., $180; 5 ft. x14 in., $165; 5 ft. x18 in., $125. Not screw-cutting: 16 ft. x24 in., $240; 15 ft. x 20 in., double head, $350; 16 ft. x20 in., double head, $260; 11 ft. x12 in., double head, $155; 8 ft. x17 in., $215; 5 ft. x 8 in., $95; 4 ft. x9 in., new, $150, speed of Drill Lathes, 5, new, 6 ft. x12 in., each $75; 6 ft. x14 in., $90; 6 ft. x13 in., $90; 5 ft. x18 in., $75; 2 ft. x9 in., with sliding rest, $55; New Chucks, 24 in. 4 jawed Omelda Chuck, $185; 13 in. 3 jawed, ditto, $90; 12 in. 3 jawed ditto, $42; Japanning Oven, $20

PORTABLE AND STATIONARY ENGINES AND BOILERS.

30 h.p. horizontal Engine $1,000; 50 h.p. upright Engine, "Chubbuck's," $1,000; 80 h.p. hor. Boiler, $1,000; 4 Locomotive, new box Boilers, each $450; 45 h.p. hor. Boiler, $700; 2—60 h.p. hor. 2 flue Boilers, each $425; 50 ft. 20 in. smoke stack, $70; 40 horse power horizontal Engine, $740; 40 horse power upright Engine, $700; 35 horse power Hoadley Portable Engine, $1,450; 35 h.p. Hoadley Portable Engine, $1,400; 25 h.p. hor. Engine, $625; 30 h.p. Portable Engine, $1,250; 25 h.p. sta. Engine, with 30 h.p. upright Boiler, $600; 20 horse power Portable, $1,425; 25 horse power Portable, $1,300; 25 horse power Portable $1,325; 25 h.p. Portable Engine, $820; 25 h.p. hor. Engine, $825; 25 h.p. sta. hor. Engine, with 30 h.p. upright Boiler, $1,000; 20 h.p. upright Boiler, $300; 20 h.p. upright Boiler, $225; 18 h.p. Hoadley Portable Engine, $925; 18 h.p. Portable Engine (same as new), $850; 15 h.p. sta. hor. Engine, $500; 16 h.p. hor. Portable Boiler on Wheels, $——; 13 h.p. Portable Hoisting Engine and Boiler, $580; 10 h.p. upright Boiler, $176; 8 h.p. hor. Engine and upright Boiler, $480; 7 h.p. new Hot Air or Caloric Engine, $640; 6 h.p. Portable Engine, $460; 5 h.p. upright Engine and Boiler, with lot shafting, pulleys, etc., $430; 5 h.p. upright Engine and Boiler, $275; with same wood-sawing arrangement $30 additional; 3 h.p. Caloric Engine, $225; 1½ h.p. Portable, new, $195; 2½ h.p. Engine and Boiler, $250; 2½ h.p. hor. Boiler, $70.

PORTABLE ENGINES AND CIRCULAR SAW MILLS.

35 h.p. Portable Engine, right hand Lane mill throughout, 30 ft. carriage, Emerson 52 in. saw, 48 in. saw, 120 ft 15 in. belting, shafting, pulleys, etc., all complete, Price $2,300; 35 h.p. Portable Engine, right hand circular saw mill, Lane Set Works, 48 ft. carriage, 72 in. Emerson saw, 44 in. solid saw, 90 ft 12 in. belting, 50 ft. 8 in. belting, shafting, pulleys, hangers, cut-off saw, saw gummer, etc., good order, Price $2,230; 18 h.p. Portable Engine, Circular Saw mill right hand, 37 ft. carriage, patent set works, Flint Frost Dog, 56 in. Emerson saw, 46 in. solid saw, 55 ft. 12 in. belting, small belts, cut-off saw and arbor, etc. All in good order, little worn, Price $1,750. 20 h.p. Portable Engine, Circular Saw Mill, left hand, 30 ft. carriage, Beard Patent Set Works, new 54 in. Hoe chise'-toothed saw, 50 ft. 12 in. belt, small belts, all complete, good repair, Price $1,850. With same, job to saw 500 to 700 M. feet lumber, at $2.50 per M., without moving, if desired.

SAW MILL AND WOOD-WORKING MACHINERY.

Circular Saw Mill, saws, carriage, set works, belting, drawing-in rope, etc., $575; Stanton right hand Set Works, new, $80; Stanton left hand Set Works, new, $80; 1 up and down Saw Mill, complete with carriage and 2—24 inch Whitney water wheels on one shaft, $300; Perry Shingle Mill, 36 in. saw and jointer, $155; Shingle Mill and jointer, $90; Shingle Mill and jointer, $60; Iron frame gang Lath Machine, 3 saws, $185; Clapboard Machine and sapper, $120; Baldwin Wood Lathe, hollow auger style, $210; 30 in. double-belted rotary bed Planer, new, extra heavy, $650; 26 in. rotary bed Planer, $240; 26 rotary bed Planer, new, $255; 24 in. rotary bed Planer, new, $190; No. 3 N. S. Ball make, Woodworth Planer and Matcher, new, $1,000; No. 0 Ball make, Woodworth Planer and Matcher, new, $760; No. 2½ O. S. Ball make, new, Woodworth Planer and Matcher, $840; Ball make, Woodworth Surfacer, new, 24 in., $345; New Excelsior Planer and Matcher, Ball's, $400; 18 in. Planer, $90; 24 in. Planer, $80; Power Matching and Jointing Machine, $150; 28 ft. (with 20 ft. extension) Daniels Planer, 28 in. between posts, $175; 8 ft. Daniels Planer, 24 in. wide, $150; 8 in. Buzz Planer, new, $75; No. 1½ Davis Dovetailing Machine, $180; Andrews box board Sawing Machine, 42 in. saw, same as new, $420; Box board Matcher, new, $65; Cylinder Saw Stave Machine, saw 11x19, $70; New Cylinder Stave Saw Machine, $75; Single endless tread Horse Power, with wood-sawing attachments, $45; 2-side Monitor Moulder, Russ patent, Ball's make, new, $525; No. 2 Lee 4-side Moulder, $520; No 2. Rogers 8-side Moulder, $325; New 4-side Iron Frame Moulder, Ball's, $360; New 4-side Iron Frame Sash Moulder, Ball's, $208; Sash and Blind Sticking Machine, $115; No. 2 Smith Mortiser, $135; No. 2 Smith Tenoner, $175; Wood Frame Tenoner, one cope, $80; New Blind Stile Tenoner, Ball's, $80; New Horizontal Boring Machine, Ball's, $80; Smith's Blind Stile Borer, $65; No. 1 scroll Saw, new, $90; Jig Saw, 3 ft. 2 in. between posts, $30; Iron Frame Railway Cut-off Saw, new, $92; Horizontal Cornering or Shaping Machine, new, $45; New Hand Power Machine for scroll sawing, boring and planing, $140; 24 in. Wood Lathe, new, $96; 30 in. Wood Lathe, new, $87; 12 in. Wood Lathe, new, $60; Stretching Machine, 3 chucks, $75; No. 3 Rod and Dowel Machine, $24; Hand Boring Machines, new, Ball's, $6 each; New Boring Shaft and Bits, $16; Paper Knife Grinding Machine, new, $16; Double Emery Arbor and Stand, new, $35. Lot new Steel Saw Arbors, from $10 to $21. Shoe Peg Machinery, as follows: Sawing and Heading Machine, 36 in. saw, $135; Boring Lathe, $25; Bleaching Furnace and Fan, $35; New Steam Dryer and Fixtures, $375; Screen, $37, or all the shoe peg machinery, $550.

CIRCULAR SAWS.

49 in. Hoe Inserted Tooth Saw, $70; 48 in. Emerson Inserted Tooth Saw, $50; 60 in. 6 and 9 gauge, new, Disston Saw, $110; 49 in. Solid Saw, $35; 46 in. Solid Saw, $35; 44 in. Solid Saw, $25; 43 in. Solid Saw, $20; 40 in. Cut-off Saw, $20.

GRIST MILLS.

36 in. and 30 in. Platt Portable Grist Mills, each $210; Old's Portable Grist Mill, $237; Run corn or feed stones, 4½ ft. elevators, etc., $68.

PULLEYS.

Pulleys, bored, turned and finished, 12 ft. x25 in., 4c. lb.; 9 ft. x20 in., 5c. lb.; 6½ ft. x20 in., 4½c. lb.; 5 ft. x25 in., 3½c. lb.; 5 ft. x12 in., 5c. lb.; 4 ft. x10 in., 4½c. lb.; 42 in. x22 in., 5c. lb. About 300 ft. good 4 in. socket and flanged cast iron Pipe and fittings, 3c. lb.

STEAM PUMPS.

No. 4 Guild & Garrison Pump, with fly wheel, $275; No. 4 Blake Pump, $220; No. 2 Knowles Pump, new, $165; No. 2 Wright Pump, new, $155; No. 1 Knowles Pump, $95; No. 0 Wright Pump, $85; No. 2 Knowles Pump, $85; No. 1 Seldon Pump, $80; No. 3 Knowles Pump, $165; No. 2 Blake Pump, $115; No. 3 Blake Pump, $165.

WATER WHEELS,
With Gearing, Shafting, Boxes, etc.

5 ft. Blake, $375; 5 ft. Whitney, $350; 4ft. Blake $195; 3 ft. Whitney, $275.

☞ For printed list, with full description of all above machinery, send us your address, with stamp, stating fully just what machine or machines you want, and where you saw this

S. C. FORSAITH & CO.,
Manchester, N. H.

TO ELECTRO-PLATERS, JEWELERS, AND WATCHMAKERS.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with Books of Instruction for Nickel, Gold, and Silver Plating. THOMAS HALL, Manufacturing Electrician, 16 Bromfield Street, Boston, Mass. Illustrated Catalogue sent free.



CENTENNIAL DRILL CHUCK—Warranted perfect and durable. Holds .64 to 1-2 in. Sent by mail on receipt of price, $4.25. Send for new reduced List of Chucks.

A. F. CUSHMAN,
Hartford, Conn.

IMPROVED MACHINERY for STAVE Heading, Shingle and Handles, Cabinet Maker's Machinery, Bailey Gauge Lathe, Durkee's Automatic Saw Mill (Improved), Key Seat Cutting, Pulley Boring and Milling Machines Radial Drills, Steam Engines, and Bailey's Veneering Machines, Cable and Sheaves for transmitting Power, etc. etc. T. R. BAILEY & VAIL, Lockport, N. Y.

CLARK & COMPANY'S
PATENT SELF-COILING, REVOLVING STEEL SHUTTERS

Can be readily fitted to *Store Fronts*, Rear Windows or other openings, making them FIRE AND BURGLAR PROOF, and affording absolute protection; also, **WOOD SHUTTERS** in various kinds of wood, suitable for Store Fronts, Private Houses, Offices, and School Partitions. Clark's shutters are self-acting, require no machinery or balance weights, and cannot get out of order. They are handsome in appearance, and are the best and cheapest shutters in the world. Are fitted to the new *Tribune* Building, Delaware and Hudson Canal Building, Manhattan Building, Lenox Library Building. Have been for years in daily use in every principal city throughout Europe, and are endorsed by the leading architects of the world.

JAMES G. WILSON, Manager, 218 West 26th St., New York, and at London, Paris, Vienna, Berlin, Melbourne, &c., &c.

AGENTS WANTED.

The TOLL-GATE! Prize Pictures sent free! An ingenious gem! 50 objects to find! Address with stamp, E. C. ABBEY, Buffalo, N. Y.

Brainard Milling Machines all styles and sizes. A new *Universal* Milling Machine for $300. Also Brown's Pat. SCREW MACHINES, and our new *Brainard* STEEL BAR VISE. B. M. M. CO., 131 Milk St., Boston, Mass.

OPIUM and Morphine habit absolutely and speedily cured. Painless; no publicity. Send stamp for particulars. Dr. Carleton, 187 Washington St., Chicago, Ill.

WILLIAM HENRY KING—ALBUMEN MANUFACTURER, 78 & 80 St. Andrew Street, Liverpool, Eng.

Planing & Matching.

Moulding, Re-sawing and Tenoning Machines, Scroll Saws and General Wood-Working Machinery. JOHN B. SCHENCK'S SONS' Matteawan, N. Y. Send for Catalogue. 118 Liberty St., N. Y. city.

PATENT
Planing and Matching

and Moulding Machines, Gray and Wood's Planers, Self-oiling Saw Arbors, and other wood-working machinery. S. A. WOOD'S MACHINE CO., 91 Liberty St., N. Y. Send for Circulars, etc. 107 Sudbury St., Boston.

$250 A MONTH—Agents wanted everywhere. Business honorable and first class. Particulars sent free. Address J. WORTH & CO., St. Louis, Mo.

Friction Pulleys.

For connecting shafting and gearing, BEAN'S PATENT *CLUTCH* is the most effective known, and is furnished for less than any other of merit. We make a specialty of FRICTION-CLUTCH COUNTER-SHAFTS. Our HOISTING ENGINES, with this clutch for Pile Driving, can strike three blows to one of engine usingordinary clutch Hoisting machinery, upon application to

D. FRISBIE & CO., New Haven, Conn.



THE BASTET MAGNETIC ENGINE AND BATTERY, for running Sewing Machines, Dentists' and Jewelers' Lathes, Printing Presses, Pumps, Blowing Parlor and Church Organs, or working any Machinery that can be moved by Hand or Foot. SIMPLE—DURABLE—ECONOMICAL. Local Agents wanted in every town and county. For circulars and price list address, with stamp, THE BASTET MAGNETIC ENGINE CO., 1113 Chestnut Street, Philadelphia, Pa.

PUNCHING AND DROP PRESSES. For the Best and Cheapest, address THE STILES & PARKER PRESS CO., MIDDLETOWN, CONN.

WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa.—The attention of Engineers and Architects is called to our improved Wrought-Iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided. We are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph, address Carnegie Brothers & Co., Union Iron Mills, Pittsburgh, Pa.

NEW & SECOND HAND WOOD WORKING Machinery, Floorers, Planers and Matchers, Single and Double Surfacers, Moulding Machines, Scroll Saws, Suction and Blast Fans for Shavings, etc. D. J. LATTIMORE, 31st and Chestnut St., Philadelphia, Pa.



COMPRESSED AIR MOTIVE POWER.—For particulars of the most recent practice, send 20 cents for SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 1 and 2, containing 5 engravings of the "Compressed Air" Locomotives now in use at St. Gothard Tunnel Works, with dimensions, etc.

ICE BOATS—THEIR CONSTRUCTION AND MANAGEMENT. For working drawings and full particulars, send 10 cents for SCIENTIFIC AMERICAN SUPPLEMENT, No. 1.

PATENT WOOD WORKING MACHINERY

PLANING & MATCHING, MOULDING, MORTISING, TENONING, RESAWING, SHAPING BAND & SCROLL SAWS &c. &c.

J. A. FAY & CO.
CINCINNATI, O.

THE IMPROVED
NIAGARA STEAM PUMP,



91 to 97 *Pearl St., Brooklyn, N. Y.* Agency at 40 John St., New York.

Hubbard & Aller,
SOLE MANUFACTURERS,
ENGINES AND BOILERS,
Pulleys, Shafting and Hangers a Specialty.

The Myers Portable Engine, 4, 5, 6, 8 h.p. Something new. Best for price. Circulars.

SECOND-HAND IRON AND WOOD WORKING MACHINERY.
CHAS. PLACE, 103 Reade Street, New York.

$12 a day at home. Agents wanted. Outfit and terms free. TRUE & CO., Augusta, Maine.



BLAKE'S PATENT
Stone and Ore Breaker
Crushes all hard and brittle substances to any required size. Also, any kind of STONE for ROADS and for CONCRETE, &c. Address BLAKE CRUSHER CO., New Haven, Conn.

ALCOTT LATHES, *for Broom, Rake and Hoe handles.* S. C. HILLS, 51 Cortlandt St., N. Y.

LeCount's Patent MACHINIST'S TOOLS.

Reduced Prices.

Set Iron Dogs,	⅜ to 2 in.		$ 5.60
" " "	⅞ " 4 "		$12.00
" Steel "	⅜ " 2 "		$ 6.30
" " "	⅞ " 4 "		$13.00

Iron & Steel Clamps, Die Dogs, Clamp Dogs, Vice Clamps, Expanding Mandrels, &c. Send for latest Price List to C. W. LE COUNT. South Norwalk, Conn.

A Good Agency Pays just now. Ours is simple, easy, very profitable and unusually respectable, like merchandising. Publications and goods. Not a cent risked. Previous experience unnecessary. Send address (with references) for samples (free), terms, &c., to Publishers of ILLUSTRATED WEEKLY, 11 Dey St., New York.

WITHERBY, RUGG & RICHARDSON, Manufacturers of 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, 26 Salisbury Street, Worcester, Mass. (Shop formerly occupied by R. BALL & CO.)
L. B. WITHERBY. G. J. RUGG. S. M. RICHARDSON.

THE CENTENNIAL INTERNATIONAL EXHIBITION OF 1876.—The full History and Progress of the Exhibition, maps of the grounds, engravings of the buildings, news and accounts of all the most notable objects, are given weekly in the SCIENTIFIC AMERICAN SUPPLEMENT. Terms, $5 for the year; single copies 10 cts. To be had at this office, and of all news agents. All the back numbers, from the commencement on January 1, 1876, can be had. Those who desire to possess a complete and splendid Illustrated Record of the Centennial Exposition, should have the SCIENTIFIC AMERICAN SUPPLEMENT.

VINEGAR HOW MADE IN 10 HOURS from Cider, Wine or Molasses, **without using drugs.** Address F. I. SAGE, Vinegar Maker, Springfield, Mass.

GEO. W. READ & CO.,
STEAM BAND SAW
AND VENEER-CUTTING MILL,
186 to 200 LEWIS ST., foot 5th & 6th Sts., E. R., N. Y.
Always on hand, FULL STOCK of SEASONED
Hard-Wood Lumber
AND CHOICE FIGURED VENEERS.
The LARGEST STOCK! The GREATEST VARIETY! The Lowest Prices!
☞ Enclose Stamp for Catalogue and Price-List. Orders by mail promptly and faithfully executed.



BOOKWALTER ENGINE
Compact, Substantial, Economical, and Easily Managed. Guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, &c., with shipping boxing, at the low price of

3 Horse Power	$252 00
4½ " "	303 50

☞ Put on Cars at Springfield, Ohio. Address

JAS. LEFFEL & CO.,
Springfield, Ohio; or
109 Liberty St., New York City

Machinery of Improved Styles for making **SHINGLES, HEADING AND STAVES.** Sole makers of the well known IMPROVED LAW'S PATENT SHINGLE AND HEADING SAWING MACHINE. For circulars, address TREVOR & CO., Lockport, N. Y.

$77 A WEEK to Agents, Old & Young, Male & Female, in their locality. Terms & OUTFIT FREE. Address P. O. VICKERY & CO., Augusta, Me.

OTIS' SAFETY HOISTING Machinery.
OTIS, BROS. & CO.,
No. 348 BROADWAY, NEW YORK.

PATENT
COLD ROLLED SHAFTING.

The fact that this shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS, Try Street, 2nd and 3rd Avenues, Pittsburgh, Pa. 100 S. Canal Street, Chicago, Ill.

☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass. GEO. PLACE & CO., 121 Chambers St., N. Y. PIERCE & WHALING, Milwaukee, Wis.

Machinists' Tools,
All sizes at low prices. E. GOULD, Newark, N. J.

EAGLE FOOT LATHES,



With Scroll and Circular Saw Attachments, Slide Rest, Tools, &c.; also Small Engine Lathes, Metal Hand Planers, &c. Neatest designs, superior finish. **Low Prices.** Our new Catalogue describes these and every tool necessary for the Amateur or Artisan. Send for it.

WM. L. CHASE & CO., 95 & 97 Liberty St., New York.

STEAM PUMPS.
FIRST PRIZES, VIENNA, PARIS, NEW YORK, BALTIMORE, BOSTON.
Send for circular of recent patented improvements.
THE NORWALK IRON WORKS,
South Norwalk, Conn.



Excelsior Scroll Saw **Latest Improvement.** Double Treadle, including one doz. Saws, thirty Infinitable Fret Sawing Patterns & Prepared Wood to the value of $1. A new device for tightening Saw, Power Drilling attachment, Wrench, Oil cup, and Screw driver, speed 800 strokes per minute. Saws 1¾ in. thick. Price, complete, cased and delivered on board cars, or at Express office, $12. SMALL STEAM ENGINES, with copper Boiler, to drive Light Lathes, Scroll Saws, &c. 100 Scroll Work Designs Free on receipt of stamp. GEO. PARR, Buffalo, N. Y.

Saw only, without Attachments, $9.00.

FRICTION CLUTCHES & ELEVATORS.
VOLNEY W. MASON & CO. PROV. R. I.

HAIR-FELT----HAIR-FELT.
FOR COVERING
BOILERS & PIPES.
☞ Discount to the Trade. ☜
AMERICAN HAIR-FELT MILLS.
316 Front Street, New York.

P. BLAISDELL & CO.,
Worcester, Mass.,
Manufacturers of the Blaisdell Patent Upright Drills and other first-class Machinists' Tools.

STEEL CASTINGS.
Solid and Homogeneous. Guaranteed tensile strength, 25 tons to square inch. An invaluable substitute for expensive forgings, or for Cast Iron requiring great strength. Send for circular and price list to CHESTER STEEL CASTING CO., Eveline St., Philadelphia, Pa.

PATENT DOUBLE ECCENTRIC CORNICE BRAKE. Manufactured by THOMAS & ROBINSON, Cincinnati, O. Send for Circulars.

MACHINERY.
IRON & WOOD WORKING MACHINERY OF EVERY DESCRIPTION.
Cold Rolled Shafting.
HANGERS, PULLEYS, COUPLINGS, BELTING, &c. Send for Illustrated Catalogue and Price List.
GEORGE PLACE,
121 Chambers & 103 Reade Sts. N. Y. City.

Munn & Co's. Patent Offices.

Established 1846.

The Oldest Agency for Soliciting Patents in the United States.

TWENTY-NINE YEARS' EXPERIENCE.

MORE PATENTS have been secured through this agency, at home and abroad, than through any other in the world.

They employ as their assistants a corps of the most experienced men as examiners, specification writers, and draftsmen that can be found, many of whom have been selected from the ranks of the Patent Office.

SIXTY THOUSAND inventors have availed themselves of Munn & Co.'s services in examining their inventions, and procuring their patents.

MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine inventions confer with inventors, prepare drawings, specifications, and assignments, attend to filing applications in the Patent Office, paying the government fees, and watch each case step by step while pending before the examiner. This is done through their branch office, corner F and 7th streets, Washington. They also prepare and file caveats, procure design patents, trademarks, and reissues, attend to rejected cases (prepared by the inventor or other attorneys), procure copyrights, attend to interferences, give written opinions on matters of infringement, furnish copies of patents, and, in fact, attend to every branch of patent business both in this and in foreign countries.

A special notice is made in the SCIENTIFIC AMERICAN of all inventions patented through this Agency, with the name and residence of the patentee. Patents are often sold, in part or whole, to persons attracted to the invention by such notice.

Patents obtained in Canada, England, France, Belgium, Germany, Russia, Prussia, Spain, Portugal, the British Colonies, and all other countries where patents are granted at prices greatly reduced from former rates. Send for pamphlet pertaining specially to foreign patents, which states the cost, time granted, and the requirements for each country

Copies of Patents.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a 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 the laws and 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 handbook of reference for everybody. Price 25 cents, mailed free. Address

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

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

Advertisements,

Back Page - - - - - - $1.00 a line.
Inside Page - - - - - - 75 cents 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 Friday morning to appear in next issue.

Engine, Spindle, & Cylinder Oil. E. H. KELLOGG, 17 Cedar St., N.Y., manufactures the best. Established '58.

TOULMIN'S ELLIPSOGRAPH—Draws ellipses in ink from 6-10 to 8 inches. See Scientific American, Oct. 9, 1875. Boxed, with lock and key, for $12.50. Larger sizes to order. TOULMIN & CO., Lock Box 132, Washington, D. C.

AMERICAN
Journal of Science,
DEVOTED TO
CHEMISTRY, PHYSICS, GEOLOGY, MINERALOGY, NATURAL HISTORY, ASTRONOMY, METEOROLOGY, ETC.

PUBLISHED MONTHLY, AND MAKING TWO VOLUMES A YEAR OF OVER 450 PAGES EACH.

Editors and Proprietors: J. D. DANA, B. SILLIMAN, and E. S. DANA.
Associate Editors: Professors GRAY and GIBBS, of Cambridge; NEWTON, JOHNSON, BRUSH and VERRILL, of Yale; PICKERING, of Boston.

☞ Subscription price $6.00 a year, with 12 cents for prepaid postage.
Address, DANA & SILLIMAN, New Haven, Ct.



Niagara Steam Pump Works
ESTABLISHED 1862.
CHARLES B. HARDICK,
No. 23 Adams Street,
BROOKLYN, N. Y.

HASKELL'S THREE CYLINDER PUMP—Hand or Power. Cheaper than a Steam Pump. Will outwear a Rotary Pump—do more work, with less power, than any other pump. Not liable to get out of order. Any blacksmith can repair it. Adapted to any kind of hard work. Send for Circular.
CHASE MACHINE COMPANY, Boston, Mass.



"Lowest Priced and BEST."
Do Your Own Printing!
$3 Press for cards, labels, envelopes, etc. Larger sizes for larger work.
Business Men do their printing and advertising, save money and increase trade. Pleasure and profit in **Amateur Printing.** The Girls or Boys have great fun and make money fast at printing. Send two stamps for full catalogue of presses, type, etc., to the Manufacturers,
Printing Presses KELSEY & CO., Meriden, Conn.

HAMILTON RUBBER WORKS, Trenton, N.J., Manufacturers of Hose, Belting, Packing, Car Springs, and Rubber for mechanical purposes.

BUILDERS Send for Catalogue of books. BICKNELL & CO., 27 Warren, N.Y.

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. Proceedings have been commenced against Imhaeuser & Co. for selling, contrary to the order of the Court, and especially the clock with a series of springs in the cover, and marked Pat'd Oct. 20, '74. Persons using these, or any other clocks infringing on my Patent, will be dealt with according to law.

EMERY
WELLINGTON MILLS.
GEO. H. GRAY & DANFORTH, BOSTON, IMPORTERS

Todd & Rafferty Machine Co.
MANUFACTURERS OF
The celebrated Greene Variable Cut-Off Engine; Lowe's Patent Tubular and Flue Boilers; Plain Slide Valve Stationary, Hoisting, and Portable Engines. Boilers of all kinds, Steam Pumps, Mill Gearing, Shafting, &c., Silk Tow Oakum, Bagging, Rope, Flax, and Hemp Machinery. Agents for the New Haven Manufacturing Co.'s Machinist's Tools; for Judson's Governors and Stop-Valves; Sturtevant Blowers; and Differential Pulley-Blocks. WAREROOMS, 10 BARCLAY STREET, NEW YORK. WORKS PATERSON, NEW JERSEY.



REYNOLDS & CO.,
145 EAST ST., NEW HAVEN, CT.,
MANUFACTURE
Iron and Steel Set Screws, Round, Square, and Hexagon Head; Machine and Cap Screws; Piano, Knob, and Lock Screws; Machine, Bridge, and Roof Bolts, Bolt Ends, Blanks, Nuts, Washers, etc., of every description.
Send for Price List.

FOR CHARLIE'S PRESENT,

Get the TOM THUMB TELEGRAPH, put up in neat little boxes containing working sounder, telegraph apparatus, battery, key, wires, and chemicals, complete, ready for operation. Price $3.50, with full directions. Can be seen in practical operation at the "Scientific American" office, 37 Park Row; at Packard's Business College, 805 Broadway; and many other places. Besides telegraphing, many beautiful experiments can be made, such as the magnetic curves, electric light, lifting weights, making compasses, magnetizing knives, electro-plating, &c. F. C. BEACH & CO., makers, 246 Canal St., near Center St., New York.

$42 A WEEK.—Agents wanted everywhere. Business permanent and first-class. For further particulars, address
J. KENNEDY & CO., Richmond, Ind.

PERFECT
NEWSPAPER FILE.

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription, "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address MUNN & CO.,
Publishers "SCIENTIFIC AMERICAN."



LOW-PRICED EMERY WHEELS

Made and introduced by inexperienced *men*, have resulted in failure, dissatisfaction and distrust of *all* Emery Wheels. Standard and reliable goods (which can not be sold at a low price), when bought direct from the maker, properly introduced and treated with the same care as other first-class tools, yield first-class results. No metal working tool in existence will save as much money as will a well mounted Emery Grinder. Emery Wheels will readily shape hardened steel and chilled iron which resist all the efforts of other tools. A Tanite Wheel, properly mounted and used by a skilled man, will do as much work in a day as the man could do with file and vise in a week. The introduction of 6 machines in one factory enabled the proprietor to dispense with the labor of 20 men. Every manufacturer can afford to buy one Emery Grinder for every two vises in his factory. Deal only with standard makers, and you buy their experience as well as their goods. Address THE TANITE CO., Stroudsburg, Monroe Co., Pa.

PURE EMERY,
Guaranteed equal to any in the market, at prices lower than any other first class Emery.

An Unprecedented Success.
THOUSANDS ALREADY SOLD.
Wrinkles and Recipes

Pronounced, by the best Scientific and Mechanical Authorities, the most valuable Handbook ever compiled for Engineers and Mechanics of every class.

Contains the CREAM of the Practical Mechanism Series by Joshua Rose, which has appeared during the past year in the SCIENTIFIC AMERICAN—Useful new papers on mechanical operations by distinguished experts—Hundreds of knotty points in Mechanics and Engineering fully explained in terms that every one can understand. No high mathematics or intricate formulæ. Recipes of all kinds for industrial processes, for cements, for making simple instruments, etc. Hints for farmers and for housekeepers. The whole is a collection of the very best practical hints and suggestions which, for several years, have been sent to the SCIENTIFIC AMERICAN by its correspondents and contributors, together with an immense variety of new material.

☞ Price $1.50, post paid. Handsomely bound; 250 pages. Large pocket-book size.

Wrinkles and Recipes and Scientific American for one year $4.20.

Address H. N. MUNN, Publisher,
P. O. Box 772. 37 Park Row, New York.

ROGERS' TANNATE OF SODA BOILER SCALE PREVENTIVE. JOS. G. ROGERS & CO., Madison, Ind.
☞ Send for book on Boiler Incrustation.

THE SOUTHERN STATES AGRICULTURAL AND INDUSTRIAL EXPOSITION

Will be Held on the Fair Grounds, at New Orleans, Commencing February 26, 1876, and Continuing Ten Days.

L. N. MARKS, PRESIDENT.
SAMUEL MULLEN, GENERAL SUPERINTENDENT.

Executive Committee.

A. BALDWIN, Chairman;
JAMES I. DAY, W. B. SCHMIDT,
COLONEL J. D. HILL, JOHN G. FLEMING.

It is the aim of the Board of Commissioners to make it a thorough Exposition of the Agricultural and Mechanical Products of the Southern States, Mexico, and Central America; but it will be open to competitors throughout the country, and the general premium list will embrace all articles comprehended in the general design of an Agricultural and Industrial Exposition, including special premiums for strictly Southern products.

The Mechanical Department has been devised with great care and on the most extensive scale. The Premium List will be ready for distribution November 20th.

Ample arrangements have been perfected for the transportation of goods and visitors from every section at reduced rates. For detailed information, address
SAMUEL MULLEN, GEN'L SUP'T,
No. 80 Camp St., New Orleans.

The NILES ENGINE.

The LATEST and the BEST Engine, independent from boiler on the same base. 2, 4, 6, 8, and 10 Horse Power. Warranted the best Semi-Portable Engine in the market.
Send for Illustrated Price List.
Niles Tool Works,
Hamilton, Ohio.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.
HARTFORD, CONN.

Schlenker's Stationary AND Revolving - Die Bolt Cutters,
MANUFACTURED BY THE
HOWARD IRON WORKS,
BUFFALO, N.Y.
☞ Send for Circular.

IRON AND STEEL DROP FORGING.
Of Every Description, at Reasonable Prices.
The Hull & Belden Company, Danbury, Ct.

IRON PLANERS,
ENGINE LATHES, DRILLS, &c. Send for Price List.
NEW HAVEN MANUFACTURING CO., New Haven, Conn.

Diamond Solid Emery Wheels.

PRICES—6x¾, $1.25; 8x1, $2.25; 12x1¼, $5.50; 16x2, $12.50; 18x2, $16.00; 20x2, 19.50; 24x3, $42. All other sizes at proportionate prices. Fast cutting, free from glazing, they are the best Solid Emery Wheels. Give diam. of holes in your order for wheels. Emery Grinders unequaled by any in the world. Address AMERICAN TWIST DRILL CO., Woonsocket, R. I.

DAMPER REGULATORS **BEST** AND LEVER GAGE COCKS.
MURRILL & KEIZER, 44 Holliday St., Balt.



$5 a year by mail, post-paid. Send 10 cents for Specimen Copy.

TO ILLUSTRATE AND DESCRIBE the many interesting themes and objects presented in the GREAT CENTENNIAL INTERNATIONAL EXPOSITION OF 1876, and also to meet the wants of that large class of readers who desire an increased supply of Scientific Information, particularly of the more Technical and Detailed character, we shall issue a SPECIAL PUBLICATION, entitled the SCIENTIFIC AMERICAN SUPPLEMENT, to be printed weekly during the Centennial year of 1876, and, perhaps, permanently thereafter. Each number will have sixteen large quarto pages, issued weekly, printed in the best style, uniform with the SCIENTIFIC AMERICAN, but separately paged.

The SCIENTIFIC AMERICAN SUPPLEMENT, in addition to the special matter pertaining to the International Exposition, will embrace a very wide range of contents, covering the most recent and valuable papers by eminent writers in ALL THE PRINCIPAL DEPARTMENTS OF SCIENCE AND USEFUL KNOWLEDGE, to wit:

1.—**Chemistry and Metallurgy.**—Embracing New Chemical Discoveries, Improvements, and Processes, with engravings. New Processes of Working Iron, Steel, Lead, Copper, Gold, Silver, and the Various Metals, with engravings of New Apparatus, New Information, etc.

2.—**Mechanics and Engineering.**—The latest and best papers upon Steam Engineering, Railway Engineering, Mining, and Civil Engineering, Mill Work, Textile Industry, with engravings and working drawings.

3.—**Electricity, Light, Heat, Sound.**—Latest Improvements in Telegraphy, Telegraph Engineering; Improvements in Galvanic Batteries, Electric Engines, New and Useful applications of Electricity in the Arts, with engravings.

4.—**Architecture.**—Examples of the best New Structures, with details and drawings.

5.—**Technology.**—New and Useful Invention and Discoveries relating to THE ARTS; Improvements in Photography, Printing, New Implements, New Machinery, New Processes, New Recipes, Improvements pertaining to Textile Industry, Weaving, Dyeing, Coloring, New Industrial Products, Animal, Vegetable, and Mineral—with engravings.

6.—**Agriculture, Botany, and Horticulture.**—New and Useful Information in all branches of Agriculture. Descriptions of New Plants, Trees, Shrubs, and Flowers, New, Useful, and Interesting Facts in relation to Cultivation, Propagation—with engravings.

7.—**Rural and Household Economy.**—The Latest Information concerning Building Materials, New and Valuable Recipes, and a great variety of Miscellaneous Information pertaining to Rural and Household affairs—with engravings.

8.—**Materia Medica, Therapeutics, Hygiene.**—Exhibiting the progress of Medical Science in various branches; New Medicinal preparations, New Health Appliances, and much Interesting Information.

9.—**Natural History and Zoology.**—The Latest Investigations, Discoveries, and most Interesting Information in this department of Science.

10 & 11.—**Meteorology, Terrestrial Physics, Geography.**—Accounts of Interesting Atmospheric and Terrestrial Phenomena, Travels, Explorations and Discoveries, etc.

12.—**Geology and Mineralogy.**—The Latest and most Interesting Geological Investigations and Reports, and New Discoveries.

13.—**Astronomy.**—Recent Interesting Discoveries and Information, with Reports of Astronomical Phenomena, Progress, New Instruments, etc.

TERMS:—Scientific American Supplement, One year, post-paid, $5.00; half year, $2.50 three months, $1.25. Three copies, one year, $13.50; five copies, $20.00; ten copies, $38.00. One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year post-paid, $7.00.

Address MUNN & CO., Publishers, 37 Park Row, New York.

☞ T. V. Carpenter, Advertising Agent. Address Box 773, New York city.

NOYE'S
Mill Furnishing Works

are the largest in the United States. They make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys and Gearing, specially adapted to flour mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

THE BEST INJECTOR

For Locomotive and Stationary Boilers.
FRIEDMANN'S PATENT.
Over 15,000 Now in Use Here and in Europe

Throws more and hotter water, with less steam, than any others. It has two Waterways, fixed Nozzles, and no movable parts to get out of order
NATHAN & DREYFUS, Sole Manufacturers,
108 Liberty St., New York.
☞ Send for Catalogue.

THE HEALD & SISCO
Patent Centrifugal Pumps.
VERTICAL & HORIZONTAL.

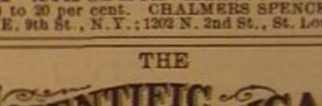
First Premiums at New Orleans, Cincinnati, and New York. "*Medal of Special Award*," American Institute, 1872.

Perfect satisfaction guaranteed. The cheapest, simplest, strongest, most efficient and popular Pump in use, for emptying Dry-docks, Coffer-dams, etc., and for use in Paper Mills, Tanneries, and Factories. STEAM PUMPS very low, for Wrecking, Dredging, Irrigating, etc. Illustrated pamphlet, free. Nearly 1,000 references to actual customers. 31 pages first class testimony. Address
HEALD, SISCO & CO. Baldwinsville, N.Y.

Portland Cement,
From the best London Manufacturers. For sale by JAMES BRAND, 58 Cliff St., N.Y.
A Practical Treatise on Cement furnished for 25 cents.

H. W. JOHNS' Patent
ASBESTOS
BOILER AND STEAM PIPE
Coverings
☞ Use only the genuine.
☞ Infringers will be prosecuted.
H. W. JOHNS, 87 Maiden Lane, N.Y.,
Patentee and Manufacturer of ASBESTOS ROOFING—SHEATHING—PAINTS—STEAM PACKING, &c.
Send for Pamphlet and Price List.

THE NATIONAL
Steel Tube Cleaner.



For Cleaning Boiler Tubes. PATENTED JULY 28 1874.
Adopted by U. S. Navy. For sale by dealers. Send for Circular.

NON-COMBUSTIBLE STEAM BOILER & PIPE
COVERING
WITH "AIR SPACE" IMPROVEMENT.
Saves 10 to 20 per cent. CHALMERS SPENCE CO., foot E. 9th St., N.Y.; 1202 N. 2nd St., St. Louis, Mo.

THE
SCIENTIFIC AMERICAN
For 1876.

The Most Popular Scientific Paper in the World.

THIRTY-FIRST YEAR.

Only $3.20 a year including Postage.

☞ Send 10 cents for Specimen copy.

THE SCIENTIFIC AMERICAN, now in its 31st year, enjoys the widest circulation of any weekly newspaper of the kind in the world. A new volume commenced January 1, 1876. Published weekly. Now is the time to subscribe and to form clubs.

THE CONTENTS OF THE SCIENTIFIC AMERICAN embrace the latest and most interesting information pertaining to the Industrial, Mechanical, and Scientific progress of the world; Descriptions, with beautiful Engravings, of New Inventions, New Implements, New Processes, and Improved Industries of all kinds; Useful Notes, Recipes, Suggestions and Advice, by Practical Writers, for Workingmen and Employers, in all the various arts.

EVERY NUMBER contains sixteen large quarto pages, elegantly printed and illustrated with many engravings. The year's issue contains 832 large pages, equal to *four thousand book* pages, at a cost, including postage, of only $3.20 a year to the subscriber.

Engineers, Mechanics, Telegraphers, Inventors, Manufacturers, Chemists, Photographers, Physicians, Lawyers, Clergymen, Teachers, and People of all Professions, will find the SCIENTIFIC AMERICAN most useful and valuable. Its pages teem with interesting subjects for thought, study, and conversation, and are an unfailing source of new and instructive information. As an Instructor and Educator, the SCIENTIFIC AMERICAN has no equal. It is promotive of knowledge and progress in every community where it circulates, It should have a prominent place in every Household, Reading-Room, and Library.

☞ *Specimen copies sent, prepaid, on receipt of 10 cents.*

TERMS OF SUBSCRIPTIONS.—POSTAGE PAID BY US.

One copy Scientific American, one year	$3.20
One copy Scientific American, six months	1.60
One copy Scientific American, three months	1.00
One copy Scientific American and one copy Scientific American Supplement, both for one year, post-paid	7.00
One copy Scientific American, one year, and one copy Science Record	5.20

☞ We make a liberal discount and give advantageous premiums to those who form Clubs or procure Subscriptions. A beautifully illuminated Subscription List, also Prospectus and Rates, *sent free.* Address

MUNN & CO.
37 PARK ROW, NEW YORK.

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

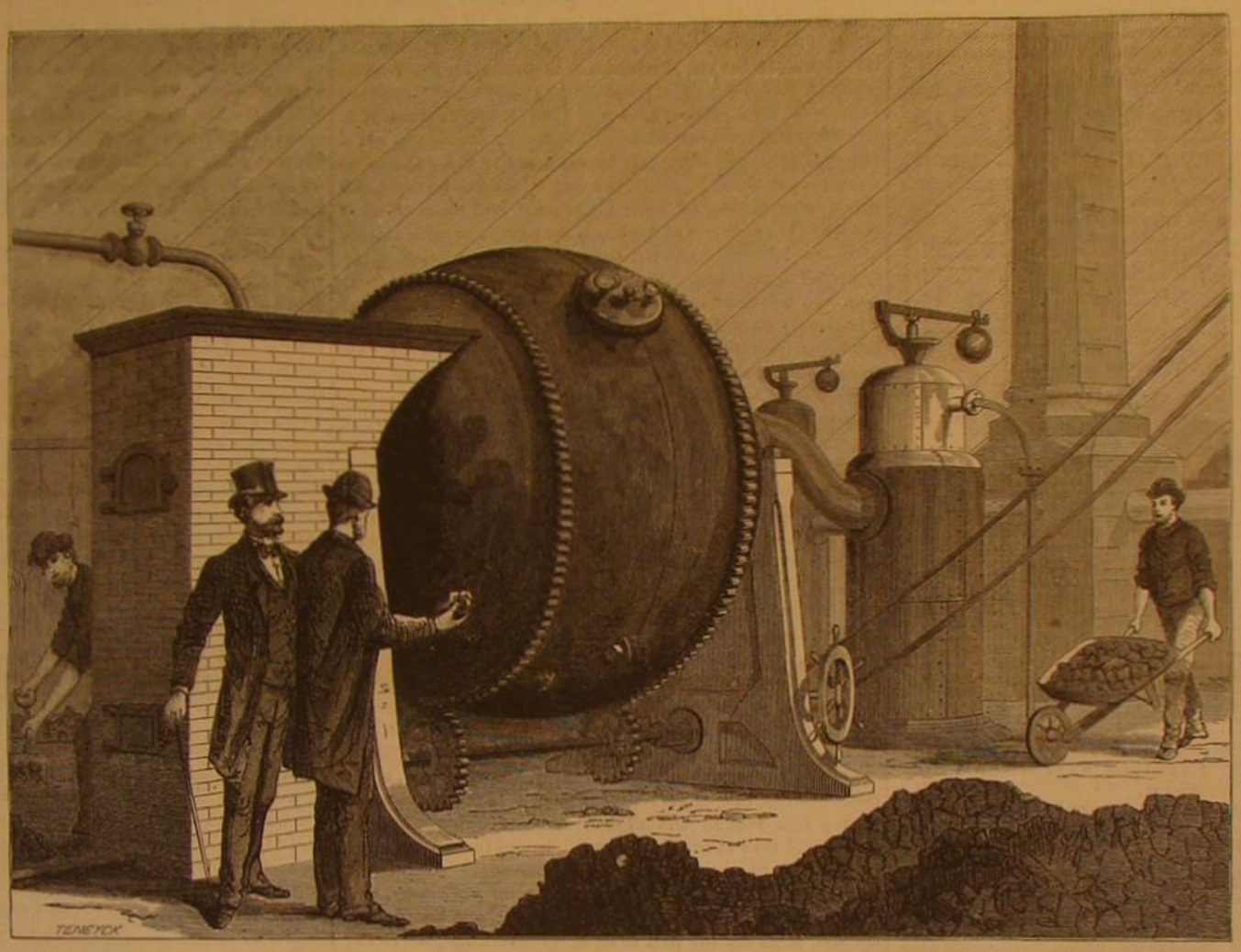
SCIENTIFIC AMERICAN

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

Vol. XXXIV.—No. 6. [NEW SERIES.] NEW YORK, FEBRUARY 5, 1876. [$3.20 per Annum. [POSTAGE PREPAID.

IMPROVED REVOLVING FURNACE.

The roasting of ores, having for its object the removal of all such volatile substances as sulphur, antimony, arsenic, etc., and the rendering of the subsequent smelting and reducing processes more easy, is ordinarily done either in mounds or heaps or in stationary furnaces (reverberatory or otherwise), according to the nature and kind of ore. As a substitute for these various means employed, the invention illustrated in the annexed engraving is intended, and it is constructed so as to perform effectively all the operations of roasting, annealing, smelting, extracting mercury, drying, reducing ores, etc. The three views here given show, first, (Fig. 1) a perspective view of the apparatus; second (Fig. 2), a longitudinal section of the furnace as used for roasting ores, and third (Fig. 3), a transverse section of the invention arranged for smelting purposes. It will be seen also from the engravings that the furnaces are intended to grouped about a central chimney, one opening into each of the four faces of the base of the latter. Referring to Fig. 2, A is a sphere of boiler plate or cast iron, lined with ganister, fire brick, and asbestos, the effect of which lining, we are informed, is to keep the exterior of the sphere cool, even while an extremely high heat is maintained within. This globe is suspended on hollow journals, and on its exterior surface are circular racks, B, which engage with the gear wheel, C, and the latter communicates with the hand wheel, L. By turning this hand wheel the globe is easily rotated. E is the furnace, the blast from which enters the globe, which is previously filled with ore and closed, through the water tweer F, which, as shown, passes through one of the hollow journals. During the operation of roasting, the globe is constantly rotated, so that the ore within is kept in agitation, thus allowing the heat to pass through and act upon every part of its mass. The volatile products make their exit through the opposite journal, G, and entering the condenser, H, are condensed by a fine shower of water entering through the perforated diaphragm, I. In this way such materials are reduced so as to be easily removable; and at the same time, if precious metals be under treatment, such portions of the latter as would otherwise escape are caught and retained. From the condenser, the blast passes, as shown, into the chimney.



MANES' REVOLVING FURNACE.—Fig. 1.

The adaptation of the furnace for smelting purposes is easily understood from Fig. 3. The globe is of course held stationary during the operation; and the blast, entering by water tweers through both journals, passes down through the charge, is reflected up, and exits through the open manhole above. The tweers can be continued downward and entirely around the bottom of the globe, if required. When the process is complete, the globe may be tipped to discharge its contents through the manhole at J, or it may remain stationary and the charge be removed through the vent at K.

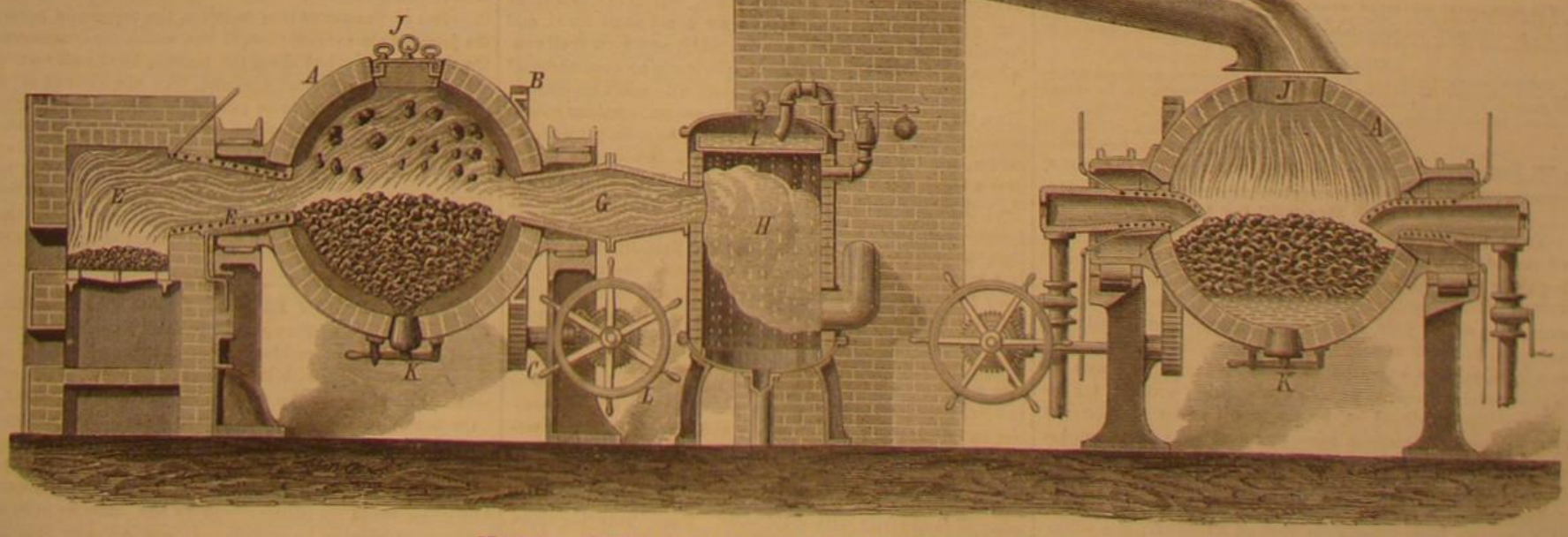
For handling refractory and low grades of gold and silver ores, the inventor claims for the apparatus special advantages, as by its use several tuns can be worked daily, and the labor of but one man to attend the furnace will be required. The globular form adopted is one easy of construction and well suited to sustain its great weight from two points of support. The lining of the interior can, it is claimed, also be rendered more stable than in any other form, while it presents less surface for the radiation of heat. The inventor has also introduced a new and effective process for amalgamating gold and silver ores, which, used in connection with the furnace, adds greatly to the advantages of the latter as a means of extracting the precious metals from their ores. Many of the ores hitherto found most difficult to handle, such as nickel, cobalt, antimony, arsenic, zinc, bismuth, lead, copper, can be safely worked, as no injurious fumes save such as pass through the condensers can escape. Iron and steel can also, as already indicated, be treated and made with important advantages, as the annealing of malleable iron and the use of crucibles in converting or making steel are, by this device, altogether obviated. The first of these furnaces is now, we earn, being constructed at the works of the Hartford, Conn., Machine Company for the new Nickel Smelting and Refining Company of the same city. Four complete furnaces of like pattern are to be erected by the corporation last mentioned.

Patented April 6, 1875. For further information address the inventor, Mr. James Manes, 74 Asylum street, New Haven, Conn.

A GERMAN firm has recently introduced an alloy of 62 parts copper, 18 parts lead, 10 parts tin, and 10 parts zinc. It is called dysiot, and is a kind of whitish brass, readily fusible.

Fig. 2.

Fig. 3.



MANES' REVOLVING FURNACE.—SECTIONAL VIEW.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

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

TERMS.

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

Club Rates.

Ten copies, one year, each $2 70, postage included.....$27 00
Over ten copies, same rate each, postage included..... 2 70

☞By the new law, postage is payable in advance by the publishers, and the subscriber then receives the paper free of charge.

NOTE.—Persons subscribing will please to give their full names, and Post Office and State address, plainly written, and also state at which time they wish their subscriptions to commence, otherwise the paper will be sent from the receipt of the order. When requested, the numbers can be supplied from January 1st, when the volume commenced. In case of changing residence, state former address, as well as give the new one. No changes can be made unless the former address is given.

If any of our readers fail to receive their numbers regularly; if the direction is not plainly written; if premiums are not received; or if there is fault of any sort at this office, we will thank our friends to send us postal card complaints, and repeat the same, if need be, until the remedy is effected. *Do not hesitate to complain.* We desire to keep all matters between ourselves and patrons right and satisfactory.

VOLUME XXXIV., No. 6. [NEW SERIES.] *Thirty-first Year.*

NEW YORK, SATURDAY, FEBRUARY 5, 1876.

Contents.

(Illustrated articles are marked with an asterisk.)

Ammonia from fish offal (2) 91
Anderson, Dr. H. J..... 88
Animalcule, a pavement..... 91
Answers to correspondents..... 88
Astronomical notes 88
Bamboo for paper..... 81
Bee culture..... 82
Bell, the Emperor..... 86
Bleaching cane juice, etc.*..... 91
Boats, propellers for (14, 15)..... 91
Boiler, pressure in a (16)..... 91
Boiler, working a (8)..... 83
Boot and shoe apparatus*..... 84
Boot calk*..... 83
Boot holder*..... 83
Boot shank machine*..... 91
Business and personal..... 88
Capsules, wafer, for medicines... 82
Car ventilation, etc 86
Centennial, workmen at the..... 89
Chinese Roger Bacon, a..... 85
Circle, dividing a*.....84, 86
Clock, a wonderful..... 86
Corn planter, improved*..... 91
Corrosive sublimate (1)..... 88
Cucumbers in Russia, the..... 88
Dyeing billiard balls..... 83
Dynamite, manufacture of*..... 79
Dystal, a new alloy..... 81
Eads, Captain James B..... 81
Edison's new force, Mr..... 89
Edison's phenomena, nature of Mr. 86
Emery wheel, cushion*..... 84
Employers and trade unions 91
Engines, loss of power in (13).... 81
Explosion, a curious..... 82
Fodder and leaves, preserving.... 79
Furnace, revolving*..... 81
Gas bills, high, etc..... 91
Good suggestion, a 87
Hardening sandstone..... 88
Heat indicator, a (12)..... 91
Hydrothermic motor, a 89
Industry, a neglected 81
Inventions patented in England.. 90
Journal of the Electrical Society. 86
Lasting tools*..... 83
Last lathe*..... 83
Life at sea, saving 87
Lighting of London, the..... 88
Linseed oil, cleaning off (7)..... 91
Machine mercy..... 80
Matches, waterproof (11)..... 91
Mississippi, the jetties of the..... 80
New books and publications..... 90
Paint, waterproof (9)..... 91
Patents, American and foreign... 90
Patents, list of Canadian..... 92
Patents, official list of..... 91
Practical mechanism—No. 41*.... 84
Preacher said, what the 81
Rain water from roofs (4)..... 91
Recipes, useful..... 89
Refrigerator, a new..... 82
Roughing horses..... 84
Rubber, molding (10)..... 91
Science Record for 1876..... 80
Snow from tracks, removing, etc. 80
Spirit, grape, etc. (3)..... 91
Steamers, road... 81
Steaming feathers (5)..... 91
Stereoscope as a civilizer, the..... 87
Stock yards, the Chicago..... 87
Success in labor..... 88
Thrashing machinery*..... 87
Torpedo boat Alarm, the..... 89
Trade unions in England..... 84
Woodworking machinery, English* 82

THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 6.

For the Week ending February 5, 1876.

TABLE OF CONTENTS.

I. ENGINEERING AND MINING.—With 42 illustrations.—History of the Suez Canal.—Prices of Bituminous Coals.—The Railway Bridges of London.—Chapman's Life and Surf Boat, 6 figs.—Theory of the Resistance of Stream Lines, by PROFESSOR FROUDE, 3 figs.—Locomotives of the Western Railway, France, page cut.—New Traction Engine, 2 figs.—Novel Speed Indicator, 5 figs.—Examples of the Crystalization of Wrought Iron, by JOSHUA ROSE.—The Wear of Wire Ropes.—The Hydraulic Locomotive.—Bicheraux's Gas Furnace, 5 figs.—New Rolling Mill, 2 figs.—Improved Chain Belt, 3 figs.—New Speed Indicator, 2 figs.—New Steam Engine Frame, 1 fig.—Improvement in Propelling Canal Boats, 3 figs.—Great Nail Works, Birmingham, Eng.—Iron Lighthouses.—New Mineral.—Cornish Pumping Engines.—Coal Mines of Russia.—Trial of a Flying Machine.

II. TECHNOLOGY.—New Mode of Finishing Photos.—Condensed Beer.—Uses of Paper.—Baltimore Air Ship.—Wood of Noah's Ark.—American Chapel, Rome.—Artificial Milk.

III. CHEMISTRY, ETC.—The Oxy-Hydrogen Light. -The Gas Wastes of Pa.—Rapid Mode of detecting Butter Adulterations.—Silicate of Soda in Textile Industry.—Chemistry of Urine.

IV. ELECTRICITY, LIGHT, HEAT, ETC.—With 8 illustrations.—On the Transmission of Musical Tones Telegraphically, by ELISHA GRAY.

V. PROCEEDINGS OF SOCIETIES.—American Social Science Association.—The Dwelling Houses of the Principal Cities.—Institution of Engineers and Shipbuilders, Scotland.—New York Academy of Sciences.

VI. MEDICINE, HYGIENE, ETC.—Brain and Intellect.—Tin and Gold Combined, in Dentistry.—Value of Hypodermic Solutions.

VII.—Lessons in Mechanical Drawing, by PROFESSOR MACCORD, with 22 figs.

VIII. AGRICULTURE, HORTICULTURE, ETC.—House Plants, How to Cultivate, What to Propagate.

IX. PISCICULTURE.—Trout Ponds, by J. I. PEASE, 1 fig.

X.—The International Exhibition of 1876.—Prospects and Arrangement of the Department of Education.—Egypt at the Exhibition.—The Ohio Centennial Building.—Geographical Exhibits.—Arrangements for Accommodation of Visitors—The Centennial Rifle Tournament.—Miscellaneous Exhibition Notes.

The SCIENTIFIC AMERICAN SUPPLEMENT is uniform in size with the 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 SCIENTIFIC AMERICAN SUPPLEMENT will be sent together for one year, postage free to subscribers, on receipt of $7.00.

Remit by postal order. Address

MUNN & CO., PUBLISHERS,
37 Park Row, New York.

☞Single copies of SUPPLEMENT sent to any address on receipt of 10 cents.

"Science Record" for 1876.

To prepare the matter for a volume of 600 pages is a work of considerable magnitude at any time: and to gather the requisite material, so that it includes everything new in the fields of mechanical, chemical, and physical science discussed during an entire year, and then to arrange and classify the subjects, is by no means a small task. The SCIENCE RECORD, which we expected to issue on January 15, and for which several hundred persons are waiting, will not, for the reasons above hinted at, be ready till about February 10. The printers and binders have promised us a large edition early in February, when the orders on our books will be filled in the rotation in which they were received.

The volumes for the previous four years, from 1871 to 1875, are on hand, ready for present delivery. See advertisement on another page.

MACHINE MERCY.

While crossing one of the ferries between this city and Brooklyn the other day, we formed one of a knot of persons who curiously watched an individual who had clambered up on the walking beam of another steamboat that was passing us, and who, clinging to the beam, was swayed up and down as he coolly scrubbed at some portion of the bright work. The general sentiment of the people about us seemed to be one akin to admiration at the man's daring; but in that view we profoundly differed from our neighbors, and thought to ourselves that the workmen was, to say the least, a fool. Why could he not wait five minutes until his boat came to rest in the slip, and then clean and polish to his heart's content while the beam was stationary? In fact there was no reason that we could perceive, and hence we were driven to the above uncomplimentary opinion, as we always are whenever we witness a presumably rational human being peril life or limb uselessly.

"Familiarity breeds contempt" is a trite old proverb, and one which appears to be especially true in regard to people accustomed to dealing with machinery. It is not so in many other cases; soldiers who handle fire arms and explosives all their lives are proverbially the most careful persons with their deadly weapons. They seldom blow off their fingers or the tops of their own skulls, through pure negligence, as many an unfortunate sportsman has done: for the reason, perhaps, that long experience with gunpowder impresses them with the merciless nature of that material when it is ignited. But machine attendants somehow manage to get a different idea, and almost, it appears, arrive at a notion that a machine is a sort of sentient being which knows them, and won't smash or bite off their limbs as it will those of other people. What scores of workmen we have seen with stumps of fingers! Machine and circular saws especially are peculiarly partial to such diet. We read of a case recently of a workman who was descanting on the advantages of his saw, and who merely wanted to point out how truly it ran. He pushed his finger forward a little too far, and whiz! off it went. He felt a peculiar sensation, not a hurt (for it is well known that there is no pain attending the lopping off of a member by a very rapidly revolving blade), and, half instinctively, he poked out another finger, and that likewise departed. Then he discovered that something was wrong, and subsequently that he was *minus* two fingers. Fingers cut off are trivial accidents to some that occur through carelessness. Not very long ago, a woman in a New England mill went to work with her hair down. She moved carelessly around among the buzzing wheels and shafts, and the first thing she knew her tresses were caught, and no Pawnee on the plains could have scalped her more neatly. Her misfortune benefited Science, however, for it gave the doctors a splendid opportunity to try the efficacy of transplanting skin. Medical skill healed the wound, we believe, but her flowing locks were gone. A workman was strangled in a somewhat similar way, his loose neckcloth catching and twisting itself about a shaft, which could not be stopped in time; another, we remember, met a more horrible fate by becoming entangled with a shaft which swung him around and around, dashing him against the beams and floor at every turn, until, before the motion could be arrested, he was literally torn to pieces. We have seen men on steam vessels crawl down among the machinery, with a light in one hand and a tool in the other, and try to work, dodging some moving part at its every revolution, the rolling of the ship making their position still more perilous. A case happened, a very short time ago, in which a machinist entered the narrow enclosure in which the paddle shaft crank of a steamer worked. He knew perfectly well that steam was up, and that the vessel would shortly get under way; but for some unaccountable reason, he chose at the last minute to get under the crank, perhaps to put the last touch on some repairing job. It was his last touch, for the engineer, whom he did not notify of his intention, happened to work the starting bar to give the engine a turn or two. The crank came over and smashed the unfortunate being out of all human semblance.

We might go on and multiply instances of this kind indefinitely: doubtless there are few of our readers who cannot do likewise. But despite the knowledge of the prevalence of these casualties, people continue to be careless. The engineer doesn't realize that the engine which he has rubbed till he can see his face in any part of it, or whose motion he has controlled for the last ten years, will crush him if he once gets in its clutch. Hasn't he a pet name for it, and doesn't he pat the cylinder affectionately, and view it all ove with a kind of fatherly interest? Certainly he reasons somer how that the insensate iron and steel will spare its master Then there is the machinist. Did he not put up those countershafts, and fit that belting? What if he does get up on a ladder, and try to slip a belt already on the driven pulley over a big driver with the latter in motion? He laughs whe the risk of his getting caught between belt and pulley is pointed out, guesses he knows this gear, and "he's done it a thousand times," and the thousand and first time may result in a horrible death. Locomotive engineers are also frightfully reckless. With an engine going forty miles an hour, it is much more prudent to slow down or even stop in order to oil a squeaky bearing than to climb out on the side and hang over so as to reach the place with the oil can. Better lose a minute or two of time than risk life. The men who run our locomotives have plenty of chances to display heroism and daring at the right time; and it is for the very reason that they are so rarely found wanting in those qualities that we hate to see them uselessly peril their lives.

In a word, workmen should learn that there is no such thing as familiarity with machinery. Study your machines, we say, know every bolt, every nut, every piece of metal in them, know how to repair, to build, to invent improvements, know how to exact their utmost capabilities; but for your own safety, and for the sake of those dependent on your labor, do not relax one instant's care, nor persuade yourself that you can rely upon your dexterity or upon any half supposed merciful attribute in moving masses of metal.

PROGRESS OF THE GREAT JETTY WORKS AT THE MOUTH OF THE MISSISSIPPI.

On January 15, 1876, the jetty works constructed under the United States grant, made to Mr. James B. Eads on March 3 last, had been so far extended into the sea that the almost complete control of the river discharge had been accomplished through a distance of 1¼ miles from the land's end, and within 2,500 feet of the crest of the bar.

Through the extent of this mile and a half, the river current had swept out 1,263,222 cubic yards of the bar on December 25, 1875, and the removal by the river is progressing at the rate of about 30,000 cubic yards per day; 2,000,000 yards more will have to be scoured away before 20 feet depth of water is secured across the bar.

The works on each line of jetty are partially constructed out beyond the crest of the bar to the full distance they are intended to be built, and the work on this portion of the jetties is being pushed with the utmost vigor, over 25,000 cubic yards of willow mattress work having been constructed and securely placed in position, and ballasted with stone, within the last 30 days—the total amount laid thus far being about 125,000 cubic yards. The construction of 20,000 additional yards is all that is now required to build the jetties up above mean low tide, and out to the crest of the bar, 10,500 feet from the land's end at the mouth of the Mississippi.

It is confidently believed that a sufficient amount of material is now in place, if no more work were done, to insure a depth of 20 feet of water across the bar, within three or four months. One remarkable feature, thus far developed, is the deepening of the water between the incomplete jetties on the outer slope of the bar, which is doubtless caused by the tidal action that is now partially controlled by the jetty works beyond the crest. This deepening clearly shows how groundless are the fears that the effect of the jetties would simply be to pile out the excavated material on the outer slope of the bar. The fact that the crest of the bar has not deepened, notwithstanding the immense amount of material excavated from above it, between the lines of the jetties, is in exact accordance with the theory upon which Mr. Eads has based his application of the jetty system to the improvement of the mouth of the Mississippi.

Those predicting the failure of the system have constantly asserted that the chief part of the sedimentary matter of the river was pushed out to sea, on the bottom, by the action of the current; while Mr. Eads has persistently declared that this was a grave error, and that these matters were almost wholly borne to the sea suspended in the water of the river, and that, the more rapid the current, the greater would be the amount of material held by it in suspension; and hence an increase of current above the normal in any part of the river, flowing over a strictly alluvial bed, would cause the water to take up an additional load of this matter, which it would retain in suspension so long as the velocity of current was maintained; and when thus charged, it would be simply impossible for it to take up any load or produce any additional scouring. The current receives its first acceleration at the upper end of the jetty works, and here it first becomes charged with the surplus load. It receives no further acceleration in its passage over the crest of the bar (owing to the incompleteness of the work there), over which it escapes laterally. The enlargement produced by the excavation gradually reduces the current, where it occurs, by the enlargement of the channel, and the acceleration and extra loading of the water then takes place lower down and nearer the crest of the bar. The effect of this is to shorten up the base of the bar, and to deepen the channel above it, before the crest of the bar is reduced.

The original crest of the bar was a plateau 3,500 feet wide, over which an average depth of only 7½ feet of water could be found, between the parallel lines of the jetties, which are placed 1,000 feet asunder. This plateau is now reduced to a width of less than 600 feet, and will gradually be reduced to nothing, before the deepening of the bar crest will begin to take place. As the current is quite as rapid now across the crest of the bar as it is between the completed parts of the jetties, it is evident that, if the sedimentary matters of the river were pushed along the bottom, by the current, the deposits which are most elevated, like the summit of the bar, would be the first to be pushed off, and piled up beyond the bar crest, in the sea water beneath the river discharge, or in what has been termed the "dead angle." The base of the bar on the 20 feet line of depth was nearly 10,000 feet long when the jetties were commenced. This base has been shortened still more than the plateau forming the bar summit, and is now only about 6,200 feet long, measured in the direction of the jetties.

REMOVAL OF SNOW FROM CITY RAILWAY TRACKS.

For a considerable time past litigations have been prosecuted on the part of residents along the line of some of our city street railways, with the object of preventing the companies from piling up the snow at the sides of the tracks.

On behalf of the residents it was shown that the companies were in the habit of using plows and rotary sweeps, piling the snow up in continuous banks between and at the sides of the tracks and in front of the adjoining dwellings, rendering all approach to the latter by ordinary vehicles practically impossible. It was claimed that the

companies by thus doing became almost exclusive occupants of the street, the householders being shut off. It is quite common for dwellers on our street railway routes to wake up on winter mornings, and find a compact bank of snow from three to four feet high along the front of their premises, deposited there during the night by the industrious railway people, aided by their powerful machinery.

On the part of the railway companies, it appeared, during the course of the recent legal proceedings, that the use of the plows and sweepers was necessary to the proper working of the roads; that the snow must be removed, or the passenger cars could not run; that their charters required them to run the cars; that if they were to be enjoined from clearing the tracks, the court would nullify the act of the legislature; that consequently the companies could not be legally prevented from clearing the snow, as they were in the habit of doing.

Judge Sedgwick, before whom the last proceedings came, has rendered a decision which, we think, will commend itself to the people by its plain, common sense, practical way of solving the difficulty.

He admits the right of the companies to clear their tracks of snow, and to pack it up at the sides of the streets as they now do; on the other hand, he decides that the companies must not obstruct the use of the streets, and requires them to remove their snow banks within a reasonable time after every storm. This decision gives general satisfaction, and fully meets the requirements of the case. It is true it imposes a laborious and expensive work upon the companies, as they are unprovided with special means for the removal. But we cannot doubt that some of our ingenious inventors will study out the proper machinery to do the business cheaply. With them we leave the subject. Whoever can devise the proper mechanism ought to reap a handsome reward. Now let us see what mechanical genius can do in the matter.

HIGH GAS BILLS AND THEIR PREVENTION.

A conflict exists at present in Brooklyn, between the gas companies on one side and some of the gas consumers on the other. The price of gas has reached lately $3 per 1,000 feet, and even at this high cost has by many been found to be of poor and unsatisfactory quality. As a result, some people have abandoned the use of gas and substituted lamps.

It is well to remember that large gas bills are due not merely to the cost per 1,000 feet of the gas burnt, but to the number of feet consumed. As any one can easily learn to read his meter index from the instructions printed on the back of the bills rendered, it is presumable that the consumer is informed of the quantity of gas he is using, and hence cannot dispute *bills* which accord with the meter. But the meter is sometimes the object of the consumer's suspicion Now supposing him to be certain that no gas unknown to him has been wasted, the question of the veracity of the meter is easily settled by a simple test. The wet meter is simply a circular box filled with water to a point a little above its center. The axis carries a series of curved buckets, each capable of holding a definite quantity of gas, which is admitted at the central part of the meter, and which causes the buckets successively to rise, thus keeping them in continuing rotation. As the edge of each bucket rises from the liquid, the gas escapes and goes to the delivery pipe at the circumference, while the quantity so discharged is measured by the rotation of the bucket axis, acting on gearing which communicates with an index. Now to test this meter, provide any large airtight vessel, say a good sized jar, of which the exact content in cubic feet and inches is easily calculated. Fill this with water and reverse it, mouth down, in a good sized pan, on the bottom of which are two or three inches of water. The atmospheric pressure will keep the water in the jar. The connection between the house pipe and the meter being previously cut, and a piece of rubber tubing attached to the meter, lead the end of the tube into the throat of the jar. Turn on the gas, which will bubble up and displace the water. The moment all the water in the jar is driven out, stop off the gas. Fill the jar with water again, thus expelling the gas collected, and repeat the operation. Do this, say five times, until in fact the previously determined cubic contents of the jar, multiplied by the number of fillings, equals exactly (for example) 10 cubic feet. Now compare the result thus obtained with the indication of the index on the meter, allowing a slight margin in favor of the latter to compensate for any inaccuracy on your part, and the error of the meter, if any there be, will at once be apparent.

The causes of error may then be searched for; and generally the trouble is that the meter has either too much or too little water. This water is put in through a screw, on top of the front box and to the right. It should be admitted until it escapes from the vent in the side just below, when the same is opened. It sometimes happens that a plumber, in filling a meter, will fill above the vent, and yet not sufficiently raise the float (which is supposed to regulate the entrance of the gas and shut the same off when too much or too little water is the case). The effect of this is to diminish the cubic contents of the buckets, while the index shows no change in the number of revolutions of the drum. So that the consumer then pays for more indicated cubic feet than he has really consumed. To remove water, try the bottom screw, and take out the water from what is called the dry well. When there is too little water in the meter, its proper quantity is easily added, and the contents should just escape from the lower edge of the vent. In winter, the meter is very prone to freeze: this need not occur more than once, if the consumer will pour a little glycerin into the water after the thawing is accomplished. Sometimes also the water in old meters becomes thick, from the accumulation of tar and dirt from the mains. This causes a slow and unsatisfactory action, and should be remedied by cleaning the meter out and replacing the impure with fresh water.

There are *various* other causes of high gas bills, which the householder might well look to, but into which we cannot enter in any detail here. Prominent among these are the burners, a poor one of which may easily burn double the gas and not give half the light of one properly constructed. The ordinary type of burner, besides, burns out, and, through the enlargement of its orifice, soon becomes very wasteful of gas. Another cause of waste is due to people trying to read or work by several lights located in a high chandelier or fixture, instead of by one light brought near them. A single burner, one foot distant from the page of a book, will shed on that page thirty-six times more light than the same burner six feet away; or in other words, the single burner, located as first stated, will light up the page as brilliantly as six chandeliers, of six burners each, hung six feet from the book. The absolute quantity of light is the same at all distances, but it is spread out over an area which increases with the square of the distance from the flame; so that it is obvious that lights are used very wastefully when they are placed far away from the objects which they are to illuminate.

A NEGLECTED INDUSTRY.—BEE CULTURE.

There is one industry in this country which is not overworked nor overcrowded, and which offers reasonably large and sure profits, because for its products there is always a demand. It is one which hundreds of people can carry on without interfering with their regular occupations, and which might serve to give employment to many now seeking labor, or additional income to others of straitened means. We refer to beekeeping, and we speak of it now because the opening of spring is a good time, for those who may heed our advice, to make a beginning. Out of the 40,000,000 people in this country, only 70,000 are beekeepers, and these send to market about 15,000,000 lbs. of honey and wax yearly. Now to see how enormously below the average, of what the country ought to produce, the above yield is, we have only to make a brief calculation based on the assertion of the late Mr. Quinby, one of the best and most reliable authorities on apiculture. He says that, on an average, every acre of ground ought to yield 1 lb. of honey—cities and all, be it remembered, because it has been practically demonstrated that the bees will find excellent materials for honey in the refuse and garbage as well as in the few green spots enclosed within brick and mortar walls. There are 1,897,146,240 acres in our national domain; and even if we deduct 50 per cent of this for utterly uninhabited localities, the yield should be about sixty times greater than it is. To proceed a step further, every pound of honey is worth, on an average, 25 cents, and each pound of wax, 30 cents. Taking the figures in the last census as a basis, the value of the annual product is: Wax $189,338, and honey $3,676,703, total $3,866 041. But this is only $\frac{1}{60}$ of the value which might be produced, and therefore the said possible value is worth $240,000,000, consequently there is a waste of $236,000,000 worth of valuable produce, which evaporates into the air. One well known authority plainly asserts that the amount of honey lost, in California alone, yearly, exceeds in value the quantity of gold gathered in the State during the same period. The census says that, in 1870, there were but 136 professional apiarists in the country; a monthly publication devoted entirely to discussion of bee culture is our authority for the statement that, altogether, 70,000 persons keep bees. Only 1 person, then, out of every 570 in the United States, is engaged in preventing the abovenamed waste, or, more strictly speaking, in trying to divert some of the evaporated value into his own pockets; 1 person in about every 300,000 is engaged in doing this as an exclusive business. The census says that there are nearly 200,000 clerks alone in the country, clerks and salesmen be it noticed, not employees in general, one to every 144 of the population. There is not a year elapses that does not see hundreds of young men and women swarming into the great cities looking for clerical employment, nor can a winter pass but that we are not brought face to face with terrible destitution, and merchants everywhere are compelled to deny, for their own immediate welfare, appeal after appeal which strongly excites both sympathy and charitable feelings. An advertisement in a daily journal of this city for clerical help results in answers by the hundred, as we personally know. Now is there not something wrong in a system under which, on one hand, an industry, not a new one born yesterday, but one almost as old as the human race itself, goes begging for people to follow it, the resources of which are suffered to run to absolute waste to the extent of millions of dollars yearly; and under which, on the other hand, thousands of the best part of the population manage to crowd into big cities and there starve because there is no honest labor for them?

We do not argue that each and everybody should instantly provide himself with an improved hive and a swarm of bees, and therein find sooner or later a fortune; we merely point out one industry, more thoroughly and uniformly neglected than any other that we now can recal. It is, moreover, in the development of industries of this kind that the solution of the much agitated woman question lies. Apiculture is one of the few pursuits that a woman is physically able to follow in its every branch; herein it is of especial advantage. Again, its development would prove a general blessing in that, besides enlarging the field of labor for every one it might serve to attract men, out from behind counters in millinery and dry goods stores, away from the cities and into the open air of the country where, in agriculture, man's natural calling, the muscles which Nature has given them, and denied the weaker sex, could be put to profitable use. We shall revert to this subject of bee culture in its more practical bearing at some future time.

Mr. Edison's New Force.

To the Editor of the Scientific American:

I notice in your issue of January 29, 1876, some experiments conducted by a gentleman signing himself "Electron," who attempts to prove that the phenomenon observed by me, and which I have called etheric force, is due to the "extra" current from an electromagnet.

There are several sources of error, I think, in his experiment, among which may be mentioned bad insulation of battery or leading wires and binding posts, and the close proximity of the galvanometer to the vibrating apparatus.

Owing to the extreme delicacy of a mirror galvanometer, the sources of error are extremely numerous, and it requires long practice and careful manipulation to eradicate them. If "Electron" will use large gutta percha wires, take the reading of his galvanometer in another room, suspend his battery by insulating cords, use a large hard rubber base for his vibrator, and keep a sharp look-out for possible sources of error, he will obtain a brilliant etheric spark right through his galvanometer without a tremble of the spot of light.

In reply to your correspondent J. P. H., who sees nothing inexplicable in obtaining a spark from an uninsulated wire laid for a long distance upon wet earth and connected to a highly insulated source of power, I will state that his telegraph experiment is not a similar one. If he had disconnected one pole of his battery from all connection with anything except air, and placed his battery upon an insulated stand, he would hardly have succeeded in working with a relay or any other electric instrument under the conditions he mentions. With this, there is no chance for circuit, and it is the same with the source of etheric force.

Newark, N. J. THOMAS A. EDISON.

Captain James B. Eads.

We give in another article a report from an authentic source concerning the progress of the Jetty-works at the mouth of the Mississippi, which shows a gratifying improvement in the channel so far as the works have been carried, and indicates that within a very short time we may expect to see the great river freely opened to navigation by vessels of the largest class.

The opening of the Mississippi will have a wonderful influence upon the material prosperity of the Republic, and will form a crowning event during this centennial year of our country's history. The region thus thrown open to the world's commerce is one of unsurpassed richness, capable of supporting an immense population.

To the noble engineer by whom, at his own cost, this great work was undertaken, the highest honors are due In war and in peace, his commanding talents and remarkable sagacity have been devoted to patriotic labors, which have always resulted in public benefits of the most extensive, far-reaching nature; and he well deserves the nation's gratitude. We nominate for the Presidency Captain James B. Eads of St. Louis, the man of genius, of industry, and of incorruptible honor.

A Curious Explosion.

The Virginia City (Nev.) *Enterprise* gives an account of the explosion of what was supposed to be simply a pail of water, or rather of ice. It was being heated near a forge so as to thaw the contents, when, just as it was being removed, it suddenly blew up, tearing the bucket to shreds and severely injuring two men near by. The local journal thinks that the casualty was due to nitroglycerin from a giant powder cartridge, which previously had been thawed in the vessel, forming an unremarked film on the inside. We doubt this explanation. There appears to have been nothing but a moderate heat applied, and that certainly would not have exploded the nitroglycerin. If the latter were present, it probably exploded through being on the outside of the bucket, and so suffering a shock by the latter being swung, by the person who was lifting it from the forge, against an obstacle.

Dr. Henry J. Anderson.

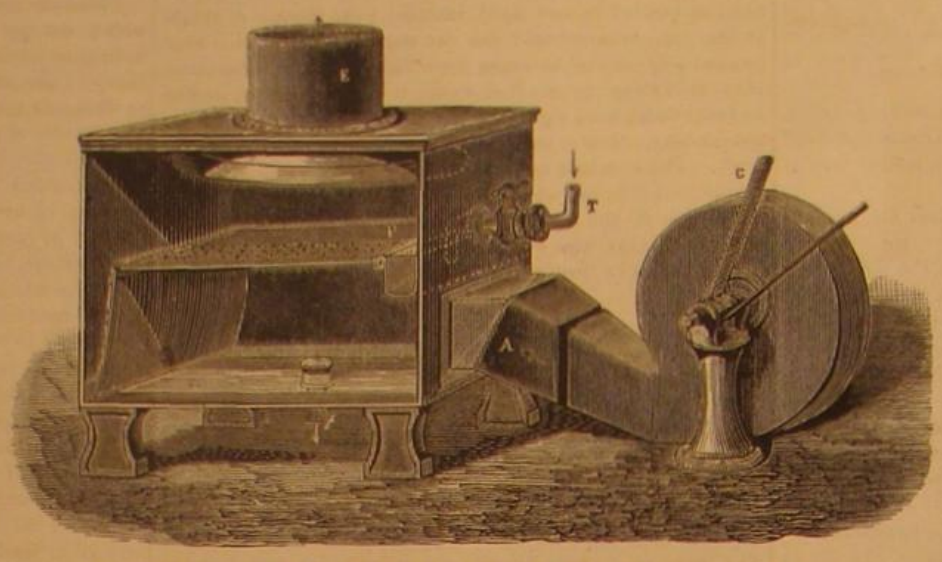
The funeral ceremonies of Dr. H. J. Anderson, who died in India several months ago, were recently held in this city. Dr. Anderson was formerly a Professor of Mathematics in Columbia College, and, although not distinguished for any especially great work, was nevertheless a gentleman of remarkably wide scientific attainments, and a vigorous promoter of scientific research and progress. He went to Australia to observe the transit of Venus from a station of his own selection, north of Melbourne; and on the way home, at Lahore, India, while making explorations in the Himalaya mountains, he contracted, through exposure, the malady which terminated his life. He was seventy seven years of age, and was the oldest living graduate of the abovenamed college.

Road Steamers.

Referring to the reward offered by the State of Wisconsin, of ten thousand dollars, for the invention of a road locomotive or steamer, capable of traveling five miles an hour on common roads, published in last week's SCIENTIFIC AMERICAN; In our SUPPLEMENT No. 6, issued this week, we give a drawing of the most recent English example of this kind of mechanism, from which it is possible that our inventors may derive useful hints.

A NEW AIR REFRIGERATOR.

We extract from *La Nature* the annexed engraving of a novel and ingenious device, which may be used with equal facility either as a refrigerator or as a heater or purifier of a current of air. A fan blower, at C, driven by the belt, forces a blast in by the conduit, A. The air passes up through a finely perforated plate, P, over which runs a stream of water, entering at T, and escaping below at *t*. The air finally emerges at E. If cold water, drawn from a well or cistern, or admitted from a running brook, be supplied at T, the air, by passing through it, becomes thoroughly cooled; and if hot water be used, the reverse is the case. At the same time the blast is deprived of any atmospheric germs or dust which may be in it, and is delivered purified. Or it may be impregnated with antiseptic or perfumed material, by suitably mingling such with the water. The apparatus is the invention of MM. Nézereaux and Garlandat, and would seem practicable for use in many localities.



NEZEREAUX AND GARLANDAT'S AIR REFRIGERATOR.

The Emperor Bell.

The third largest bell in use in the world was recently placed in the southern tower of the cathedral in Cologne, Germany. Three castings were made, of metal obtained by melting French cannon captured during the Franco-Prussian war. Two were unsuccessful, but the third was perfect. The twenty guns used weighed 50,000 German pounds, and to these was added 80,000 lbs. of tin. The time of melting was but ten hours, and twenty-nine minutes sufficed to fill the mold. The cooling continued for four weeks. The bell is 10 feet 8 inches high, and 11 feet 2 inches in diameter. Its total weight is over 25 tuns. Of the larger bells in existence, two, those of Moscow, weighing respectively 193 and 63 tuns, are broken. Pekin has one bell weighing 53 tuns, and Novgorod, Russia, one of 31 tuns—both of which are in use.

WOODWORKING MACHINERY IN ENGLAND.

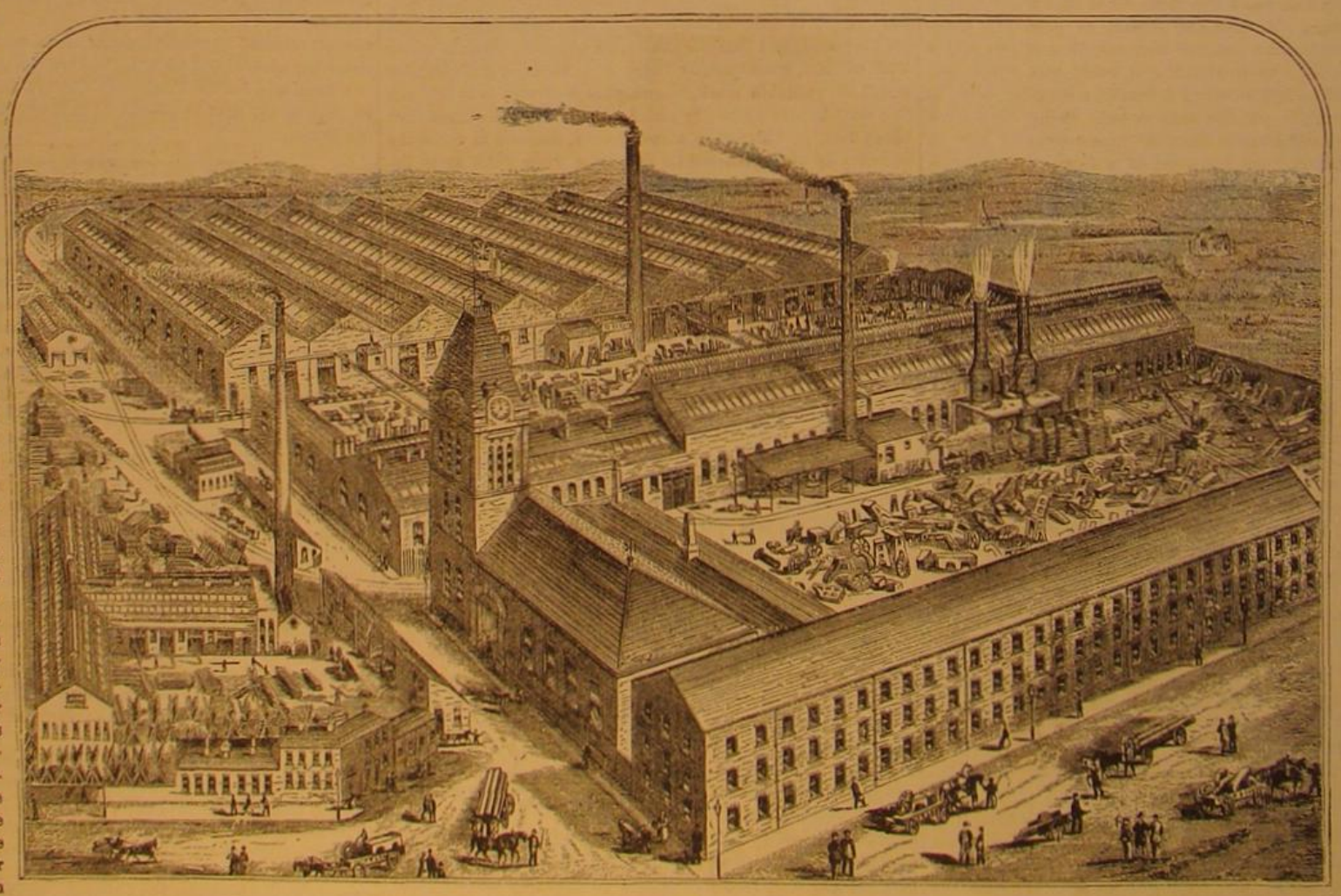
Our engraving gives an excellent birdseye view of a very extensive woodworking machinery establishment in England. It is owned by Messrs. Thomas Robinson & Son, and the *Timber Trades Journal* states that it is the largest factory in the world of its kind, machines for special woodworking operations, such as shipbuilding, cooperage, wagon building, door and window sash making, being constructed in large numbers, and railway and car-building companies being applied with complete sets of plant. The works cover an area of about seven acres, and give employment at present to 1,200 men.

The general arrangement may be seen from the engraving. The fitting shop is built in sheds, on one flat, except 178 feet of the end, which is built with a gallery round, and left open up the middle for a traveling crane. It has a total length of 537 feet, and a width of 103 feet. It is fitted up with all kinds of tools by the best known makers. There may be seen in different stages of progress all kinds of machinery for the conversion of timber to its various uses. Particularly to be noticed in course of erection are some very fine machines for railway wagon building for the Midland and the Lancashire and Yorkshire Railway Companies, and for the Japanese Government. All these machines, many of which are completed, exhibit strength combined with elegance. The galleried end of the fitting shop is devoted to the erection of steam engines, to the designing and construction of which this firm has paid especial attention, so as to make them suitable for the driving of sawing machines. The gallery round this shop is used for the fitting of small machines, principally saw benches and light engines.

Passing out of the fitting shop at the end, we come into the boiler shop, where boilers of all kinds are constructed, a specialty being made of those intended for sawmills, where it is desirable to burn up the waste from the machines. This shop is fitted up with a steam riveting machine, and all the most modern tools used in boiler making. The smithy runs parallel with the fitting shop, and is separated from it by a yard in which are stored the castings as they come out of the foundery. An overhead steam traveling crane runs the whole length of the yard, as far as the boiler shop, and is found very convenient both for economizing space and for loading purposes. The smithy is fitted up with steam hammers, forging, punching, and shearing machines, and all the most modern appliances. It is of proportionate extent with the fitting shops, being 298 feet long by 49 feet wide. Parallel with the smithy, a railroad and offices and stores intervening, stands the pattern shop and foundery.

The pattern shop is a large three-storied building, 183 feet long by 48 feet wide, the ground floor being occupied by pattern makers, and the upper rooms for storing patterns. Messrs. Robinson & Son turn out some very heavy castings, and their foundery is one of the special objects of interest. It is one of the largest in Lancashire, having a length of 316 feet by 94 feet wide, and is divided up the center by a row of massive cast iron pillars, on each side of which are two overhead steam traveling cranes, which traverse the whole length of the building, thereby effecting very great economy of labor. Outside the building are stoves for drying cores, sand-mixing sheds, grinding mills, and three cupolas for melting the metal. Another important branch of this establishment is the forge. Messrs. Robinson perform themselves all the various operations of converting the metal to a suitable state for the fitting shops. All shafts for log frames and engines, and other heavy forgings, are made here from the scrap produced in the other departments. The scrap is heated in two furnaces, the escaping gases from which pass at a high temperature through the flue of a vertical boiler, and are sufficient to generate steam for the supply of two large steam hammers, one of three tuns and one of one tun, underneath which the metal is worked. This not only prevents any waste of material, but insures to the firm a material for the principal working parts of their machines of exceptional strength and quality.

Separated by the street from the buildings just described, as shown on the left of our illustration, Messrs. Robinson and Son have a large woodworking establishment, where they have for many years carried on an extensive business in sawing up logs of timber, and working the same into various forms suitable for building purposes, such as doors, windows, and moldings of every variety. This, by giving practical experience of the requirements of the work, and of the actual working of the machinery for it, has doubtless conduced to the attainment of the simplicity and efficiency for which their woodworking machinery is especially renowned.



ROBINSON & SONS' WOOD-CUTTING MACHINE WORKS, ROCHDALE, ENGLAND.

Preserving Fodder and Leaves.

A correspondent of the *American Farmer* says that, when roots or potatoes are either frozen or in any way so damaged that they cannot keep good a long while, or when these products in the spring begin to grow or sprout, the only way to save them without loss is to preserve them in trenches. These trenches ought to be about eight feet broad, at least five feet deep, and of any length. The sides ought to be perpendicular, so that the mass may settle equally. To keep the food clean and to save all the juice, it is preferable to build these trenches of bricks laid in cement. The roots are cut, packed, and stamped as closely as possible; and should there be a great surplus of juice, chopped straw may be mixed with it, to enlarge the bulk. Salt is not at all necessary to preserve this fodder, but it may be used about in the proportion of a quarter of a pound of salt to one hundred pounds of leaves or turnips. Above the filled trench the fodder is to be heaped up like a roof, so that the rain water may run off easily. After this the heap is covered with tree leaves and with soil. A straw cover would be too porous, likewise a stiff soil is better than sand. The earth ought to be rammed so that a closed cover of about two feet and a half in thickness is formed; and should the soil begin to burst or to break, stamping ought to be repeated. The principal matter of importance is to keep off the atmospheric air, else the mass proceeds to molder and to putrefy. Leaves and chopped roots treated in this way will keep good many years.

The Old Grievance of Car Ventilation.

The vexed question of car ventilation, says the *National Car Builder*, has again come to the front, and is vigorously handled in the local columns of our city journals. The writers on the subject are doubtless commuters, who travel on the crowded night and morning trains that run to various points in the neighborhood of the city. A more severe test of their endurance can hardly be devised, and it is quite natural that the grumblers, in what they have to say, should speak feelingly. Fancy a car on a moist December evening, packed to its full capacity — doors and top ventilators closed, windows doubly closed with weatherstrips, and two stoves in full blast; then imagine a conglomerate odor, increasing in power every moment, made up of musk, baked peanuts, cigar stumps, kerosene, old boots, fried onions, and tanglefoot whisky—and the peculiar inwardness of the situation is partially realized. And yet, strange to say, the smallest current of outside air, let into this seething pit of foulness, is pretty sure to give offence to some one, and he too seeks an outlet for his indignation in the newspapers. This shows that the proper ventilation of cars is an impossibility so long as it is subject to the control of passengers.

THE MANUFACTURE OF DYNAMITE.

Our illustrations show the apparatus commonly used for the preparation of nitroglycerin, the dangerous substance to the peculiar properties of which the fearful slaughter at Bremerhaven is due. A contemporary states that Nobel, the inventor of dynamite, tried many experiments "in order to bring nitroglycerin within the range of articles of transport, and finally hit by accident upon the one which resulted in the production of the powder known as dynamite." This description is a severe criticism on the inventor and his discovery, for every change of temperature produces free nitroglycerin from dynamite, and the latter substance is thus far more dangerous than the former; and an attempt to send dynamite over land or sea will soon show how it is regarded

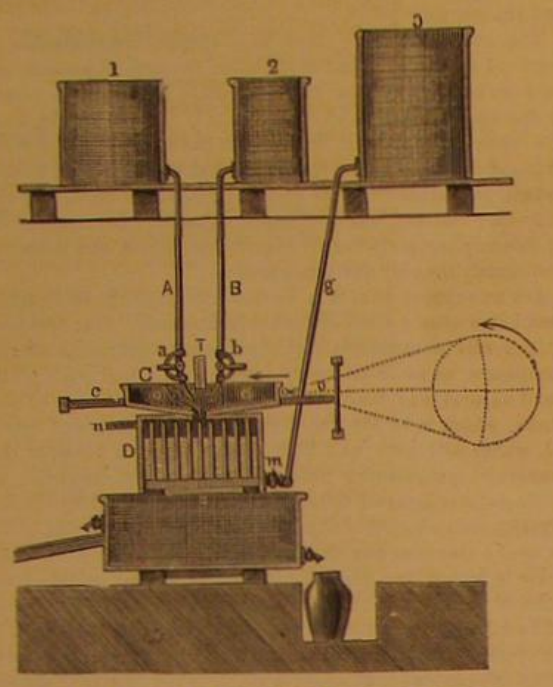


Fig. 1.—PREPARATION OF NITROGLYCERIN.

as an article of article of freight by railroad and ship authorities.

Nitroglycerin is usually commenced by mixing 2 parts nitric acid with 4 parts sulphuric acid. This mixture heats spontaneously, and is left for 24 hours to cool. Then 1 part glycerin is added to the combination of the two acids by the method shown in Fig. 1, the acids being in the vat marked 1, and the glycerin in vat 2, the vat 3 being a reservoir of water. The vats 1 and 2 communicate with a box, C, which is lined with lead, and divided into compartments which open into the trough, D. This box is provided with machinery to give it an oscillating motion, indicated by the dotted lines; it also has a thermometer to show the temperature. A constant stream of cold water is made to flow around the vat, D, and out at N. As soon as everything is ready, the acid is allowed to flow through A into C, and the glycerin through B into the same vessel. At the same time an oscillating motion is imparted to C by workmen who are stationed at a distance of thirty or forty feet, protected by a strong wall. As soon as all the glycerin has flowed in, the operation may be considered as ended, for the nitration takes place instantly. The oil from D is drawn into the vat below, which is half filled with water. The nitroglycerin sinks to the bottom and can be decanted from the dilute acids.

The nitroglycerin being now ready for use, the next step is to mix the oil with inert silica. The infusorial earth has three constituents which must be removed —water, organic salts, and coarse gravel. The first two are removed by calcining at a red heat in an oven with four shelves, one above the other, on which the earth is placed and slowly pushed from the upper to the lower. The organic matter which is considered dangerous to the stability of the dynamite, but which is less dangerous than the nitroglycerin, is thus burnt out. It is then pressed with hard rollers

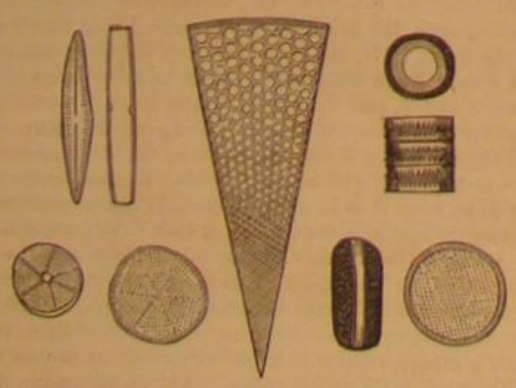


Fig. 3.—MICROSCOPIC ENLARGEMENT OF INFUSORIAL EARTH.

and sifted, which separates it from the larger grains. It is now ready for use.

Fifty lbs. of the infusorial sand are put into flat wooden tanks and covered with 150 lbs. nitroglycerin, when the workmen mix them with the naked hand. Gloves of india rubber were at first provided, but the workmen preferred to knead the mixture with the free hands. In half an hour the incorporation of the oil with the sand is complete, and the dynamite is ready for filling in the cartridge molds. The cartridges are simple cylinders, protected by parchment paper. If ordinary paper is used the oil soaks into it, and there is great danger of premature explosion. Dynamite is a brownish gray, sometimes reddish, inodorous, pasty, greasy mass, having the specific gravity of 1·6. When ignited by an ordinary flame it burns up quickly without detonation, and must therefore be fired with a patent exploder containing fulminate of silver inclosed in a copper capsule. When in its normal state, it requires a heavy blow of a hammer on an anvil to explode it, and even then only the portions struck are fired. Nitroglycerin, however, is easily exploded by percussion, and it exudes from dynamite on the slightest change of the temperature; and the wood of the boxes in which dynamite is packed becomes, by slow degrees, impregnated with nitroglycerin, and forms a most dangerously explosive material, which may give rise to serious accidents in warehouses where it is stored.

The sulphuric acid used in this dangerous manufacture is the oil of vitriol of commerce, an acid too well known to need description here. The nitric acid is usually made from native saltpeter, imported from Chili or elsewhere; and as it is required to be highly concentrated, the preparation of it is a peculiar process, which is shown in our Fig. 2. In a cast iron vessel, A, is placed the nitrate to be operated upon, to which is added, by means of a funnel, strong sulphuric acid. The lid is replaced, and the vessel connected, by means of the clay-lined tube, B, with the glass tube, C, dipping into the large stoneware flask, D, which serves the purpose of a receiver. This flask is connected by means of a tube, *a*, to a similar vessel, D′, and that to a third vessel, D″, and so on, in order to completely condense the vapors which might have escaped through the first, second, and third vessels. The iron vessel, A, is heated by means of the fire placed in the hearth, F, the smoke and hot gases being carried off by G, H. At the outset of the operation, the damper, *d*, is so regulated as to shut off the lower channel and cause the smoke and hot gases to pass through E, heating the vessels, D, D′, and D″, this precaution being required to prevent their cracking by the hot acid vapors entering from A. As soon, however, as the distillation has fairly commenced, the damper is altered to shut off E, and pass the hot air and gases through G. The product from each retort is so mixed that the average specific gravity shall be equal to 47° or 48° B. A weaker acid than this does not work well.

The acids being mixed as above described, the next step is the mixture of them with the infusorial earth, called by the Germans *kieselguhr*, which is found in most countries. The polishing powders known as tripoli and electro-silicon are specimens of it; and it is composed of the skeletons of a vast number of diatoms, which yield a spongy silica, admirably adapted for a polishing powder, or as an absorbent for oils and liquids. It is also used in the preparation of soluble

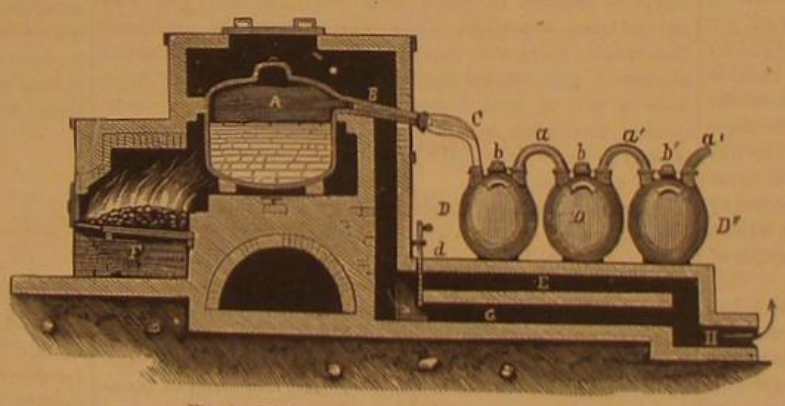


Fig. 2.—PREPARATION OF NITRIC ACID.

glass for pigments, and fireproof packing and numerous other purposes. A microscopic view of a portion of this substance is shown in Fig. 3, which fully exhibits the remarkable porosity which makes it adaptable for absorbing the perilous fluid which gives it its efficiency as an explosive.

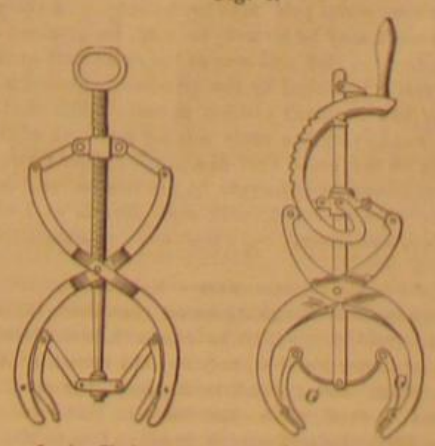
BOOT AND SHOE APPARATUS.

The illustrations, selected from Knight's "Mechanical Dictionary,"* given herewith represent apparatus used in the manufacture of boots and shoes. The engraving, Fig. 1, represents

LASTING TOOLS,

which are employed to grip the upper leather of a boot or

Fig. 1.



Lasting-Pincers. *Tool for lasting Boots and Shoes.*

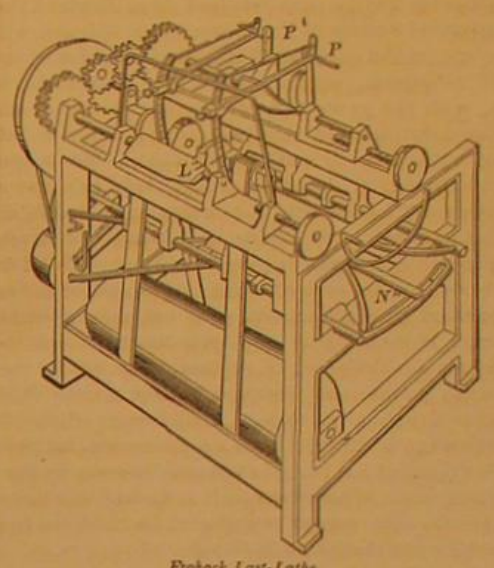
*Published in numbers by Messrs. Hurd & Houghton, New York city.

shoe, and draw it over the last. In the tool on the left, the two jaws act simultaneously upon the leather through the motion of the nut, C, upon the screw. The same movement brings the jaws toward each other and stretches the leather around the last. The two pairs of jaws in the second tool engage the sides of the leather, and are then drawn thereupon and also inwardly by the action of the cam lever. Lasts are usually made upon the ordinary type of lathe employed for turning irregular forms. For this purpose, however, special machinery has been devised, to which class belongs the

LAST LATHE,

represented in Fig. 2. In this machine, the block, L^5, from which the last is to be cut, is, by a train of gearing, made to present a face to the cutters precisely corresponding to the face of the model against the guides, P P^4. By moving links on these rods, up or down on their graduated scales, the last

Fig. 2.



Frohock Last-Lathe.

may be enlarged or reduced in its relative proportions to the model. A similar variation of the bar, N‴, on the sector at the end of the machine, will vary the work in relation to its length as compared with that of the model.

In Fig. 3 is a

BOOT SHANK MACHINE,

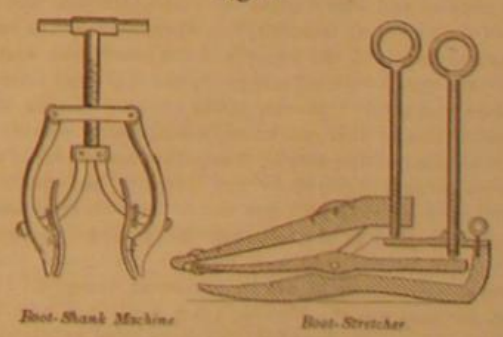
used for drawing the leather of the upper or boot leg over the last into the hollow of the shank. The leather being placed over the last is inserted between the jaws, which are pivoted to the plate. The screw connecting the jaws by arms is thus turned, causing the jaws to be brought together, and thus stretching the leather. The same figure also shows a boot stretcher, for stretching the uppers. The last is divided into an upper and an under section which are connected by a lever. The fore end of the upper section is pivoted to the fore end of the lever, and the middle end of the lever has its fulcrum at the mid-length of the lower section. The screws operate to raise the rear end of the upper section directly, and its fore end through the medium of the lever. The upper surface of the last has changeable knobs to stretch the leather in particular places.

Fig. 4 represents a

BOOT HOLDER

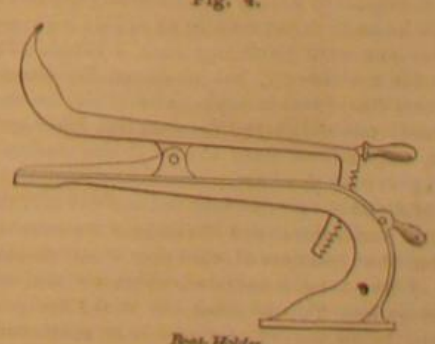
or jack, for holding the boot during the process of manufacture. The base piece is attached to the bench and has a stationary prong. The movable prong containing the foot piece is attached to the other, and is held at its adjustment by a rack and pawl. The operation may be clearly

Fig. 3.



Boot-Shank Machine. *Boot-Stretcher.*

Fig. 4.



Boot-Holder.

understood from the engraving. A similar device is sometimes used to stretch the boot while blacking or varnishing it.

Fig. 5 shows a boot sole with steel calks attached, for the use of pedestrians in winter weather or when scaling the snowy tops of mountains or crossing glaciers. These calks are readily arranged to screw into plates fastened to the sole and heel of the boot, and are then removable at will. In walking over ice, these or similar appliances are indispensable; and many bruises, and sometimes limbs and even lives, have been saved by their use.

Fig. 5.



Boot-Calk

Correspondence.

Employers and Trade Unions in England.

To the Editor of the Scientific American:

Intelligence having been received from England that the Amalgamated Society of Engineers is in dispute with the employers, on the question of the re-introduction of the system of piecework, which dispute has culminated in one strike, with the probability of the occurrence of others, I take the opportunity of ventilating this question a little, premising my remarks by stating that they are based upon personal knowledge of the actual facts. As a rule the editors of newspapers have very little mercy upon trades' unions, and this has been often said to be because the interests of newspapers lie with the employers of labor. This I believe to be a mistake, for even a mechanical newpaper has as large a circulation among workmen as it has among employers. The truth is rather that employers are more apt to avail themselves of the press, to present their side of the question to the public, and workmen are not usually skillful as writers or as special pleaders. Furthermore, editors, having no knowledge of the real evils of piecework (for piecework has its evils), and not being enlightened thereon by the workmen themselves, whose interest it is to ventilate that side of the question only, cannot be expected to form an equitable judgment upon the issues involved.

All the real causes of the opposition of trades' unions to the introduction of piecework will be found to be elucidated in the following recital of facts, in which it will be made apparent that, between employers and employed, there is, so far as abstract justice between them is concerned, but little to choose, and that the balance, if any there be, is decidedly in favor of the workmen, excepting in so far as acts of violence are concerned; and the occurrence of these acts is due only to the fact that a strike or lockout renders the condition of the workman a positively desperate one, whereas to the employer it is a mere question of his capital lying idle.

Public opinion is largely influenced by the publications of such works of fiction as Charles Reade's "Put Yourself in his Place," in which injustice is done to the workman, not in describing the terrible deeds which have been wrought by one workman on another, but by gathering together isolated cases of extreme violence, and attributing them all to the hero. This was perhaps a necessity for the author, in order to give this book the flavor of sensation necessary to the success of such works. But the excuse for the author by no means debars the artisan or trades' unionist from protesting against the injustice he sustains at the hands of the writer, whose impression on the public mind, by the description of such outrages, is grossly partial.

Towards the end of the year 1860, a young man who had been in business in South America and had returned to England, was re-engaged in the workshop in which he had served his apprenticeship; and having himself been an employer, he resolved to so perform his duties as a workman that he would prove to others that a good workman had only to study the interest of his employers to secure promotion. He wished to demonstrate that employers were watchful of those who were capable and who studied their interests, that the interests of the two were bound up together, and that the success of the one involved the success of the other; but alas! his employers were a railroad company, and that companies have no souls was amply "proven in the sequel." Labor was, in the estimation of this workman, a commodity whose value, like that of any other article, was just what it would fetch, its price being regulated by the quantity and quality delivered, and varying with the same. It was, therefore, not very encouraging to him to be told that it did not matter how much work he did, nor how well he did it, and that his wages at starting could not in any event exceed £1 12s per week, for that was the highest price paid to a new hand. That labor was not, therefore, the same as an article of merchandise, became to him at once painfully apparent; as it is not a rule of trade to pay less for an article because it is the first time you have purchased such a thing. There was nothing for it, however, but to accept the situation, and trust to time to obtain a higher rate of pay in the future. However, time passed, on, and the workman found no improvement in his condition until at last it was decided to have much of the work done by piecework. Accordingly a set of engine connecting rods were set aside to be fitted up by piecework, and some dozen workmen were selected and invited to give an estimate of what they would do the job for; and the young man in question, whom we will call Tom, gave the lowest bid and took the work, the price being sufficiently below the ordinary cost to be satisfactory to the managers. A set of axle boxes, other sets of rods, and several other jobs were done by Tom under similar conditions, he earning as much again as his day's work wages. This caused a sharp competition, as other workmen, anxious to better their condition, gave in lower prices; Tom, however, kept the lead, always managing by shrewdness, luck, or whatever else it may be termed, to take every job he bid for. Nothing daunted, however, his fellow workmen continued to compete, thus compelling Tom to either reduce his prices or lose the work. Some of the competitors bid because they would be satisfied if, by working piecework, they could increase their pay only twenty-five per cent; others competed upon general principles, saying that, if Tom could do it, they could. At length, however, Tom's repeated success discouraged competition, not, however, without raising some little feeling among the men, on account of his having, as was charged, cut the prices of the work down. This charge was scarcely fair, since it was in consequence of the competition of others that the prices had been reduced. It cannot, however, be denied that, since Tom was always the lowest, he was the most instrumental in the reduction of prices, notwithstanding the fact that his price was as a rule remarkably close to the next lower one. But the feeling among the men did not amount to positive estrangement, and it only found vent in upbraiding Tom by statements that he was ruining the trade and injuring the other workmen. At length, however, Tom began to make from 60 to 70 per cent more than his day's wages would have been: and this notwithstanding that the prices of his work had been very materially reduced since the piecework began. He innocently believed that the unusually low cost of his work, and the unusually large amount of his earnings, would open the eyes of his employers to his expertness, to the methods by which he saved time and work, or to whatever other cause may have enabled him to do so well. How far this was the case, he learned by an intimation that the prices of his work must be reduced because *no piecework man was allowed in that shop to earn more than 50 per cent more than his ordinary daily wages.* He pleaded that the cost of his work was at least 50 per cent less than the large quantity of the same kind of work being done in the same shop by men who had had from 7 to 15 years' experience on it. He was told it didn't matter what time the day's work men had taken, nor what their work had cost, or was now costing; he was making *too much money*, and must reduce his prices. He urged that, since no one else would take the work at so low a price as his, he could not perceive why he should be called upon to still further reduce the price; and he was informed that he must either reduce the prices of all those kinds of work on which he earned more than 50 per cent above ordinary day's wages, or else he would be put back to day's work on his old day wages; and as an alternative he had to reduce the prices

Now, this was not a new shop, or one in which a constant change of work was had; but, on the contrary, there had probably never been, at any one time during the then preceding 15 years, less than 70 workmen in that shop who were employed on the same kind of work, many of whom had been engaged for years on precisely the same jobs from the selfsame drawings. Tom learned from the old hands that similar rules with regard to the amount of earnings of piecework men existed throughout England, that the rules were a sort of tacit understanding, and that as a consequence piecework men who had any wisdom in them gaged it so as to never exceed the allotted amount of "time and a half," as it is called.

At this time Tom's reflections were anything but rose-colored, as he had commenced with the idea of being an example to other men and a student of his employers' interest; but although he had practically demonstrated the identity of interests of the employer and the employed, he had advanced sufficiently far in his programme to be on questionable terms with many of his fellow workmen, and at loggerheads with his employers. His situation, so far as his personal relations with his business acquaintances were concerned, threatened ostracism; he felt almost like a criminal, and was only consoled by the consciousness that, in his own mind, he could not believe that doing a large amount of labor for an unusually small price, which is perhaps the most severe language in which his struggle to better his condition can be termed, deserved the meted punishment. "So much work for so much money," and "the more the work, the more the money," sounded exceedingly well as aphorisms; but when the workmen shouted: "No extra work, and no extra pay," and the employer added: "No more pay, however much more work you may do," and (in the same breath) "*less pay for more work for you only*," it became exceedingly difficult for Tom to put his theory of identity of interests into any sort of practice. Tom found himself, according to the ordinary rules of commerce, the very worst paid man in the shop. In every article (as his work may be termed) he sold, he obtained a less price than any one else, and was at the same time grumbled at and virtually punished by the purchaser (his employer), because he had so many articles to sell; while that same purchaser was buying the same quality and kind of articles from others on the same spot at a much higher price. He, however, resolved to persevere in his course, and let the future take care of itself, with such results as I will describe in another letter.

PIECEWORK.

New York city.

A SIMPLE mode of roughing horses, practised in Russia, consists in punching a square hole in each heel of the shoe, which, in ordinary weather, may be kept closed by a piece of cork. When the ground is slippery, the cork is removed, and a steel spike inserted. If this steel rough be made to fit the hole exactly, it remains firm in its place, and is not liable to break off short at the neck, like some of the screwed spikes.

PRACTICAL MECHANISM.

BY JOSHUA ROSE.

NUMBER XLI

TO DIVIDE A CIRCLE INTO ANY NUMBER OF EQUAL PARTS.

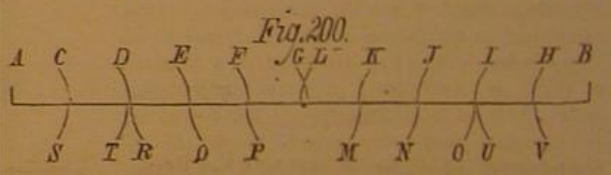
When a circle requires to be marked with a number of holes equidistant from each other, it is a very difficult matter to set the compasses so that, commencing at any one point and marking off the centers of the holes continuously in one direction, the last center marked will come true with the one first marked: because, if the points of the compasses are only one half the thickness of a line out, the error becomes, supposing the circle to require 60 holes around it, 60 times as great in the distance between the center last marked and the starting point.

The consequence is that it is almost impracticable to mark off any large number of holes in such a manner, not only on account of the frequent trials necessary to obtain so fine an adjustment of the compass points, but because the frequent trials will leave upon the surface of the work so many compass marks that those last made become almost indistinguishable from the other and incorrect ones. By the following method, however, such holes may be marked off, sufficiently correctly for all practical purposes, and more expeditiously than by any other means:

Let us suppose that it is required to mark off 60 equidistant holes upon a circle 30 inches in diameter. Our first procedure will be to ascertain at about what distance to set the compasses, so as to be nearly correct at the first trial. The most natural way would be to find the circumference of the circle, which is 94·248, and divide it by the number of holes, 60, which will give us 1·5708 as the distance between the centers of neighboring holes. The difficulty, however, of setting the compasses to the distance represented by the decimal fraction becomes apparent; and though this plan gives as near a result as any that can be arrived at, even in those cases in which the diameter of the circle may contain fractions of an inch and the number of holes required may be an odd one, still, in the matter of our example and, in fact, in all circles of whatever diameter, if the required number of holes is even, we may adopt a much better plan as follows:

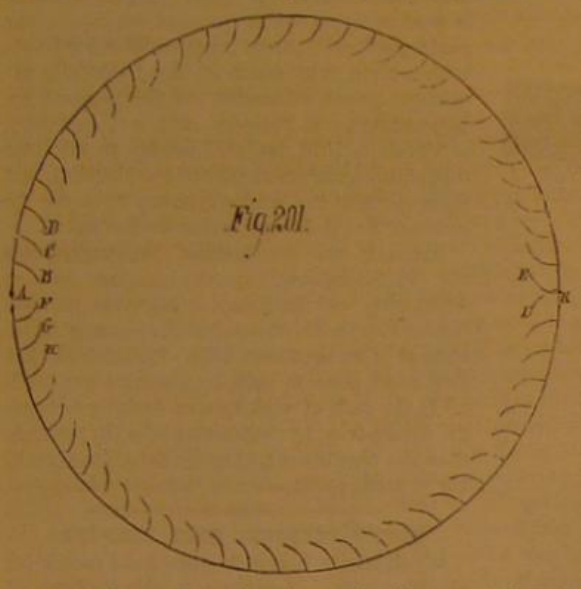
We know that the radius of any circle will divide its circumference into six equidistant points; and since we require ten times as many of such points, we have only to divide the radius of our circle into 10 equal parts to get the required distance, between the compass points, more correctly than by any other method. In many cases a simple mental calculation will give us the required distance. If, for example, our 30 inch circle requires to be divided into 18 equidistant points, we would say: If the radius (15 inches) of the circle gives us 6 points, one third of it, 5 inches, will give us 18 holes. Such instances are, however, the exceptions; and it is therefore necessary, in all cases where the required number of holes or points is an odd one, to divide the circumference by their number; and if an even number be required, to divide it into the radius of the circle, which may be done readily enough if the number of holes is small, but if they are many, the following method is the most expeditious: In Fig. 200, let A B represent the radius, 15 inches, of

Fig. 200.



our circle, and therefore the distances between any two points when the circle is marked off into 6 equal divisions. It is apparent, then, that each of such divisions will require to contain ten equidistant points, which we mark off as follows: Setting the compasses as near as practicable to $\frac{1}{10}$ of the radius of our circle, we commence at A, and mark on one side of the line only the line, C, and from that the line, D, and so on up to G. Then recommencing at B, we mark off in like manner the lines, H, I, etc., up to L, and the exact center between the lines, G and L, will be the true position for the center hole, notwithstanding that none of the other points are in their proper positions, nor at proper distances apart. We now note that, as the lines, G and L, overlap one another, the compass points were a shade too wide open. This defect we remedy to the best of our judgment; and starting from the center point, between L and G, we mark off the lines, M, N, and O, on one side, and P, Q, and R, on the other. Then commencing again at A, we mark off the lines, S and T, and then from B, the lines, U and V: the junction of the lines, T and R, forming another true point, and that of O and U forming another, the fifth practically true division. It will be readily observed that, by marking the lines, from C to L, on one side only of the line representing the radius of our circle, and then subsequently marking the lines, from O to V, on the other side only of the said radius line, we keep them distinct, and are enabled readily to perceive the difference between them. For all ordinary purposes our compasses will now be set sufficiently exactly; but if a greater number of holes be required, we make a light centerpunch mark at the points, A and B, and at the junction, in the center of the nearest approach of the lines, T, R, O, and U; and rubbing out or chalking over all the lines save the one representing the radius, we proceed as above to mark out other holes to justify the compass points' distance. The centerpunch marks, however, should be made very lightly, and all of about one depth. If this second adjustment is necessary, it may be concluded by commencing at A and continuing on to B, so as to have the longest possible distance for the justification.

Whenever the number of holes required is a multiple or divisor of the diameter of the circle, we may obtain the first approximate distance of the compasses as follows: Every inch of the diameter of the circle represents 3·1416 inches of its circumference; and since, in our example, the diameter of the circle is supposed to be 30 inches and the number of holes required is 60, it is evident that every 3·1416 inches of the circumference will have to contain 2 holes; and therefore 3·1416÷2=the proper distance of the compass points. Had the number of holes required been 30 instead of 60, their distance from center to center would be 3·1416 inches, while had their number been 15 their distance from center to center would be 6·2832. Now supposing the compasses to be set as nearly as possibly correctly, we proceed upon our circle as follows: Commencing at A, Fig. 201, we mark off

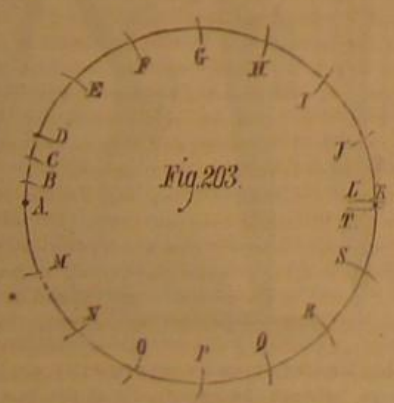


continuously one from the other, and taking care to be very exact in placing the point of the compasses exactly on the mark at its junction with the circle) the 30 points, B, C, D, etc , ending at E. Then commencing again at A, we mark off continuously and equidistantly the 30 marks, F, G, H, etc , ending at T; and the center, K, between the two lines, E and I, will be the true position of the point diametrically opposite to the point, A, from which we started.

It will be perhaps observed by the reader that it would be more expeditious and perhaps cause less variation were we to set the compasses to the radius of the circle and mark off the point, K, as shown in Fig. 202, commencing at the point,

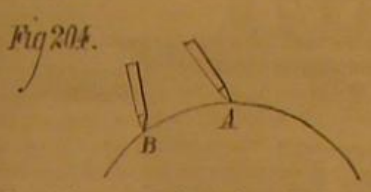


A, and marking off on the one side the lines, B, C, and D, and on the other side, E, F, and G, the junction or center, between G and D, at the circle being the true position of the point, K. For circles struck upon flat surfaces, this plan is decidedly advantageous: and in cases where there are not at hand compasses large enough, a pair of trammels may be used for the purpose; but our instructions are intended to apply also to marking off equidistant points on such circumferences as the faces of pulleys or on the outsides or insides of rings or cylinders, in which cases the use of compasses or gages is impracticable. The experienced hand may, it is true, adjust the compasses as instructed, and mark off three or four of the marks, B, C, D, etc., in Fig. 201, and then open out the compasses to the distance between the two extreme marks, and proceed as before to find the center, K, but as a rule, the time saved will scarcely repay the trouble; and all that can be done to save time in such cases is, if the holes come reasonably close together, to mark off, after the compasses are adjusted, three or four spaces, as shown in Fig.

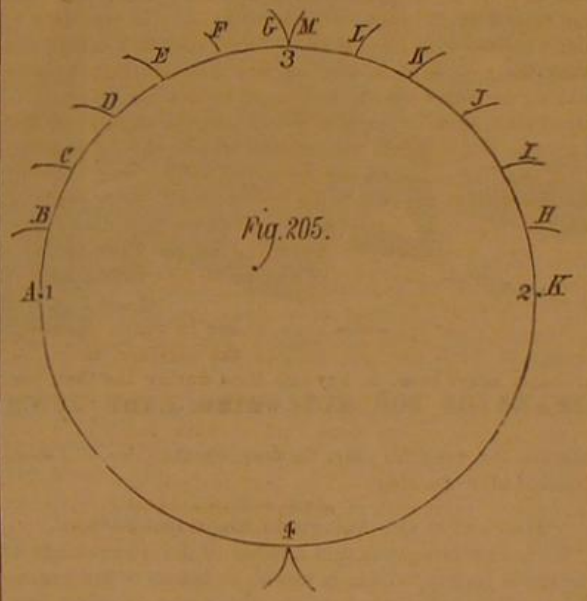


203. Commencing at the point, A, and marking off the points, B, C, and D, we then set the compasses to the distance between A and D, and then mark, from D on one side and from A on the other, the marks from F to L and from M to T: thus obtaining the point, K. This method, however expeditious and correct for certain work, is not applicable to circumferential work in which the distance between two of the adjacent points is at the most $\frac{1}{20}$ of the circumference of the circle; because the angle of the surface of the metal to the compass point causes the latter to spring wider open in consequence of the pressure necessary to cause the compass point to mark the metal. This will be readily perceived on reference to Fig. 204, in which A represents the stationary, and B, the scribing or marking point of the compasses.

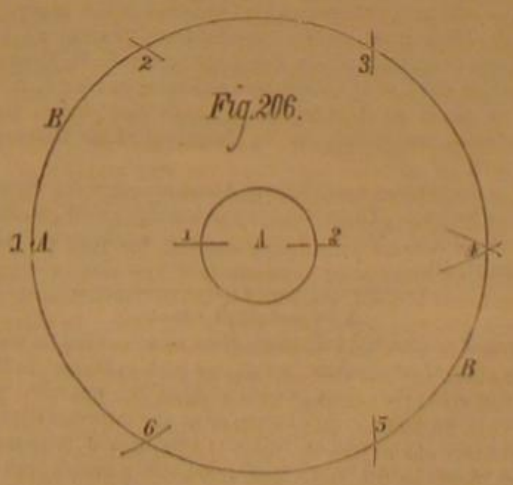
Having found the two diametrically opposite points, A, K, we note how much out of true the two lines last marked, E and I, in Fig. 201, vary, and we alter the compass points (in this case) to $\frac{1}{60}$ of the variation, that is, we divide the amount, of the variation between them, by the number of holes or points required; and setting our compasses as nearly as our judgment dictates, we mark off our next two points, as shown in Fig. 205. Commencing at A, we mark off (on the other



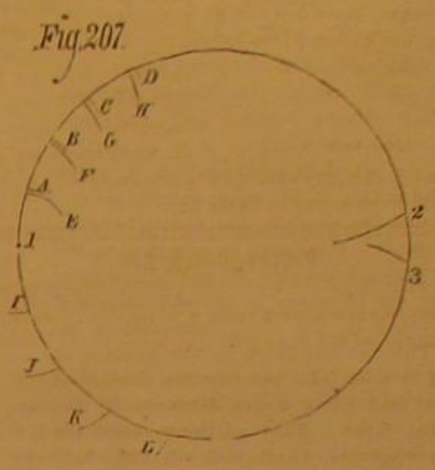
side of the circle, so as to keep them distinct from the marks previously made) the lines, B, C, etc., as far as the line, G, that is to say, we make as many of such marks as are equal to one quarter of the whole number required. The object of showing a less quantity in Fig. 205 is to keep the illustration distinct and clear. Then we start from the point, K, and mark off the same number of points, represented by the lines, H, I, and ending at M; the center between the lines, G and M, at their nearest point of contact, is the true position of point No. 3, the point, A, being No. 1, and K, No. 2. By proceeding in a similar manner on the other half of the



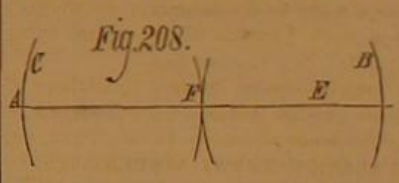
circle, we get the true position of point No. 4. If, in obtaining points 3 and 4, the compasses are not found to be set dead true, the necessary adjustment must be made; and it will be seen that, so far, we have obtained four true positions, and the process of obtaining each of them has served as a justification of the distance of the compass points. From these four points, we may proceed in like manner to mark off the holes or points between them; and the whole will be as true as it is practicable to mark them off upon that size of circle. In cases, however, where mathematical precision is required upon flat and not circumferential surfaces, the marking off may be performed upon a circle of larger diameter, as shown in Fig. 206. If it is required to mark off the



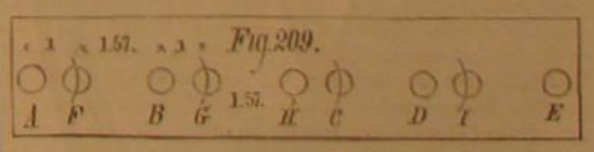
circle, A, Fig. 206, into any even number of equidistant points, and if, in consequence of the closeness together of the points, it becomes difficult to mark them (as described) with the compasses, we mark a circle, B B, of larger diameter, and perform our marking upon it, carrying the marks across the smaller circle with a straight edge placed to intersect the centers of the circles and the points marked on each side of the diameter. Thus, in Fig. 206, the lines 1 and 2 on the smaller circle would be obtained from a line struck through 1 and 4 on the outer circle; and supposing the larger circle to be three times the size of the smaller, the deviation from truth in the latter will only be $\frac{1}{3}$ of whatever it is in the former. If the number of points to be marked off on any circle is an odd one, the only variation from the above instructions is as follows: Suppose that we have commenced at the point marked 1, in Fig. 207: we mark off half the re-



quired number of holes on one side and arrive at the point 2; and then, commencing at the point 1 again, we mark off the other half of the required number of holes, arriving at the point 3. We then apply our compasses to the distance between the points 2 and 3; and if that distance is not exactly the same to which the compasses are set, we make the necessary adjustment, and try again and again until correct adjustment is secured. It is highly necessary, in this case, to make the lines drawn at each trial all on the same side of the circle and of equal length. For example, let the lines, A, B, C, D, in Fig. 207, represent those made on the first trial, and E, F, G, and H, those made on the second trial; and when the adjustment is complete, let the last trial be made upon the outside or other side of the circle, as shown by the lines, I, J, K, L. Having obtained the three true points, marked 1, 2, and 3, we proceed to mark the intermediate holes, as described for an even number of holes, save that there will be one more mark made on one side of holes 3 and 4 than there are on the other side of them. In cases where mathematical exactitude is not a requisite, and an odd number of holes is required, after setting the compass points as nearly true as necessary, and obtaining from them the points 2 and 3, we may take another pair of compasses, and find with them the center between points 2 and 3. Then taking the first and adjusted pair of compasses, we make a mark, as shown in Fig. 208. We first draw the line, E, and, resting one leg of the compasses on the point, A, we draw the segment of a circle, B; then resting the point of the compasses on the point of intersection of B and E, we draw the segment of a circle, C. The distance, at E, between the two segments, B and C, represents the required distance apart of the holes. We now take our extra pair of compasses, and find the center of B and C, as denoted by the point, F, setting the compasses to the exact center, so that, when one point rests on F, the other will come fair with the lines, B and C. We turn to our work represented on Fig. 207; and from the center found between points 2 and 3, we make, with our extra pair of compasses, a mark on each side of that center, which will represent the correct position of points 2 and 3; and we then correct the variation between them nearly enough for ordinary purposes without the tedious process of going over the whole ground again, because the distance between points 2 and 3 was not precisely correct.



In marking off any number of holes varying in their distances one from the other, the variation being regular, as for instance holes around a 30 inch circle, 60 in number but each two holes being 1·57 inches apart, the distance between the next two would require to be 1 inch, and so on, as shown in Fig. 209. The total number of holes must in this case be an even one; hence we mark off, by the rules already given, one half of that total number, making them equidistant all round the circle or circumference, as the case may be, which points will represent the distance apart of the holes that are widest apart, as the holes, A, B, C, D, and E, in Fig. 209,



amounting in our example to 30 in number. We then set our compasses to the required distance apart of the two holes nearest together; and commencing at A in Fig. 209, we mark the center for the hole, F, and from the center of the hole, B, the center of the hole, G, and so on, continuing all round the circle, but taking care to mark the new center in each case in advance of or behind the points, A, B, C, etc., according to the manner in which the first of the holes nearest together was marked. Thus in Fig. 209, the points, F, G, H, and I, are marked to the right, in each case, of the points from which they were struck.

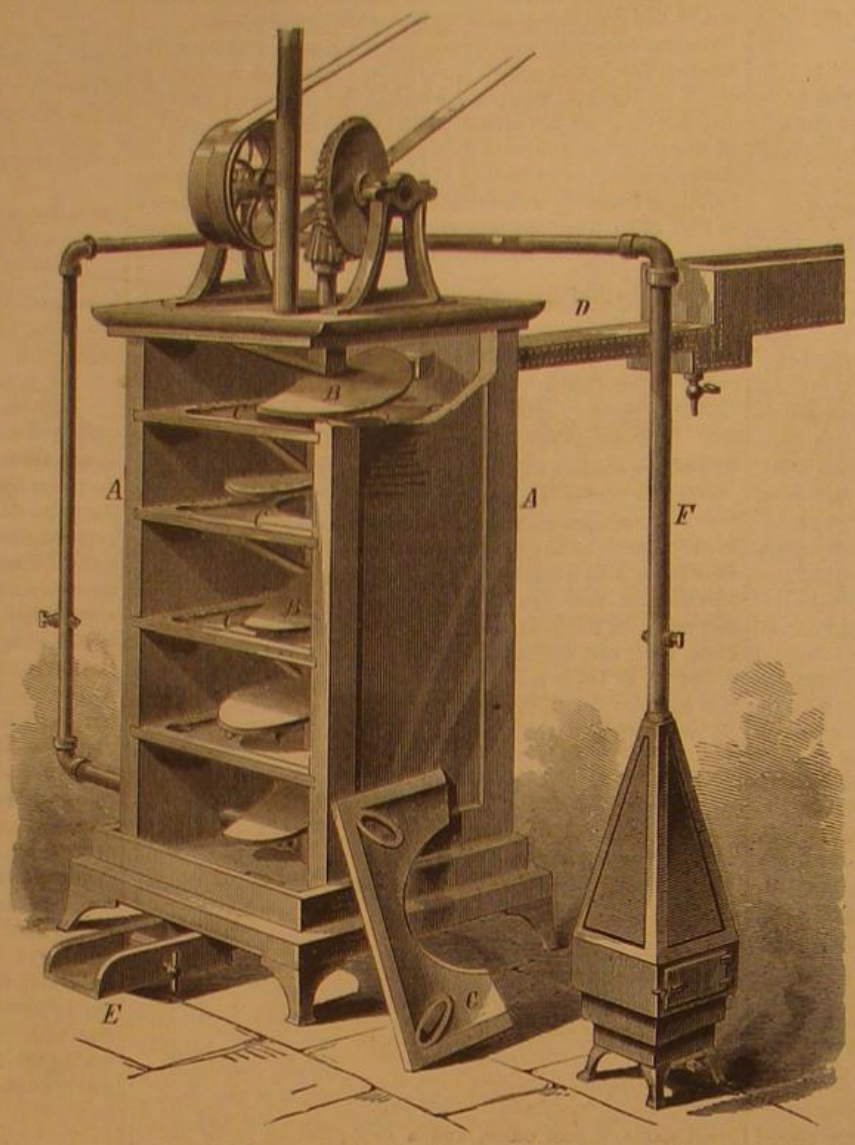
There are of course many variations in the grouping of holes around a circle, but all the principles involved in marking them off are shown in the examples given above.

IMPROVED SULPHUROUS ACID APPARATUS FOR BLEACHING CANE JUICE.

We illustrate herewith a new apparatus for bleaching cane juice through the action of sulphurous acid gas. It is claimed to introduce less acidity into the juice, and consequently to produce sugar more dry and of a superior grain to that ordinarily made by machines in use, to obviate the use of bone black in the clarification of refined sugar, to work uniformly in any kind of weather, to bleach efficiently, to admit of easy cleaning and repair, and to be adapted to any mills. A is an airtight chamber, in which is a vertical shaft which carries the wings, B, the latter extending spirally around the shaft in the spaces between the shelves, C. The juice is admitted to the chamber through the pipe, D, and falling upon the upper set of wings is thereby dispersed and collected by the shelf immediately beneath. Through apertures in the corners of the shelf it then falls, meeting the second set of wings, and being again dispersed by the centrifugal force. This continues until the lowest compartment is reached, when the fluid escapes by the pipe, E. In both pipes, E and D, are sealing chambers, which prevent entrance of air into the main chamber, A.

The sulphurous acid gas is generated by burning sulphur in the furnace shown, out of which it passes by pipe, F, which extends over the apparatus and finally enters the lower compartment. The gas is about two and a half times heavier than air; and in order to produce a draft sufficient to draw it up and through the chamber, A, the wings, B, are again utilized, so that they thus perform a double office. These wings, rotating at the rate of 300 revolutions per minute, necessarily produce a strong upward current, which therefore meets the descending liquid, which is already beaten into a fine spray. That the latter will thus be brought into intimate contact with the bleaching agent is obvious; and furthermore, it will be observed that the cane juice, just before it is drawn off, meets the freshest supply of entering gas. The juice thus bleached, if left to rest and defecate at least ten hours, will have, we are informed, a most beautiful appearance, and will make a very superior quality of liquor. The machine acts especially well in treating cane badly injured by frost, and has already been practically tested on a large scale.

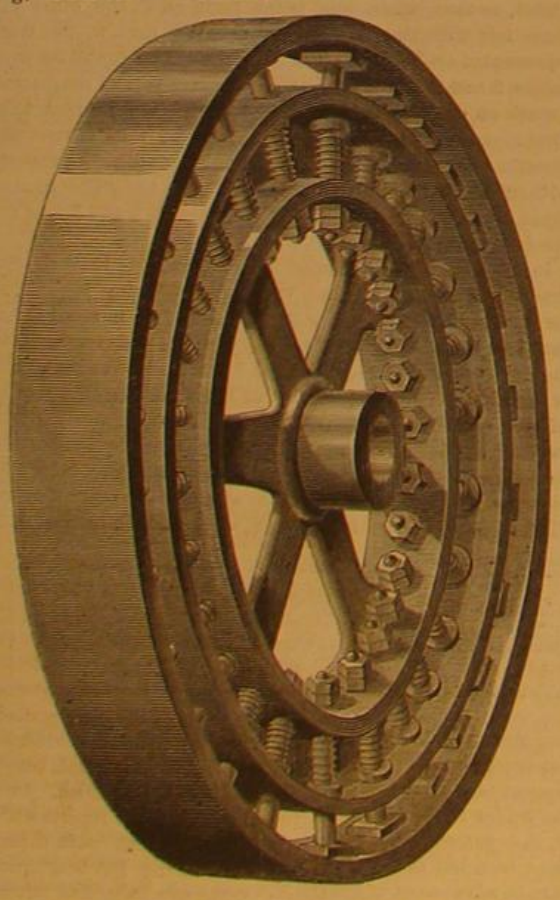
Patented March 30, 1875. For further particulars address the manufacturers. Messrs. Lescale & Guedry, Paincourtville, Assumption Parish, La.



APPARATUS FOR BLEACHING CANE JUICE.

HARDING'S CUSHION EMERY WHEEL.

We illustrate herewith a new form of emery wheel, the principal feature in which is the flexible or cushion rim. This is so constructed as to be soft and yielding to pressure, thus especially adapting it to the polishing of articles, both heavy and light. The rim is also adjustable, and never needs truing, and is therefore durable and economical.



The device is composed of a strong cast iron wheel having a double periphery, through which several apertures are made. The outer rim consists of several layers of leather or other suitable material, firmly cemented together and varying in thickness from one half to three quarters of an inch, according to the purpose for which the wheel is needed. This leather rim is attached to T-headed bolts which rest on springs, as shown, and are set up and adjusted by nuts within the inner periphery of the wheel. In operation the flexure of the rim will move around the wheel in wave form, as the object to be ground is pressed against its surface, the transfer of pressure from one point of support to another taking place in a perfectly uniform manner.

Patented January 17, 1871. For further particulars, relative to sale of rights for Eastern and Southern States, etc., address the inventor, Mr. Thomas Harding, No. 3 Second street, Lafayette, Ind.

Journal of the American Electrical Society.

We have received the first number of the Proceedings of the above society, which, in respect to beauty of typography and excellence of contents, is one of the most valuable documents we have seen for a long time. The Society comprises among its members all the principal practical discoverers and workers in electrical science, and perhaps it is therefore not surprising that the selections of its contributions to electrical knowledge should be unusually good.

The first article is by Elisha Gray, whose remarkable inventions in the transmission of musical sounds by telegraph have from time to time been noticed in the SCIENTIFIC AMERICAN. The present article gives a full and intelligible description of them, and the article is of so much interest that we reproduce it in full, with its excellent illustrations. It will be found complete in our SCIENTIFIC AMERICAN SUPPLEMENT, No. 6. We are indebted to the Society for a loan of the excellent engravings that accompany the paper. Mr. F. W Jones contributes to the Society's journal an excellent paper on Quadruplex Telegraphy: Mr. C. H. Haskins, a paper on the Use of Condensers as Repeaters: Mr. I. N. Miller, a paper on Lightning and Lightning Rods: Mr. R. H. Jewett, an article on an Improved Line Galvanometer etc.

For the present year, General Anson Stager is the President of the Society. The publishing committee are W. H. Smith, F. W. Jones, M. G. Kellogg. The headquarters are at Chicago, Ill.

A Wonderful Clock.

One of our foreign exchanges gives an account of "a marvellous piece of mechanism, which just been exhibited in Paris. It is an eight day clock, which chimes the quarters, plays three tunes every twelve hours, or at any intervals required. The hands go round as follows: One once a minute; one once an hour; one once a week; one once a month; one once a year. It shows the moon's age, the rising and setting of the sun, the time of high and low water, half ebb, and half flood; and there is a curious contrivance to represent the water, which rises and falls, lifting some ships at high water tide as if they were in motion, and, as it recedes, leaving them dry on the sands. The clock shows the hour of the day, the day of the week, the day of the month, the month of the year; and in the day of the month provision is made for the long and the short months. It shows the signs of the zodiac; it strikes or not and chimes or not, as may be desired; and it has an equation table, showing the difference between the clock and the sun for every day in the year."

Working Men's Lodgings at the Centennial.

Our excellent contemporary the Philadelphia *Public Ledger* quotes approvingly our recent suggestions regarding the providing of cheap quarters for working men who may be enabled to visit the Centennial, through concerted action of trades' unions and other societies, but adds that good cheap accommodations are already in existence. The editor says: "As to the matter of lodgings at moderate rates, the SCIENTIFIC AMERICAN may assure its artisan readers that here, if anywhere in the world, working men can secure good, respectable, comfortable, and desirable lodgings and board at moderate rates, for all that may come—unless they come in armies more than a hundred thousand strong in one day." We are certainly glad to learn the above, and no doubt our readers will be likewise; but on the other hand, with a vivid recollection of the frightfully exorbitant prices demanded for the meanest accommodations at Paris in 1867, and especially at Vienna in 1873, we still adhere to our idea that cheap quarters cannot be too plentiful, and therefore that the work suggested by us for the societies would by no means be useless.

Athough we are inclined to congratulate the Philadelphians on the golden harvest which they will thus reap, it behooves us, and indeed everybody, to see that the reaping is restricted to its legitimate field. Philadelphia has very much more to gain, by placing every facility in the path of working men desiring to benefit themselves by witnessing the Exposition, than she possibly can have by her citizens seeking to profit pecuniarily by their attendance.

NOEL'S IMPROVED CORN PLANTER.

We illustrate herewith a new hand device for planting corn. According to the inventor, it may be manipulated so easily that the operator may traverse the field as rapidly as if the apparatus were but a walking stick carried in the hand. The invention is fully shown in Fig. 1, and in Fig. 2 it is represented in operation.

A and B are two bars connected together by pivots passing through overlapping plates near the lower ends. At the extremities are secured steel plates, C, which enter the ground and make an opening for the reception of the seed. Between the bars pieces of leather are attached, extending from the overlapping plates to the hopper, D. The seed contained in the latter is removed and dropped between the bars by the slide, E, which enters D through an aperture in the bar, A. The outer end of the slide is secured to bar, B. The seed enters a hole in the slide, indicated by dotted lines at F; and the size of the hole is regulated, so as to take more or less seed, by a suitable sliding piece.

To the bar, A, is attached a convenient handle, the end of which is pivoted to a short connecting bar, which is also similarly attached to bar, B. This allows of the easy operation of the bars, which carry the slide into and out of the hopper, thus allowing seed to pass to the plates, C, and thence, on the latter opening the ground, into the hole made. The object of the loop on bar, A, is indicated in Fig. 2, it serving to afford a secure grasp for the device. The rigid handle, G, may be held by the operator with one hand while he grasps the handle above with the other, so that both hands, when desired, may be conveniently applied. The spring shown between the upper parts of the bars holds the plates, C, together while the machine is being carried, and while said plates are being forced into the ground.

Fig. 1 Fig. 2

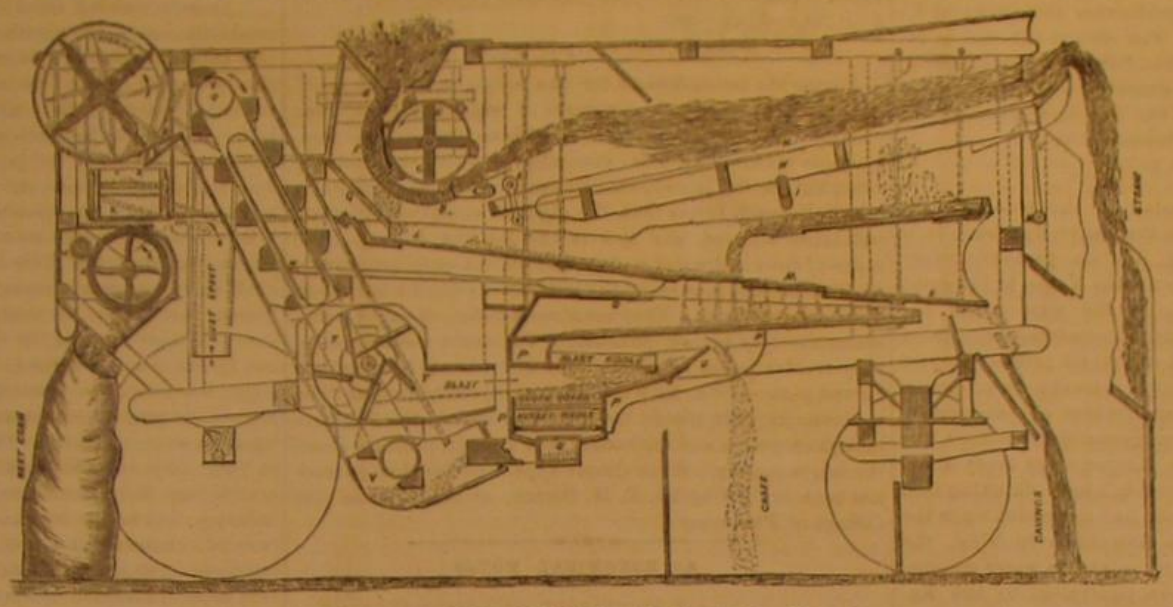


Patented through the Scientific American Patent Agency, January 4, 1876. For further information address the inventor, Mr. M. P. Noel, St. Cloud, Stearns county, Minn.

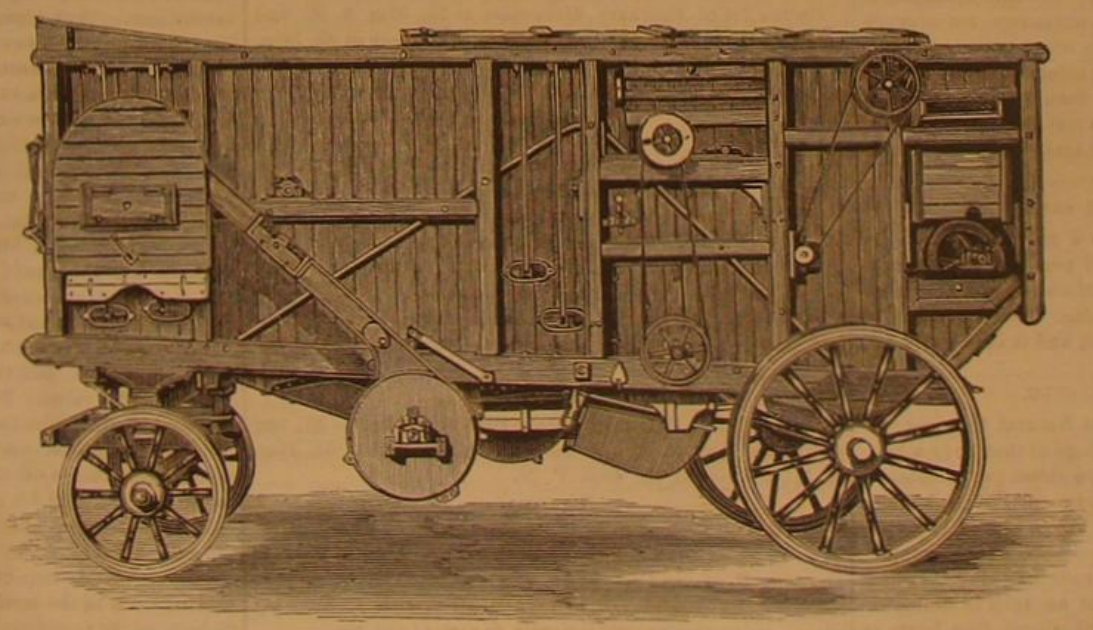
IMPROVED THRASHING MACHINERY.

We publish herewith an elevation of the exterior and one in section of an improved thrashing machine, recently constructed by Messrs. Wallis and Stevens, of Basingstoke, England, and exhibited by them at the recent Christmas exhibition of the Smithfield Club, held at Islington, London. Fig. 2, the exterior view, shows the machine as it stands in the rick yard or the field, and Fig. 1, to which all the letters in the following description relate, shows the construction and working of the machine. This thrasher resembles very much a similar English machine illustrated in this paper last year, but agriculturists will observe that it is quite different in its internal construction.

A is the feed mouth through which the unthrashed corn is fed into the machine. B B, adjustable mouthpieces for increasing or decreasing the size of the mouth to suit different descriptions of corn. C, the thrashing drum, which has a steel spindle, wrought iron head and rings, and either six or eight ash beaters—according to the size of the machine—fitted with Coucher's patent beater faces and plate iron fronts. D, the concave or breasting, made entirely of wrought iron, and provided with adjusting screws, E E, at the hinge, F, for regulating its distance from the drum. G G, casing behind concave which carries the thrashed corn as it passes through the bars of the concave down on the upper shoe on the riddle board, L. H H, the straw shakers worked by the shaker crank, I, each alternate shaker being attached at one end or the other by links, J J, turning on centers, K K. The shaker shakes out of the thrashed straw any loose corn which may be left in it. L, vibrating shoe on which the corn falls from the drum and shakers. In this shoe is fixed the perforated mahogany riddle, M, which separates the short broken straws—technically called "cavings"—from the corn. This, and also the lower shoe, is driven by connecting rods from the riddle crank, N. O, the lower vibrating shoe, to which is fixed the first winnowing machine, P. Both shoes are suspended from the framing of the machine on spring hangers, Q. P, the first winnowing machine, in which are placed an upper perforated zinc riddle marked "blast riddle," which assists the blast in separating the chaff from the corn, and a lower riddle marked "hussey riddle," for taking out the husks containing grains of corn—technically known as "husseys" or "chobs"—poppyheads, etc. S, spout for conveying the corn to the elevators. In the bottom of this spout is a third riddle—not shown in the section—for separating any small seeds which may be mixed with the corn. T, the fan which supplies the blast of air to the winnowing machine, P. Slides are provided to the openings in the center of the fan through which the air is drawn in, by opening or closing which the strength of the blast can be regulated to suit the particular sort of grain being thrashed; and by regulating these and raising or lowering the hinged flaps, U, at the back of the winnowing machine, the whole of the chaff can be blown over without carrying any of the corn with it. V, the elevator which carries the corn up and delivers it either into the barley horner, W, or else direct into the second winnowing machine without its passing through the barley horner at all. W, the barley horner, the steel blades of which are set at an angle so as to throw the corn out at the upper side of the horner casing, where it is marked "opening." By raising the hinge valve, X, by means of a handle outside the machine, the corn will then fall on the slope board, Y, instead of on the valve, and so pass direct into the second winnowing machine without passing through the horner at all. This arrangement is of importance, as some sorts of grain, and beans and peas, would be injured by being passed through the horner. Z, the second winnowing machine, which has a set of hard wood riddles for thoroughly separating from the grain any chaff, husseys, etc., which may have passed the first winnowing machine, or have been rubbed off in the passage through the horner. It is suspended on spring hangers and vibrated by a connecting rod fixed to the end of the upper vibrating shoe, L. A blast of air is blown through the winnowing machine by a fan fixed outside the framing of the machine, shown by the dotted line behind the barley horner. The husseys, etc., removed from the sample by the winnowing machine, as well as the dust and awns from the barley horner, are carried into the spout marked "dust spout," to the bottom of which a sack is attached to catch them. R, the Penny's patent adjustable rotary screen which separates the clean corn into three samples—namely, best corn, best tail, and small tail. A brush is used for keeping the rotary screen clean. Apparatus for lifting and bagging the chaff is often added, in which case the chaff can either be bagged or allowed to fall, as shown in the drawing, at pleasure. This apparatus is shown, in the external view, fixed to the side of the machine near the front end thereof.



IMPROVED THRASHING MACHINE.—Fig. 1.



IMPROVED THRASHING MACHINE.—Fig. 2.

The Chicago Stock Yards.

The business enterprise which characterizes the people of Chicago is best portrayed by the quick and substantial manner in which they have rebuilt their city. But some idea of the extent of the gigantic stock business of Chicago may be had from the following extracts from a recent article in the Chicago *Times*:

"Stock can now be got in condition for this and all eastern markets at these stock yards with a despatch and perfection unequaled anywhere on the face of the globe. The new works constructed make an imposing showing. A new exchange building has been finished, 50x137 feet in area, containing offices, restaurant, etc., heated by steam and otherwise comfortably arranged. There have also been built four yard offices, a hay barn, a corn crib, large horse sheds, a great stable, a post office, and a new printing press office. There has, however, been other and greater work even than this achieved. Think of twenty acres covered with new and superior cattle pens; and of ten acres of covered hog and sheep pens. There are also six new scale houses, equipped with Fairbanks' standard scales. Beside all this, over five acres of yards and alleys have been replanked. Over 5,000,000 feet of lumber has been consumed in this work of improvement. Twenty double-decked chutes have been made for the shipping division, twelve of these being for the Baltimore and Ohio Railroad. A mile of new water pipes has been laid. Over five hundred new gates, and about the same number of water boxes, have been made. A half mile of eight-feet sidewalks has been completed. The cost of this improvment has been more than $200,000. The company has about two hundred acres of land in active and continuous use for tracks, yards, roads, etc, the whole space covered by the demands of the place, roadway included, amounting to about three hundred and seventy acres. More than twenty-four miles of railroad track are operated at the stock yards; so that the company, in addition to its other features, is really a railway organization of no small pretensions. The rails used here are mostly of steel, and the equipment of the lines includes 160 frogs and switches connected with the various tracks. The stock yards proper contain 475 cattle yards, 675 covered hog and sheep pens, 375 chutes and pens, making a total of 1,525. There are also fifteen corn cribs and ten hay barns, besides the different weighing houses.

"A brief summary of figures will show how business at the stock yards has gone on during the progress of the improvements we have sketched. About four millions of live hogs have been received. Add to these about nine hundred thousand beef cattle and half a million sheep, and we have a total in round numbers of nearly five and a half million head of live stock received. Only about one fourth of that number has been shipped, the remainder having been consumed by the huge packing and other like interests having their headquarters in Chicago. The total valuation of live stock handled at the stock yards during the year 1875 is estimated to exceed a hundred millions of dollars."

A Good Suggestion.

A writer in *Engineering* says: The inadequacy of the present means employed for saving life at sea has been sufficiently demonstrated. No doubt much has been done by inventors to mitigate the perils of the sea, and it does seem a little hard that their exertions should prove of no avail, just because their inventions have not been allowed to get a fair trial. To alleviate this evil he suggests that a competitive exhibition might be got up of apparatus for saving life at sea, to test the relative merits of such inventions, and to enable the Board of Trade to decide what a vessel ought to carry. He also suggests that a ship ought to be provided with means to save at least one third more than her complement of passengers and crew, as it often happens in such circumstances that a boat is rendered useless, and this just means death to a certain number. Besides, did the passengers know that there was more than sufficient means to save all on board, it would help materially to allay any panic. As it is desirable to economize space on board ship, some of a ship's furniture might be utilized for saving life; for instance, the beds might be air beds of waterproof material, which, being provided with couplings, could easily be attached to one another and form a very good raft. Further, a raft provided with provisions and water might be kept in readiness to set adrift in any emergency, so that it could be picked up. He also advises that a whistle, or some such instrument, should be attached to each apparatus for saving life, in order that there might be some chance of those who are shipwrecked letting vessels know of their vicinity, especially at night. All these are good suggestions, applicable not only to England but to this country.

The Stereoscope as a Civilizer.

A "Quaker among the Indians" wishes that a good stereoscope, with suitable pictures, could be exhibited in every Indian camp and properly explained to the people, the effect of an exhibition of stereoscopic views among the Comanches being, according to his experience, most amusing as well as extremely salutary.

"As a body the Indians who have never been East, and, as a consequence, have seen but few white people, are disposed to disbelieve the accounts they receive respecting their numbers, the magnitude of their towns and cities, and the extent of the country they occupy. They believe that their own people who have been East have been duped by some kind of sorcery, or, as they would say, 'medicine.' They also think it is impossible to make an imaginary picture. Hence a picture is to them 'proof positive' of the existence of an original. Consequently, exhibiting towns, buildings, rural scenes and soldiers has had a most convincing effect. This was much hightened by having some mountain scenes from Colorado, familiar to them, and which they recognized at once. This was, in fact, the strongest adducible evidence that the accounts they had received were so far from being exaggerations that the half had not been told them. One middle-aged man, who has always treated these reports with the utmost skepticism, was particularly struck with them. He could not sufficiently express his surprise, but beat upon his mouth in utter astonishment. Sun Boy, who had often told him what he saw in the East, would say to him in Kiowa: 'What do you think now? You think all lie now? You think all chiefs who have been to Washington fools now?' Again and again would he look them over, with his hand upon his mouth, dumb with amazement. After he had looked them over several times, being a war chief, he called in his warriors, and exhibited the pictures to them, talking

to them all the time. I could understand but a part, yet would gather such expressions as these: 'Look! see what a mighty powerful people they are!' meannig white people. 'We are fools! We don't know anything! We just like wolves running wild on the plains!' Such an effect on the war chiefs and warriors cannot but be very salutary, and must conduce much toward deterring them from going on the war path against such a 'mighty powerful people.'"

SCIENTIFIC AND PRACTICAL INFORMATION.

THE LIGHTING OF LONDON.

The streets of London have an aggregate length of 2,500 miles, requiring about 5,000 miles of gas mains, and upwards of 54,000 public lamps, which consume something like 1,000,000,000 cubic feet of gas a year, or about 3,000,000 a day. The gas supply of the entire metropolis is about 14,000,000 cubic feet a year, or 38,500,000 cubic feet a day, requiring for its production the coking of 1,500,000 tuns of Newcastle coal. The cost of the coal is reported to be $8,750,000. The value of the residual products, such as coke, breeze, tar, and ammonia liquor is, as much as $3,500,000 The gas rental of the city is $15,000,000, of which $1,250,000 goes for street lamps.

THE CUCUMBER IN RUSSIA.

What the onion is to the Spaniard, or the potato to the Irishman, that the cucumber is to the native Russian. It is the indispensable part of every Russian peasant's every meal. In the account of his trip up the Volga to the great fair of Nijni Novgorod—which, by the way, packs the greatest amount of instructive and entertaining description in the smallest space of any book of travels printed the past season—Mr. Munro Butler Johnstone remarks the profusion of water melons and cucumbers everywhere offered for sale. At the fair and on the road thither, pyramids of melons, like cannon balls in an arsenal, were heaped up in every direction; and as for cucumbers, one couldn't help thinking that a plague of cucumbers, like locusts, had descended upon the earth. All along the Volga, from Astrakhan to Nijni, the whole population seemed engaged in eating water melons, which were sold for three copecks, equivalent to one English penny, two cents. At every station the trade in melons was rivaled only by the traffic in sunflowers.

But if the water melon and the sunflower are luxuries and pastimes, the cucumber is a law and a necessity. One never sees a Russian peasant at dinner without a lump of black bread and a cucumber. "A moujick's dinner may be said to consist of x + cucumber." The x will consist of his favorite cabbage soup, with or without meat in it, and sometimes, in addition to it, the famous grit porridge; sometimes the soup is without the porridge, sometimes the porridge without the soup, but in either case the cucumber is always there; and should x equal zero, then the ever-faithful cucumber does duty for all the rest.

In the hot and arid regions of Southern and Southwestern Asia, these succulent vegetables are highly appreciated, and with good reason. Juicy and cool, they cannot but be always refreshing where water is a rarity; but in a climate like that of Russia, the cucumber is the last thing one would expect for a national dish. Mr. Johnstone suggests that their price—about the fifteenth part of a cent—may help to explain the anomaly. We are rather inclined to think it likely that the Russian peasant eats cucumbers, not so much because they are cheap, as because his remote ancestors, who came from the South, were cucumber eaters. To the one the taste for cucumbers was the natural result of climatic conditions; with the other it remains an inheritance and a national eccentricity, in spite of a naturally unfavorable climate.

NEW MODE OF HARDENING SANDSTONE.

In Saxony, sandstone is soaked in a solution of alkaline silicates and of alumina. The liquid penetrates some inches into the stone, and renders the surface so hard that it resembles marble and will bear polishing. On being heated to a high degree, the surface vitrifies, and it may be colored at pleasure.

A PAVEMENT ANIMALCULE.

Professor Leidy, of the Academy of Natural Sciences, describes in recently published proceedings of that body a curious animalcule which he discovered on street pavements. It is named *gromia* and resembles a cream-colored ball about one sixteenth of a line in diameter. When placed in water, it in a few minutes projects, in all directions, a most wonderful and intricate net. Along the threads of this net (which are less than one thirty thousandth of an inch in diameter) float minute *naviculæ* from the neighborhood, like boats in the current of a stream, until, reaching the central mass, they are swallowed. Professor Leidy states that during dry weather the creature remains quiet in the dust, and that when rain falls it spreads its net and gathers food.

PREPARING BAMBOO FOR PAPER.

We mentioned recently Mr. Thomas Routledge's investigations relative to the utilization of bamboo as a paper making stock. The following is the method in which he treats the young plants: The stems are first passed through heavy crushing rolls, in order to split and flatten them, and at the same time crush the nodes. The stems then go through a second series of rolls, which are channelled or grooved in order to divide them into strips. The latter, being cut into convenient lengths by a guillotine knife or shears, are delivered by an automatic feeder direct to the boiling pans. Both the boiling and washing processes ordinarily in vogue for producing half stuff or semi-pulp, Mr. Routledge conducts in a series of vessels connected by pipes and furnished with valves, so that communication between the vessels may be regulated as desired, and in such method that the receptacles being charged in succession, the heated lye (composed of caustic alkali) can be conducted from vessel to vessel. The lyes are thus used over and over again until exhausted, fresh lye being continually supplied, until by degrees the extractive matters combined with the fiber have been rendered soluble. In the same manner hot water is admitted to remove the matters rendered soluble, leaving the fibers sufficiently cleansed. A final cooling stream of water is run on and through the fiber, which is drained and pressed. The semi-dry material is next submitted to the action of a "willow" or "devil," by means of which it is opened or teased out and converted readily into a tow-like condition, when it is dried by a current of heated air, induced by a fan blast. When baled up for storage, it may be kept for an indefinite length of time; and when received by the paper manufacturer, it has only to be soaked down and bleached in order to fit it for making paper.

WAFER CAPSULES FOR MEDICINES.

Among the latest devices for the administration of medicine is the wafer capsule, by means of which any dose, however unpalatable, can be taken without the slightest disagreeable taste. Capsules, generally speaking, are nothing new; but in the present case the novelty lies in the shape, which is much better than the gigantic elongated pill form ordinarily adopted, and also in the fact that the capsule is made of flour and water wafers, and may be supplied to druggists empty, and may be, by the latter, easily filled when medicines are dispensed. They are simple disks cut out of a thin wafer sheet by hollow punches. To render them concave, they are dampened between cloths and placed between two curved plates of tin, by which they are quickly shaped. The medicine is then placed between two wafers, the rims are brought together and moistened, and a slight pressure closes the edges tightly. Some simple apparatus for this purpose has been devised by Mr. E. M. Boring, of the Philadelphia College of Pharmacy.

ASTRONOMICAL NOTES.

OBSERVATORY OF VASSAR COLLEGE.

The computations and some of the observations in the following notes are from students in the astronomical department. The times of risings and settings of planets are approximate, but sufficiently accurate to enable an ordinary observer to find the objects mentioned. M. M.

Position of the Planets for February, 1875.

Mercury.

On the 1st of February, Mercury rises at 7h. 58m. A. M., and sets at 6h. 42m. P. M. On the 29th, Mercury rises at 5h. 31m. A. M., and sets at 3h. 41m. P. M.

Mercury, which was west of Saturn before January 28th, passes east of Saturn at that time, is again very near Saturn in right ascension on the 7th of February, but some degrees further north in declination, and too near the sun to be easily seen.

Venus.

Venus will be brilliant all through the month, setting at 7h. 50m. on the 1st of February, and at 8h. 55m. on the 29th. The moon will be in conjunction with Venus on the 28th.

Mars.

On the 1st of February, Mars rises at 9h. 41m. A. M., and sets at 10h. 13m. P. M. On the 29th, Mars rises at 8h. 36m. A. M., and sets at 10h. 4m. P. M. The moon will be in conjunction with Mars on the 29th.

Jupiter.

On the 1st of February, Jupiter rises at 2h. 15m. A. M., and sets at 11h. 52m. A. M. On the 29th Jupiter rises at 0h. 38m. A. M., and sets at 18h. 11m. A. M.

The most noticeable phenomenon connected with the motions of Jupiter in February is its near approach to the star β *Scorpii*, and the possible occultation of the star, by the planet, on the early morning of the 28th.

β *Scorpii* is a star of the second magnitude, and with an ordinary glass may be seen to have a companion star of the fifth magnitude.

Saturn.

On the 1st of February, Saturn rises at 8h. 3m. A. M., and sets at 6h 21m. P. M. On the 29th Saturn rises at 6h. 21m. A. M., and sets at 4h. 49m. P. M.

Uranus.

On the 1st Uranus rises at 5h. 38m. P. M., and sets at 7h. 34m. A. M. of the next day. On the 29th, Uranus rises at 3h. 40m. P. M., and sets at 5h. 42m. the next morning. It is among the stars of *Leo*, and can be seen with an ordinary glass; its motion among the stars is toward the west.

Neptune.

Neptune can never be seen without a good telescope, and at present is not well situated.

Occultations.

On the 3d of February, the path of the moon will be among the beautiful stars of the *Pleiades*, and the moon will occult, or hide from our view, several of the small stars, and also η *Tauri*, a star of the third magnitude. As the moon will be just past the first quarter in high northern declination, and the phenomena will occur in the evening hours, a fine opportunity will be afforded to those who love to watch these changes. To the astronomer, observations of occultations are valuable for determinations of differences of longitude.

Sun Spots.

The report is from December 18 to January 18 inclusive. Photography and observations have been much interrupted by clouds. Three pictures only have been taken, of the dates December 22, December 23, and December 27. The photographs of December 22 and December 23 show, on the western limb, a large group or spots, which disappeared before the next picture, December 27 In the picture of this date, a pair of small spots was seen on the western limb. From December 27 to January 9, whenever observations could be made, the sun's disk, as seen through a glass of three inches aperture, was free from spots. On January 10 a very small group was observed on the western limb, but after that could not be found.

Success in Labor.

Mr. George W. Childs, of the Philadelphia *Ledger*, is one of the most successful newspaper publishers in the land. He is the friend of the laboring man, and practises himself the precepts which his paper advocates. The following editorial from a recent issue characterises the man—the publisher.

"There is nothing more essential to prosperity than the establishment in the popular mind of the intimate connection between efficient labor and true success. In one sense they are synonymous. Success consists not so much of the reward a man reaps from labor as the value of the labor itself. He who, by honest work of hand or head, is constantly enriching the world is intrinsically the successful man, whether riches or poverty fall to his lot; while he who amasses millions by speculation or fraud, leaving none to bless his memory when he is gone, has made his life a disastrous failure. We trust the time may arrive when this shall be the common acceptation of the word success, but at present it is not so. We usually measure it by what is gained—not by what is given; by the reward which labor brings—not by the intrinsic value of the labor itself. Even by this gage, however, the connection is still closely preserved. Eventually each one's personal welfare is strictly dependent upon his value to others. There may seem to be exceptions to this. Idleness and unfaithfulness may occasionally appear to reap the fruit that belongs of right only to honorable industry; but in the long run it is not so. The cheat is discovered, character is sifted, and justice is indemnified for her dishonored claims. Faithful, patient labor, of some sort that benefits mankind, is the only road to personal prosperity, and the success that seems to follow quicker and easier methods is short-lived and illusory.

"Few, however, believe this in their hearts. To many, work is only a disagreeable necessity, to be taken like medicine, in as small quantities as possible and dispensed with as soon as may be. They do not love it for its own sake, they do not care for its importance to mankind, or its reflex influence on their own characters. They do not specially desire to attain excellence in it, and they only put enough energy into its performance to accomplish immediate and necessary results. Their hearts are not in it; they are ever looking beyond and over it to find objects of interest. Other things excite, stimulate, and inspirit them; their work alone is dull and irksome. Labor thus performed can never be of superior quality, can never greatly add to the happiness or progress of mankind, can never bloom into true success. It has no soul to animate, no hope to inspire, no vital power to develop it. A life spent thus, in unwilling and compelled labor, in which the heart has no place, is surely one of the saddest of failures. There are others again who fail in their life work because they are ashamed of it and think it beneath them. They blame fortune or circumstances for having condemned them to a toil which they conceive degrading If their lot had been cast differently, they think, they migh have made some mark in the world; if their work had beent of a higher grade, they could have pursued it with energy and zeal; as it is, they only follow it from necessity and with no more assiduity than they are compelled to exert. Such persons make a fatal mistake. It is in them, not in their work, that the fault lies. For if they do not perform what is committed to them with fidelity and zeal, how can they be fitted for a higher post? Besides, this separation of work into ranks and grades is altogether artificial and unauthorized. Who can decide which labor is higher or lower than another, which is of more or less value to mankind? It is not the kind of work, but the manner in which it is done, that determines its value. The faithful day's work, in the field, the workshop, or the forge, in the kitchen or the factory, is far more honorable, useful, and elevating than that of the scheming politician or the flushed and eager speculator, who count his votes or his gains by the thousands, but whose labors add nothing to the prosperity, happiness, or virtue of the community.

"It is certainly important for each one to find his own appointed work in the world, that which he loves best, and can do best, as far as practicable; but it is folly to sit down supinely and give way to despair and lethargy because he imagines he ought to occupy a more prominent or important post. Nine tenths of the changes made under this delusion prove to be for the worst instead of the better. The character and capacity that fail of success in the one case fail yet more signally in the other. Froude well says: "You cannot dream yourself into a character—you must hammer and forge yourself one;" and it is only by laying hold earnestly and vigorously of the work that lies nearest to us, and raising its value by putting into it all the vigor and energy, all the patience and fidelity, all the thought and ability we can command, that we have any right to expect success in any of its meanings."

THE simplest way to dye billiard balls red is to soak them for ten or fifteen minutes in very dilute nitric acid, wipe them dry, and place them for the same length of time in an ammoniacal infusion of cochineal; repeat this until the desired color is obtained.

[For the Scientific American.]

THE NATURE OF THE PHENOMENA DISCOVERED BY MR. EDISON.

BY P. H. VANDER WEYDE, M. D.

Two of your recent issues contain interesting articles on Mr. Edison's recent discovery. One is by Mr. W. E. Sawyer, page 36, and the other by Dr. G. M. Beard, page 57. The writers take directly opposite views of the matter, and therefore some comments may be welcome to such readers as look with interest on new discoveries in electricity, a field remarkably fertile with subjects of purely scientific importance, and also with facts capable of useful practical application.

Mr. Sawyer claims that there is no novelty in the alleged discovery, that two years ago he experimented in the same way, having learned the existence of the identical phenomenon from others, that he considered the spark to be the effect of molecular magnetic vibration, "not, however, purely magnetic, but magneto-dynamic," and "practically of no value."

Dr. Beard was at first inclined to the same view as that taken by the SCIENTIFIC AMERICAN, by myself, and by others, namely, that the phenomena were simply due to electric induction, produced in the atmosphere surrounding any vibratory electro-magnet: but now he appears to have deserted this rational view, and to have gone over to Mr. Edison's idea that it is a new force; and he bases his conclusion on some new experiments, of which he gives an account, and the results of which appear to him to be irreconcilable with the attributes of pure electricity.

I cannot but disagree with both gentleman, as I do not see how the view of Mr. Sawyer, who considers it to be a "molecular magnetic vibration," can convey any definite idea in harmony with what we know of the behavior of the magnetic and electric forces. His assertion that it is practically of no value is bold and hazardous in the extreme; it is always very imprudent to maintain, because we do not succeed in solving a problem or finding the practical application of a phenomenon, that nobody can, and thereby to deny that the problem or phenomenon may some day become a most fruitful source of discovery. For proofs, I point to the fields of physics and chemistry, which abound with illustrations showing the caution which we should observe in pronouncing a verdict.

Dr. Beard's conclusions are tinged with some disregard of the laws of static electricity. I have noticed this frequently to be the case with some electricians of the present day, many of whom have studied exclusively the laws governing voltaic currents; and from such I have often heard assertions, proving that they were total strangers in the field of static electricity, and entirely unacquainted with the characteristic experiments with the old-fashioned frictional electric machines, Leyden jars, etc. I do not say this to throw any reflection upon the capacity of Dr. Beard, whom I know to be a thorough electrician; but still, if he were more familiar with the inducing action of the conductors (not those of the style now used with Rhumkorff coils, but the old style, consisting of two parallel tinfoils or their equivalents placed at a distance), he would not come to the conclusion that the electricity (or whatever it is) passed from one tinfoil to the other through the air between them; but he would see that inductive influence only reaches from the one to the other, the + — + —, etc., condition of the one exciting inversely a — + — +, etc., condition in the other plate.

It is now more than a century since the Abbé Nollet, in France, made a similar mistake by maintaining that the electric current passed through the glass of the Leyden jar. He saw that, when such a jar was insulated, for every positive spark with which the inside coating was charged he could draw also a positive spark from the outside, and therefore he concluded that the positive electricity passed through the glass. This otherwise eminent investigator never obtained in his whole life a clear idea of induction; he could not conceive that a positive electric charge of the inner coating of the jar could, while retained there and without being lost, induce a positive electric charge to leave the outer coating.

The very experiments mentioned by Dr. Beard are to me a most convincing proof that the phenomena are due to induction. Frictional electricity will, when the conducting wire is cut, if the ends are separated beyond the distance that the spark can leap, be totally arrested at the separation: but if we attach large conducting flat surfaces, like tinfoil, to the ends of the wire, so that the charge can diffuse itself over one surface, it will, by induction, cause electric phenomena in the other flat surface and the wire attached thereto. This is not an overleaping of the electric current through the air, but simply an inducing action, exciting the other plate by a destruction of its neutrality, and a separation of its + and — electricities. In fact, the arrangement of the parallel tinfoils, described by Dr. Beard, is nothing but one of the forms of the old-fashioned condenser.

I see no reason why all the phenomena observed by Mr. Edison cannot be considered as: 1. Induced electric currents constantly reversing polarity, so rapidly changing and neutralizing each other that it is very difficult to determine any polarity at all. 2. Induced electric currents, of very low intensity, but enormous in quantity, which at once explains their lack of physiological action and the needlessness of a perfect insulation.

If, after the above explanation, we review the six points which Dr. Beard gives on page 57, against the theory that it is electricity, we find: 1 The various forms of electricity, recognized as such, vary so much among themselves that there is scarcely any one phenomenon that is common to them all. 2. Many forms of the electric force produce no perceptible or demonstrable physiological effects. 3. Induction of electricity is not resisted by air, glass, rubber, or paraffin, as is the case with the electric current itself. 4. The absence of polarity is only a negative proof; and polarity may yet be demonstrated with the proper apparatus, if care be taken in manipulation. 5. The inducing action of electricity passes through non-conductors, such as air, rubber, glass, etc., most readily when the terminals consist of large surfaces. Electricity of low intensity will not pass off at points. 6. Electricity diminishes in intensity with the distance from the exciting cause, in definite ratios determined by the nature of the conductors: while the induction also depends on the distance and the nature of the intervening insulating substances.

To place this supposed new force between heat and magnetism appears to me to be entirely unwarranted. We know that light consist of waves of a velocity of vibration of over 450,000,000,000,000 oscillations per second; non-luminous heat has a less velocity, and its principal effect is to expand bodies, and change their molecular aggregation *from* solids into liquids, and then into gases; while magnetism manifests itself alone in the attraction and repulsion of a very limited number of bodies; the intrinsic nature of magnetism is still a mystery, and we know little about it, except that it is closely related to electricity, and besides we know the nature of that relation. But of electricity we know more. We know that it may differ greatly in intensity and quantity, that the various forms produce the utmost varieties of phenomena: we know that electric currents induce other currents; that permanent or temporary magnets may induce currents; that this inducing action extends like an atmosphere around electric currents and magnets producing other electric currents or magnetic phenomena. When we look at all this, and at the circumstances under which the assumed "etheric force" is produced, we cannot help considering any attempt to deny its electric nature as a vain endeavor to magnify the importance of the discovery which is, in truth, in itself important enough not to need any such exaggeration.

Another argument that this force is not electricity itself, and is only related to electricity, and not to magnetism, and much less to heat, may be deduced from the new theory of the intrinsic nature of the electric phenomena. This I will reserve for a future occasion.

New York city.

A Hydrothermic Motor.

M. Tommasi, we learn from *Les Mondes*, has recently constructed a so-called hydrothermic motor, from which he has obtained effective results. The dilatation and condensation of oil, caused by the action of heat, transmits motion to mechanism which actuates a piston at the rate of 100 strokes per minute. With M. Tommasi's model, at this speed, about one third of a horse power is developed. It is believed that with large machines an efficiency of several horse power can be realized. The inventor thinks that the chief application of his motor will be its utilization of the heat of the exhaust of steam engines, something after the manner proposed for the bisulphide of carbon and ammonia machines. The alternate dilatation and condensation of oil is, however, not attended by the production of annoying vapors as is the case in the last mentioned motors. This is one advantage of importance, while another is found in the enormous force which exists in the process of dilatation of the oil. The editor of *Les Mondes* states that he saw the cover of the small tubular boiler used by M. Tommasi torn off, and the four heavy screw bolts by which it was secured broken, while the oil infiltrated the apparently hard cast iron as if the latter had been sponge.

From this it will be seen that the motor is apparently capable of yielding almost instantly a powerful force, for a brief period, a quality which might be advantageously utilized on locomotives. In such a case the machine would be operated by the heat of the exhaust, and could be thrown into action whenever a heavy grade was to be ascended, necessitating extra work. By its use, also, after a train had acquired sufficient momentum, steam might be allowed to run down to just sufficient to keep the engine to its duty, with no margin for emergencies or for starting purposes. The hydrothermic motor would start the train or apply the heavy power necessary to increase the speed. This would cause no inconsiderable saving of fuel. The use of the oil as above detailed is not new in principle, as a similar invention appeared in this country twenty years ago. M. Tommasi's application of the power, as near as we can judge from *Les Mondes*' incomplete statement, seems to be novel.

The U.S. Torpedo Boat Alarm.

The *Graphic's* Washington correspondent gives the following particulars of the torpedo boat Alarm, now at the navy yard in that city, in charge of Lieutenant Commander William Bainbridge Hoff.

"It is the first command of this gallant young officer, and by a singular coincidence, next his own is now anchored the Relief, the first command of his father, Admiral Hoff. The contrast between the two vessels is as great in construction as in name, and admirably illustrates the improvements made in our navy. There is much of interest to be seen on the Alarm. She has a single death-dealing turret, a 15 inch gun in the bow, the largest afloat, a formidable prow used as a weapon of attack, and a row of Gatling guns ranged along both her sides. A surprising deal of general utility business is done by an ingenious combination of machinery worked on deck, by means of which the wheel is turned, the ship steered, and torpedoes run out if desired. All this can be directed by one person standing in a small shot-proof enclosure on the deck. The mode of attack of such a vessel as the Alarm is, I am told, first to blind the enemy with an electric light flashed in its face; then to fire the fifteen-incher at the foe; at the same time *to run out* and explode a torpedo beneath the hostile vessel; next, if there is anything left to attack, to give a *coup de grace* with the incisive prow, and if the enemy still decline to be wiped out of existence, the devastating instruments of the turret are called into requisition, and if they do not suffice the Alarm swiftly turns a broadside to the foe, and brings into range in turn the innocent-looking but fatal rows of Gatlings."

Useful Recipes for the Shop, the Household, and the Farm.

A well known druggist gives the following directions for coating pills with sugar or gelatin in the shop: Pills which have been thoroughly dried can be coated with sugar as follows: Boil 32 ozs. of best white sugar with 12½ ozs. of distilled water to a sirup, and use enough of this sirup (temperature 120° to 150°) to moisten the pills in a small copper kettle or pan, exposing it to a heat sufficient to dry the pills while kept in motion and worked with the hand. After this first coat is dry, the operation is repeated until the pill is covered with sugar sufficiently. A very soluble coating for pills is the following composition; 1 oz. flaxseed, ½ oz. Irish moss; boil with 8 fluid ozs. water, strain, add 4 ozs. sugar, boil again and use in the same manner as a solution of gelatin is used for coating pills.

To detect fusel oil in whiskey, the readiest process is to shake one or two fluid ounces of the liquor with an equal volume of pure ether, and about one fourth of its volume of water. The supernatant liquid being decanted, will, on being evaporated at the ordinary temperature, leave behind the fusel oil present in the whiskey, together with some of the flavoring ingredients that may have been introduced artificially.

A very pretty amusement, especially for those who have just completed the study of botany, is the taking of leaf photographs. One very simple process is this: At any druggist's get a dime's worth of bichromate of potash. Put this in a two ounce bottle of soft water. When the solution becomes saturated—that is, when the water has dissolved as much as it will—pour off some of the clear liquid into a shallow dish; on this float a piece of ordinary writing paper till it is thoroughly moistened. Let it become nearly dry in the dark. It should be of a bright yellow. On this put the leaf, and under it a piece of soft black cloth and several sheets of newspaper. Put these between two pieces of glass (all the pieces should be of the same size) and with spring clothespins fasten them together. Expose to a bright sun, placing the leaf so that the rays will fall upon it as nearly perpendicular as possible. In a few minutes it will begin to turn brown, but it requires from half an hour to several hours to produce a perfect print. When it has become dark enough, take it from the frame and put it in clear water, which must be changed every few minutes, till the yellow part becomes perfectly white.

To pickle beef for long keeping: First, thoroughly rub salt into it and let it remain in bulk for twenty-four hours to draw off the blood. Second, take up, letting it drain, and pack as desired. Third, have ready a pickle prepared as follows: For 100 lbs. beef use 7 lbs. salt; saltpeter and cayenne pepper, each 1 oz.; molasses, 1 quart; and soft water, 8 gallons; boil and skim well, and when cold pour it over the beef.

Says a correspondent of *Inter-Ocean* who has had much experience with wire fences: "I would not recommend straight wire with patent barbs, as it is liable to break in cold weather. There is a twisted wire with barbs that does well, as it is said the twist will allow it to expand so that it will not break. Of this kind I have some on my own place. It is a perfect fence for any cattle or horses. I have three wires, and posts two rods apart, but on level ground they might be three or four rods apart."

A Chinese Roger Bacon.

A Chinese scientist has established at Shanghai a scientific laboratory, which will strongly recal the famous workshop of Roger Bacon. With an extraordinary energy, in the possession of which he seems to differ greatly from the generality of his compatriots, this wise Celestial, after purchasing the apparatus merely, has taught himself photography. He has likewise studied medicine with a European doctor, and invented a new, and it is said very efficacious, antidote for the opium habit. In his laboratory are electric bells, a printing press, and a large variety of ingenious philosophical apparatus, mainly of his own device and construction. The principal object of his investigations, however, is to find a way of printing Chinese books in movable type. With the aid of the machinery at the Presbyterian mission, he has already begun the manufacture of the matrices or molds for the type, an immense undertaking when it is considered that, for each single sort or variety of character, no less than 6,664 matrices are required. Moreover, there are over 20,000 Chinese characters. Each matrix must be cut from wood and electrotyped. It will require, it is said, fourteen years' work of the mission machinery to make 24,000 different characters. In the six years in which this benefactor of his race has been at work, he has produced 5,000 matrices of little characters and 6,000 of larger ones. With what he has already of small type, he has printed a little volume. He does not expect to live long enough to complete his immense task, and therefore is educating his children to the proper degree of skill in order that they may continue the undertaking.

NEW BOOKS AND PUBLICATIONS.

A GUIDE TO THE MICROSCOPICAL EXAMINATION OF DRINKING WATER. By J. D. Macdonald, M.D., F.R.S., Assistant Professor of Naval Hygiene, etc. With Twenty-four Lithographic Plates. Price $3. Philadelphia, Pa.: Lindsay & Blakiston. New York city: William Wood & Co.

Nearly all the impurities in water may be detected by the microscope. Mineral bodies of course are visible; and when not corrosive, or otherwise intrinsically hurtful to the system, they do harm by mechanical action on the intestines. All the ova of entozoa and minute worms are readily seen through the same instrument; and the vegetable bodies (*algæ*, etc.), many of which are perceptible to the unaided vision, may emit sulphuretted hydrogen when acted on by the sulphates in the food. But a *still more* important revelation is the presence of living creatures which subsist on organic impurities which defy detection by the most powerful instruments, and which are the agents by which many of our severest and most loathsome diseases are propagated and spread abroad. Dr. Macdonald has here given us a volume of twenty-four admirably executed plates, in which nearly all the organic impurities are displayed; so that a careful observer can readily detect any unsanitary condition of his water supply. The book is valuable as a contribution to an interesting branch of natural history; but its chief function will be to aid our health inspectors and other sanitary authorities in the investigation of the causes of disease, and for this purpose it deserves our highest recommendation.

DYEING AND CALICO PRINTING, including An Account of the Most Recent Improvements in the Manufacture and Use of Aniline Colors. Illustrated with Wood Engravings and Specimens of Dyed Fabrics. By the late Dr. Crace Calvert, F.R.S., etc., etc. Edited by John Stenhouse, F.R.S., and Charles E. Groves, F.C.S. Price $8.00. Manchester, England: Palmer & Howe, Bond street. New York city: John Wiley & Son, Astor Place.

This is one of the most elaborate and handsome technical works which we have ever read. Dealing with a complicated subject involving many processes of the most elaborate chemical science, it is a treatise which will be useful to the accomplished chemist in his laboratory, and at the same time one which we should unhesitatingly place in the hands of any intelligent workman. The illustrations are nothing short of perfection. The book possesses additional interest as a legacy to the industrial world from one who spent his life in gaining victories over the occult forces of Nature, giving the fruits thereof to mankind. With perhaps the exception of Liebig, no chemist has done more for practical science and for the furtherance of the processes employed in the higher manufactures than Dr. Crace Calvert. A catalogue of his labors would occupy much of our available space; but it would be an enduring monument to his untiring zeal and his inexhaustible inventive power in experiment. His literary executors have done full justice to the labor which Crace Calvert left almost finished when he was called away.

PROSERPINA. Studies of Wayside Flowers. Parts I & II.—ARIADNE FLORENTINA. Six Lectures on Wood and Metal Engraving. Nos. IV, V, & VI.—DEUCALION. Collected Studies of the Lapse of Waves and Life of Stones. Parts I & II. By John Ruskin, LL.D., Professor of Fine Art, Oxford, England. Price $1 each. New York city: John Wiley & Son, 15 Astor Place.

These three little volumes faithfully portray their eminent writer, whose style has lost nothing in force or vivacity since the time when the first volume of "The Stones of Venice" astonished the world by the power of its genius. The occasional eccentricity of the author is a matter of little moment either to the critic or the reader; suffice it to say, that all the force of his logic and his intense sympathy are used in these volumes on behalf of genuineness, thoroughness, and sincerity in art and in labor. The lectures on engraving are masterpieces of instruction in its best and widest sense.

MARTINDALE'S UNITED STATES LAW DIRECTORY FOR 1875-6, containing the Names of Law Firms, Banks, and Real Estate Agents in Each of the Principal Cities of the United States and Canada, together with a Digest of the Commercial Law of each of the States and Territories, and the Bankrupt Law in Full. By James B. Martindale, Attorney and Counsellor at Law.

The extensive scope of this work is fully shown in the above title; and an examination proves that the labor of the author has been thoroughly and faithfully done. The book is especially valuable to merchants, who are frequently subject to serious losses through ignorance of the laws of the various States to which they ship goods.

REVISED STATUTES OF THE UNITED STATES, relating to Mineral Lands and Mining Resources. By Walter A. Skidmore. Second Issue. San Francisco, Cal.: Sumner, Whitney & Co.

This is a valuable compendium of all the mining laws of the United States, fully annotated. Reference is made to the decisions of the Attorney General and of the Interior Department, in cases involving mining questions. The circular instructions of the General Land Office are added, and there is an appendix of special statutes bearing on the general subject. The book will prove useful to lawyers, as it places before them the law in complete form, and so copiously indexed and digested as to admit of the ready applications of its provisions to any case.

Inventions Patented in England by Americans.

(Compiled from the Commissioners of Patents' Journal.)
From December 17 to December 30, 1875, inclusive

BOILER TUBE STOPPER.—P. Walker, Jersey City, N. J.
BOTTLE STOPPER, ETC.—C. De Quillfeldt *et al.*, New York city.
CALORIC ENGINE.—F. Brown, New York city.
CARVING FORK.—C. S. Landers, New Britain, Conn.
COPYING TELEGRAPH.—W. E. Sawyer, New York city.
CORD FASTENERS.—G. P. Reeves *et al.*, Helena, Mon. Ter.
COTTON BEATER.—R. Kitson *et al.*, Lowell, Mass.
COTTON OPENER.—W. E. Whitehead (of Lowell, Mass.), Stalybridge, Eng
ENGRAVING PANTAGRAPH.—J. Hope, Providence, R. I.
GEAR TACKLE.—G. Stacy, Nanuet, N. Y.
JOURNAL BEARINGS, ETC.—W. A. Hathaway *et al.*
LOCKING SWITCH.—D. Rousseau, New York city.
MAKING SPIKES.—W. Haddock, Pittsburgh, Pa.
PRINTING MACHINERY.—R. M. Hoe, New York city.
PRINTING PRESS FEED.—J. T. Ashley *et al.*, Brooklyn, N. Y.
ROTARY PUDDLER.—W. Sellers *et al.*, Philadelphia, Pa.
RUBBER ARTICLES.—H. P. Dunbar *et al.*, Boston, Mass.
SAFETY MINE CAGE.—H. Carlile *et al.*, Steubenville, Ohio.
SEWER TRAP.—J. A. White, Concord, N. H.
SLATE DESK.—W. Rose, New York city.
TELEGRAPH.—J. Olmsted, Providence, R. I.
TREATING ALLOYS.—B. Silliman *et al.*, New Haven, Conn.
VALVE, ETC.—J. Wolf *et al.*, Philadelphia, Pa.
VEGETABLE PARCHMENT.—A. G. Fell, New York city.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED FIRE EXTINGUISHING AND ESCAPE APPARATUS.

William E. Wood and Edward Leonard, Baltimore, Md.—The object of this invention is to provide a means for the immediate suppression and extinguishment of fires, and a safe and expeditious means of escape from factories and other large buildings containing many operatives. The invention consists in a stand pipe upon the outside of the building, with hose pipes and connections at the windows of each story, in combination with balconies upon the outside of said windows, connected with the earth by means of outside ladders. By means of this arrangement, a ready means of escape is afforded, and the firemen or watchmen can play upon the fire in the upper stories in such a position as to be free from the smoke.

IMPROVED SEWING MACHINE THREAD GUARD.

Lillian Roosevelt, Hempstead, Texas.—This is a clamp having oppositely extended arms, arranged as a guard attachment to the Wheeler & Wilson sewing machine, for preventing the thread from being thrown off the tension by the work, and for preventing the thread from running off the spool on the spindle.

IMPROVED TURBINE WATER WHEEL.

John B. McCormick, Armagh, Pa., and James L. Brown, Brookville, Pa.—The object of this invention is to increase the effective power of a turbine water wheel, whereby a wheel of a given depth may utilize a larger proportion of the water than wheels of the same depth heretofore used. It consists in a wheel having a double series of buckets, one of which is arranged to receive its water laterally and interiorly, and the other arranged to receive its water latterly and exteriorly from a common flume, the said two series being also arranged together so as to discharge their water with a confluence which reacts upon the wheel in the direction of its circumference, and utilizes a larger percentage of motive power. The invention also consists in the combination of the said wheel with other coöperating parts.

IMPROVED STREET RAILWAY TRACK.

John Quigley, St. Joseph, Mo.—This is a cast iron tie, with an elevated and broadened seat for the rail at each end, contrived to fasten the rail in the seat by a key. The broadened elevations for the chair are grooved in the sides, so that the earth of the road will pack in and hold the tie down securely. The object is to enable iron to be used, instead of the less durable wood, and to save the cost of fastening the chairs to the ties, and also to secure more permanent seats for the chairs.

IMPROVED COMBINATION LOCK.

George F. Knight, Carroll, Ohio.—This invention relates to certain improvements in combination locks applicable to storehouses, dwellings, safes, vaults, etc., and designed to increase the security of the same against the efforts of burglars and thieves. It consists principally in a number or series of bolts, so arranged with small gear wheels and connecting rods, or their equivalents, that the withdrawal of one bolt shoots into place and locks another until a certain number of turns are made which constitutes the combination at which all of the bolts are withdrawn and the door unlocked. It also consists in the particular construction of a bell-ringing device, which, operating in connection with the bolts, keeps up an incessant ringing during any attempt to unlock the same. The invention also consists in other details of construction.

IMPROVED TURBINE WATER WHEEL.

John B. McCormick, Armagh, Pa., and James L. Brown, Brookville, Pa.—This invention relates to certain improvements in that class of turbine wheels which receive their water from a vertical flume through lateral chutes, and discharge the same centrally through the bottom of the wheel. The invention consists in the peculiar construction and arrangement of a tapering wheel, which is made smaller at the top than at the bottom, to compensate for the different velocities of the water at the top and bottom of the wheel by reducing the radius of leverage of the wheel in proportion to the said decreased velocity.

IMPROVEMENT IN BALANCING MILLSTONES.

William Gosshorn, Waterloo, Pa.—This inventor proposes a bail, which is adjusted centrally in the eye by means of the screws which adjust balancing sections. By turning either of the screws, the section attached thereto will be raised or lowered, as may be required, and, by moving the weights up or down, the stone is balanced on the point of the spindle in the center of the bail. By raising or lowering a section of the balancing ring, the change affects the running of the stone, as the latter is suspended and revolves freely on a center.

IMPROVED TRAP FOR STEAM PIPES

Charles A. Read, Bridgeport, Conn.—This is an improved steam trap for thoroughly draining the water of condensation from steam pipes for heating buildings without allowing the escape of steam. An adjustably seated globe has an interior valve and top perforation for guiding a hollow plug screwed at the end of a drip pipe that connects with the steam pipes to be drained. The valve closes or opens the plug as the pipe is expanded or contracted by heating or cooling.

IMPROVED WELL DRILLING APPARATUS.

Daniel Henry Muir, Racine, Mis.—In this device there is a tube which extends down the bore and along a groove in the drill to within an inch or so of the bottom. The effect of the action of the drill is to drive the mud up the tube when the drill falls. The tube has a check valve to prevent the mud from going back when the drill rises, and it is mounted in a support which turns in unison with the drill. This arrangement keeps the surface of soil under the drill constantly free from dirt and sand. There is also a lever contrivance in connection with the tube, to lower it from time to time, and to hold it above the bottom of the bore. By this contrivance, the taking of the drill out of the bore and removing the mud with the sand pump are avoided.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED WAGON SPRING.

Alexander W. McKown, Honesdale, Pa.—This inventor proposes a novel combination of torsion springs of a vehicle with auxiliary or re-enforcing torsion springs, arranged under the wagon body, and acted upon by a lever connection with the axle, bolster, or other supports, to be thrown in or out of action, according to the weight of the load to be carried. The lever of the auxiliary springs is swung up, and secured, by any suitable fastening device, to the wagon body when not in use. The effect is to utilize more fully the power of the springs, and to render them more durable by rendering the strains upon them uniform.

IMPROVED BRACE ROD FOR VEHICLE SPRINGS.

Alfred Cliff, Lapeer, Mich.—This is a rod for connecting the front and hind springs of a carriage to stay them against forward and backward motion. It has an attaching plate connected by a pivot joint at one end for connecting to the front spring, and a joint near the other end, which allows of longitudinal extension and contraction to compensate for the lengthening and shortening of the distances between the connections on account of the independent vertical movements of the springs.

IMPROVED PUMP.

Henry M Wyeth, Newark, Ohio.—This invention relates to certain improvements in pumps, and it consists in the peculiar construction of a double-acting submerged pump, in which two valves are connected by a slide so as to move together on opposite sides of the piston, and operate both the induction and discharge ports.

IMPROVED HORSE POWER.

Frederick Trulender, Harmersville, N. J.—This is an ingenious arrangement of mechanism, driven by an endless chain and platform, so placed that the horse walks upon a level, while through the inclination of the track his weight produces the same driving power as it would in a machine in which both platform and track were inclined.

IMPROVED CHILDREN'S CARRIAGE.

Thomas Galt and James Blaisdell, Rock Island, Ill.—The body of this carriage is suspended on cross bars between coiled springs, and balanced over the rear axle, so that a slight pressure will tip it either forward or backward, and thus enable the vehicle to be easily operated by a child. The reach is so arranged as to connect the body with the front axle.

IMPROVED THILL COUPLING.

Daniel D. Whitney, Beverly, N. J.—This inventor proposes the combination of a hand screw with the forward end of the rigid arm and the forward end of a hinged arm of the coupling, for securing the pin of the thill iron in the notches of the said arms. This forms a means of quickly attaching and detaching of the thills, allows of wear being readily taken up, and prevents rattling of the parts.

IMPROVED CHAIR.

George Grems and Leonard I. Fowle, Fredericksburg, Iowa.—These inventors have devised a simple and easily adjustable chair back. A back piece independent of the ordinary back, and located above it, is connected by bars to the front of the ordinary arms, so as to swing up and down. Ratchet braces extend from the back down through an eyepiece attached to the bottom of the chair by means of a lever pawl to hold the back at any hight. The device may be used with or without the ordinary back, as desired.

IMPROVED FOLDING OR PORTABLE DESK.

James Miller, Atlanta, Ga., assignor to himself and Luther S. Ames, of same place.—This is an improved portable desk for offices, that may be folded into small space for transportation or storage, and set up readily into open or closed position for use. It is specially adapted in cases in which a frequent moving is rendered necessary. The novel feature is a top section with drawers and pigeon holes, to which the lower section, made of folding front, side, and rear walls, is hinged, to be locked by suitable fastening devices into open or folded position.

NEW HOUSEHOLD ARTICLES.

IMPROVED SOFA BEDSTEAD.

William E. Buser, Chillicothe, Ohio.—The invention relates to an arrangement of cords or pulleys beneath the adjustable false bottom of the two-part folding sofa, for the purpose of elevating the same to a level with the other part of the bed when opened; and also to pins or lugs attached to the side of said bottom to support it in such elevated position. The pins or lugs work in inclined grooves in the vertical sides of the lounge.

IMPROVED FLY TRAP.

Thomas C. Dunn, Promise City, Iowa.—This trap is designed for catching flies at dusk on the ceiling and walls. It consists of a box which is hung to a supporting pivot frame, and provided at the open front half of its top with a swinging spring-acted lid, that is fringed with brushes, and thrown open by a lever when applied to the ceiling, and closed instantly when removed from the same. A corner recess of the flanged front edge allows the emptying of the flies from the box after they are killed.

IMPROVED HEATING STOVE.

William M. Morse and Morris G. Knox, Harmar, Ohio.—In order to utilize the heat of the fire to a great extent, and also to ensure a rapid circulation of air through the air chamber of a cylinder stove, these inventors construct said upper portion in one or more sections, formed with large radial inlet air pipes and a central vertical pipe, which connects with a discharge passage in the top plate for the air.

IMPROVED WASHING MACHINE.

Jesse Bartoo, Plainfield, Ill.—When the clothes have been put in the box, the handles are worked up and down so as to force pounders forward alternately. Each pounder as it moves forward carries down its supply of air, and presses the clothes against the forward side of the suds box, and holds them while they are rubbed by the movements of the other pounder, the clothes constantly changing their position, so as to be operated upon each time in a different place.

NEW TEXTILE MACHINERY.

IMPROVED LOOM TEMPLE.

John C. Thickins, Washington Mills, N. Y.—This is a drum and ratchet contrivance for the weighted cord, so arranged that when the cord is unhooked to shift it along the cloth, the ratchet supports the weight, and thus relieves the operator from the labor of holding it. After hooking on the cord again, the ratchet lever is raised by the operator to let the weight strain the cloth.

NEW AGRICULTURAL INVENTIONS.

IMPROVED HARVESTER REEL RAKE.

Thomas H. Bacon, Hannibal, Mo.—The invention relates to certain improvements in harvester reel rakes; and it consists in the particular construction and arrangement of the revolving reel shaft and oscillating rake arms, with cams for controlling the motion of the rake; and also in the construction of the devices for adjusting the rake for high or low grain.

IMPROVED STUMP EXTRACTOR.

John A. Hart and William A. Grove, Tionesta, Pa.—This device consists of a truss beam, which is supported on side standards and braces, and carries centrally a longitudinally fulcrumed main lever. The rear end of the main lever is connected by adjustable chains, according to the power required to lift the stump, while the front end is connected by pulleys and rope with a tackle block, coupling pivoted V brace pieces, stiffened by chains, to the bed piece. By detaching the tackle block, the V pieces may be swung out of the way of stumps in setting the extractor. The general arrangement is strong, and such as to admit of the application of power to much advantage.

IMPROVED HARROW.

Joseph R. Van Orthwick, Hillsdale, Mich.—This a harrow provided with runners, which are applied by raising the outer end of each section of the machine by means of its handle, while the teeth are inserted. A bar is then slid through notches, to prevent the sections turning on the pivot rod. Thus the harrow is adapted for employment in the transportation of grain to the field, the same being placed or loaded upon the top thereof, thus saving extra or additional means for effecting such transportation.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED POCKETBOOK FASTENING.

Daniel M. Read, New York city.—This inventor has patented two new pocket book attachments. The first relates to the ratchet and hook for engaging the same adjustably, so combined as to form a simple securing device for the flap of the book. The second is a small mirror arranged in combination with a fastener, and so constructed that persons holding it in their hands can be enabled to see a reflection of their entire faces.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

"Wrinkles and Recipes" is the best practical Handbook for Mechanics and Engineers. Hundreds of valuable trade suggestions, prepared expressly by celebrated experts and by correspondents of the "Scientific American." 250 pages. Elegantly bound and illustrated. A splendid Christmas gift for workmen and apprentices. Mailed, post paid, for $1.50. Address H. N. Munn, Publisher, P. O. Box 772, New York city.

Copyright of a Valuable Leather Preservative for Sale. W. R. Burgess, Mallitt's Mills, N. C.

Wanted—Machines for Knitting Narrow Fancy Worsted Webs suitable for Borders. H. E. Dillingham, 39 West Broadway, New York.

Wanted—Agents in Eastern and Western States (liberal Commission) to sell the Toope Patent Grate Bar, Best in the world. Chas Toope, 88th st., 4th av., N.Y.

How to lay out the Teeth of Gear Wheels. Price 50 cents. Address E. Lyman, C.E., New Haven, Conn.

Wanted—The address of makers of hard solder for Brass. Address Box 3109, New York Post Office.

Leather and Rubber Belting, Packing and Hose. Greene, Tweed & Co., 18 Park Place, New York.

Hearing Restored—Great invention. Book free. G. J. Wood, Madison, Ind.

Wanted—A Bone Crusher, suitable for crushing bones size of nut coal. A stamp mill preferred. P. O. Box 3369, Boston.

Wanted—Second hand Railroad Track Scales, 30 ft. platform, 20 tons draft. Address E. B. Seeley, Bowling Green, Ky.

For Sale—37 in. x 15½ ft. Lathe, $300; 18 in. x 12 ft. Lathe, $250; 12 in. x 8 ft. Lathe, $125; 48 in. Chucking Lathe $195; 16 ft. Planer, $700; 6 ft. Planer, $275; 4 ft. Planer, $175; 9 ft. Planer, $375. Shearman, 45 Cortlandt St., N.Y.

Wanted—One Heavy Drop, with 600 lb. Hammer, and one Facing Machine. Address P. O. Box 2258, New Haven, Conn.

½, 1, & 2 Horse Engines, $30, 60, & $100; Boilers for same, $75 & $100. T. B. Jeffery, 253 Canal St., Chicago.

For Sale—Engine 4x8; no boiler—new—cheap—good. Will send pho. A. R. C., Lincoln, Ill.

Manufacturers of Middlings Purifying Machines and Chilled Rolls, used in the Manufacture of Flour send Circulars, or correspond with John W. Hopkins, Wilmington, Del.

An Erector, Engineer, and general Machinist desires a permanent engagement. References furnished. Address D. C., 29 Concord St., Brooklyn, N. Y.

Wanted—A Combined Power Punch and Shears for ordinary work. Address Louden M'f'g Works, Fairfield, Iowa.

No 2 Bogardus Mill for Dry Work for Sale at half price. A. C. Stebbins, 98 Liberty St., New York.

Abbe Bolt Headers, the best—Prices reduced; 2 sizes made. Palmer Power Spring Hammers, 10 sizes. See machines, or write for information before buying. S. C. Forsaith & Co., Manchester, N. H.

Piles—No matter of how long standing your case may be, or how many remedies failed, a cure is possible. Circulars free—cause—consequence and cure. Wonder Worker Medicines. Salem, N. J.

Steel Castings, from one lb. to five thousand lbs. Invaluable where great strength and durability are required. Send for Circular. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Wanted—To purchase the Patent of a good article of general use, or will manufacture and pay royalty. Address B. H. Robb & Co., Cincinnati, Ohio.

Use Yocom's Split-Pulleys on all Shafting, same appearance, strength and price as finished Whole-Pulleys. Shafting Works, Drinker St., below 147 North Second St., Philadelphia, Pa.

Designer or Draughtsman—Engagement wanted by an engineer of practical and scientific education. Woodworking Machinery a specialty. Best references. Address Civ. Eng., 322 East 55th St., City.

Blake's Belt Studs are the best and cheapest fastening for Leather or Rubber Belts. Save ten times their cost. Greene, Tweed & Co., 18 Park Place, N.Y.

Linen Hose for Factories—1, 1½, 2 & 2½ inch. At lowest rates. Greene, Tweed & Co., 18 Park Place.

Manufacturers! Send for illustrated catalogue of Best Belt Pulleys made. A. B. Cook & Co., Erie, Pa.

Fine Castings and Machinery, 96 John St., N. Y.

For Sale—Second Hand Wood Working Machinery. D. J. Lattimore, 31st & Chestnut St., Phila., Pa.

Electric Burglar Alarms and Private House Annunciators; Call, Servants' & Stable Bells; Cheap Teleg. Insts; Batteries of all kinds. G. W. Stockly, Cleveland

Solid Emery Vulcanite Wheels—The Original Solid 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, New York.

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. Frisbie & Co., New Haven, Ct.

Water, Gas and Steam Goods—Send eight stamps for Catalogue, containing over 400 illustrations, to Bailey, Farrell & Co. Pittsburgh, Pa.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., or lithograph &c.

Hotchkiss & Ball, Meriden, Conn., Foundrymen and workers of sheet metal. Fine Gray Iron Castings to order. Job work solicited.

Peck's Patent Drop Press. Still the best in use Address Milo Peck, New Haven, Conn.

All Fruit-can Tools, Ferracute W'ks, Bridgeton, N.J.

American Metaline Co., 61 Warren St., N.Y. City.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon, 470 Grand Street, New York.

Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass.

For best Bolt Cutter, at greatly reduced prices, address H. B. Brown & Co., New Haven Conn

Diamond Tools—J. Dickinson, 64 Nassau St., N.Y.

Temples and Oilcans. Draper, Hopedale, Mass.

Notes & Queries

R. M. P. will find an answer to his query as to power from compressed air on p. 43, vol. 34.—W. P. C. can make a solution of tin salt by the process described on p. 139, vol. 31, and he can crystallize the metal from the solution by a method described in the same article.—S. B. S. will find a description of a one track railroad on p. 370, vol. 29.—J. E. F. will find a full description of the Keely motor on p. 400, vol. 32.—C. W. J. will find directions for making patent leather on p. 122, vol. 27.—P. P. will find, on p. 91, vol. 32, directions for making chloride of calcium.—H. S. T. will find directions for making imitation black walnut on p. 90, vol. 32. This also answers J. C. A.—W. L. will find an answer to his question as to stones sinking in the ocean on p. 208, vol. 33.—T. H. will find directions for molding rubber on p. 283, vol. 29. This also answers H. F. B.—M. T. will find an engraving of a kerosene lamp for heating a small boiler on p. 229, vol. 33.—F. M. can dissolve gutta percha in bisulphide of carbon.—T. G. will find directions for making glue that will answer his purpose on p. 282, vol. 31. For a recipe for flour paste, see p. 219, vol. 30.—G. G. P. can remove inkstains from paper by the method described on p. 410, vol. 32.—W. N. G. will find directions for stereotyping by the paper process on p. 363, vol 30. For a recipe for stereotype metal, see p. 186, vol. 24.—T. M. W. will find directions for French polishing on p. 11, vol. 32.—C. C. will find directions for purifying rancid butter on p. 119, vol. 30.—A. will find directions for tempering springs on p. 363, vol. 32.—W. M. B. will find that paraffin varnish is a good non-conductor of electricity. See p. 91, vol. 31.—D. C. H. will find a description of the Mont Cenis tunnel on p. 213, vol. 25.—G. C. will find directions for bluing steel on p. 123, vol 31.—J. H. will find a description of a good field glass on p. 363, vol. 31.—W. L. S. will find a good article on building a windmill on p. 241, vol. 32.—C. A. S.'s perpetual motion device is very old. See p. 82, vol. 24.—M. S. can bleach paraffin by the process given on p. 309, vol. 30.—W. H. F. will find full information on blast furnaces in "The Iron Trade Manual," published by Wiley & Son, New York city.—M. L. will find a recipe for root beer on p. 138, vol. 31.—J. M. will find directions for making a submarine light on p. 229, vol. 28.—S. E. will find the proportions in which to mix carbolic acid with soap on p. 241, vol. 29.—D. C. will find directions for bleaching tallow on p. 27, vol. 31.—H. B. Jr. can make artificial meerschaum by the process described on p. 193, vol. 26.—G. F. A. will find a description of a spectroscope on pp. 277, 384, vol. 28.—J. M. will find directions for ascertaining the strength of boilers on p. 186, vol. 32.—J. D. can fasten emery on iron by the process given on p. 363, vol. 33.—H. C. S. will find directions for pasting paper labels on tin on p. 26, vol. 34.—T. R. W. will find a description of a cement for cast iron on p. 251, vol. 28.

(1) C. M. B. asks: Will iron decompose corrosive sublimate? Last spring I stuffed a few birds, and used a solution of corrosive sublimate, applying it with a small piece of common cotton batting on an iron wire. In the course of about two months the wire rusted, and the cotton appeared to be full of quicksilver, in little spheres, from the size of a pin's point to that of a pin's head. A. Yes. The action is accompanied by the formation of a basic chloride of iron and a separation of subchloride of mercury.

(2) L. E. B. asks: 1. Is there any known way to dry fish offal without the use of the patent dryer? A. Send us a sample of the patent dryer you have reference to. So much depends upon the condition of the materials, and the temperature at which the operation takes place, that it is impossible to give any very decisive answer. 2. When it is dried, what proportion of ammonia could I safely calculate on obtaining from it? A. The average amount of available nitrogenous matter contained in such waste is from 8 to 10 per cent.

(3) S. E. T. asks: 1. What are grape spirit, French spirit, corn spirit, and English spirit as used by perfumers? A. Grape spirit is the spirit of wine; corn spirit that obtained by the fermentation of corn. The other two grades we do not recognize by the names you give them. 2. Is spirit of jasmine the same as extract of jasmine? A. Probably.

(4) R. H. B. says: I use 8 inch welded boiler flues for stove pipes, etc. How can I cut off the rain at the roof or catch the water below? A. Construct two conical flanges around the flue pipe where it connects with the roof, above the latter, with the largest end of the cones downward; secure the bottom edge of the lower one to the roof, and the top edge of the upper one to the pipe, by soldering or by packing within a ferrule. The upper cone will serve as a cape over the lower one; and as they are not fastened to one another, no harm can come from expansion and contraction.

(5) J. F. M. & B. ask: Can you inform me of an easy manner of steaming geese feathers? We have plenty of steam. A. The feathers may be placed in a long tubular vessel surrounded by a steam jacket. In order to prevent any tendency to condensation of the steam as it passes through the vessel, it should be considerably superheated before being allowed to enter, and be passed through as rapidly as the case will permit.

(6) W. B. W. asks: What substance or substances of a quickly drying and gummy nature will serve as a vehicle for sulphuric acid, or any other acid that will quickly destroy vegetable tissue, without neutralizing the acid or destroying the properties of the vehicle? A. We do not think it is practicable to use any of the stronger acids in the way you propose. All such substances as the gums, gum resins, and oils are more or less acted upon by acids, if the latter are sufficiently strong to accomplish the destruction of vegetable fiber.

(7) A. B. asks: How can I clean jugs in which linseed oil has been kept for a long time, so they will not smell like the oil? A. Remove as much of the oil as possible by means of naphtha or benzine, and then wash the interiors well with a concentrated hot solution of potash or soda (lye). Finally rinse with clean water.

(8) J. H. C asks: What are the greatest conditions of safety under which a steam boiler can be operated? I wish to use a three horse power engine three or four times per week, about five hours at a time; if I get a boiler large enough to run the engine that length of time without adding any water (not providing any pump) the boiler being tested to 150 lbs. and having a valve set to blow off at 50 lbs. pressure, would not danger of explosion be entirely obviated? A. These conditions, supplemented by careful management, should ensure safety in a high degree.

(9) J. H. S. says: I have a bath tub set in wood. How can I paint or coat the surface with an imitation of marble that will resist water? A. The following has been used for this purpose: Boil a quantity of water glass (silicate of soda) in water until a clear sirupy liquid is obtained; then add sufficient oxide of zinc to form a stout body color, and apply several coats to the woodwork if necessary.

(10) J. W. S. says: In your article on p. 283, vol. 29, on molding rubber, you say: "Immerse the rubber in a mixture of bisulphuret of carbon 95 parts, and rectified spirits 5 parts, until it swells into a pasty mass. It may then be molded into any form required." I can dissolve the rubber nicely, but cannot form it in a mold. You say: "Your trouble probably arose from using vulcanized rubber. Try pure rubber in bisulphide of carbon and rectified spirits." I inclose a small piece of the rubber which I used. What is the difficulty? A. Bisulphide of carbon is the most usual and best solvent for caoutchouc (india rubber). This solution, owing to the volatility of the menstruum, soon dries, leaving the caoutchouc in its natural state. When alcohol is mixed with the sulphide of carbon, the latter does not any longer dissolve the caoutchouc, but simply softens it. Alcohol precipitates solutions of caoutchouc.

(11) F. L. B., of Yokohama, Japan, says: I am manufacturing safety matches, and find that they become soft in the warm, damp weather which we have here during the summer months. I use chlorate potassa, oxide manganese, sulphuret antimony, sulphur, and glass, and the best glue for the matches, and amorphous phosphorus, sulphuret antimony, and glue for the boxes. English matches stand this climate, and they are not varnished. What can I use that will keep the composition ends free from the influence of the weather? A. Collodion has been used for this purpose with very good results.

(12) M. R. H., of Mannheim, Germany, says: We have a brick room or oven with an iron floor. By means of furnaces underneath, it is gradually heated (during 12 hours) to 295° Fah. What liquid or substance can be put into an iron globe, communicating with a pipe outside the building, to cause a piston to rise as the heat inside is developed? A. Let the pipe from the globe turn downwards outside the room, a certain distance determined by experiment, and then bend and turn up again in a vertical position; fill the pipe outside the room with water, thus enclosing a certain quantity of air within the globe and in that portion of the pipe which is in the room. Now, if you provide a float upon the surface of the water in the exterior vertical pipe, as a piston, the expansion of the air in the globe will raise the water and the float, without making steam, and so effect the object you desire.

(13) J. S. C. asks: What are the causes of loss of power in the reciprocating engine, and what is the percentage of the loss from each cause? A. The following table, from an article by Messrs. Hunt and Skeel, on "The Methods of Testing Steam Engines," gives a good idea of the quality and amount of the losses, in the case of a condensing engine connected to a propeller:

		Per cent.
Units of heat in 100 lbs. anthracite	1,400,000	
Heat equivalent to weight of ashes	200,000	
Total heat in 100 lbs. of anthracite	1,200,000	100
Carried off by hot gases in chimney	200,000	16⅔
Available to produce steam	1,000,000	83⅓
Lost by leakage and condensation	200,000	16⅔
Available for work in cylinder	600,000	66⅔
Escaped with steam into condenser	660,000	55
Transformed into work	140,000	11⅔
Absorbed by friction, etc., of engine	40,000	3⅓
Available for useful work	100,000	8⅓
Absorbed by friction, etc., of propeller	20,000	1⅔
Usefully applied to propulsion	80,000	6⅔

(14) J. B. M. says. We have a yacht 32 feet long by 6 feet 4 inches beam. Would it make greater speed with two propellers of 26 inches diameter and 35 inches pitch, driven by two engines of 3 inches diameter by 5 inches stroke, than with one propeller of 36 inches diameter and 38½ feet pitch, driven by 1 engine of 4 inches diameter and 6 inches stroke, boiler being same in both cases? A. You do not send sufficient data to enable us to form an opinion. Other things being equal, however, one screw is generally preferable. Of course there may be special cases, as with yachts of very slight draft, where better results might be obtained by using two propellers.

(15) E. R. asks: Will a half horse power motor be large enough to propel a boat 20 feet long by 5½ feet wide, and 5 inches deep at the bow and 16 inches at the stern? A. The boat will not be very effective under the circumstances. 2. I want to use a 16 inch propeller wheel, and drop it 2 inches below the bottom of boat. What pitch shall I give the wheel? A. You can make the pitch of the propeller from 27 to 30 inches.

(16) W. H. B. says: In answer to a question as to pressure in a boiler, you say: "There is a little more pressure at the bottom." I suppose you mean that the weight of the water gives the over pressure, and that, aside from that, the pressure is equal. Am I correct? If so, is the answer a correct one? Does not the water (at its surface) resist the action of the steam in a downward direction? And is not the pressure carried through the whole body of water to the lower part of the boiler? Suppose the boiler is half full of water. Then the upper part of the boiler (on which the steam acts directly) is ½ greater than the surface of the water; and if steam presses equally upon every square inch of surface, then (aside from the weight of water) there is ½ more pressure on the upper part of the boiler. If this is not true, please explain why? A. Your idea in regard to the weight of the water increasing the pressure on the bottom is correct. You will find the other part of your query answered in any good treatise on the pressure of fluids.

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

G. F.—It is a cast of a fossil plant in sulphuret of iron. The material is not valuable.—J. F. B.—It is sulphuret of iron.—J. A. M.—It is hydrated sesquioxide of iron mixed with clay. By burning, it is converted into an inferior brown umber. Mix minium to change its color to a red.

J. M. H. Jr. asks: Can you give me a recipe for making decalcomanie varnish?—R. M. asks: Are black pearls of commercial value?—J. W. C. asks: How are gelatin capsules, such as are filled with various medicines, made?—J. A. B. asks: How can I make a polish or varnish for rubber shoes?

COMMUNICATIONS RECEIVED.

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

On Coal Mine Explosions. By J. F. R.
On a Curious Tree. By W. J. McG.
On Safe Launches. By P.
On Etheric Force. By J. R.
On Water Pressure in Mains. By J. C.

Also inquiries and answers from the following:
J. C. H.—R. L.—M. C.—P. S.—J. B. D.—R. S. P. R. S. R.—T. H.—C. H.—A. C.—A. A.—W. W.—H. L.—T. M.—F. W. C.—J. C.—J. K.—B. L.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Whose electro-motor is the best? Whose is the best apparatus for drying and evaporating, using steam as the heating medium? Who sells small balloons? Who makes a barometer with a self-adjusting scale? Whose is the best pump for raising water from a mine 45 feet deep? Who makes lead chambers for sulphuric acid works, and what do they cost?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

January 4, 1876.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Addressing machine, R. Dick (r)	6,852
Air compresser, E. Hill, Jr	171,805
Alarm, automatic fire, D. Kearney	171,669
Alphabet board and block, D. C. Taylor	171,884
Awl handle, Page & Schroeder	171,739
Axle, W. W. Kisner	171,732
Bag fastener, C. W. Harvey	171,801
Baggage check, Wheeler & De Haven	171,894
Balance, spring, J. P. Chatillon	171,650
Bale bands, punching, S. H. Gilman	171,660
Bales, untying cotton, S. H. Gilman	171,659
Barrel-pitching machine, H. Lehmann	171,672
Bayonet clamp, etc., T. W. Rounds	171,868
Bearing, anti-friction, C. B. Sheldon	171,874
Bed bottom, spring, W. Chase	171,776
Bedstead, folding, A. M. Eastman	171,653
Bitters, J. Gerlitz	171,658
Boat, life, J. M. Richardson	171,698
Boats, towing canal, W. F. Goodwin	171,783
Boiler for steam heaters, W. S. Payne	171,844
Boiler plates, machine for shearing, E. Fisher	171,655
Boiler, steam, C. W. Reed	171,861
Bolt for windows, etc., H. Seymour	171,701
Boot protector, C. S. Mossholder	171,837
Boots, making, H. Port (r)	6,859
Box-trimming machine, G. W. Swan	171,883
Bracket, adjustable, E. T. Starr	171,746
Bridge, floating draw, H. H. Gorringe	171,722
Bronze, aniline, O. Fiorillo	171,787
Burner for gas stoves, T. J. Kelly (r)	6,853
Burner, gas, O. J. McGann	171,831
Burner, vapor, A. H. Watkins	171,891

Busk fastening, R. Stokes	171,881
Butcher's stall, J. Matheson	171,676
Calendar, C. S. Murphy	171,839
Camera, E. B. Barker	171,643
Car axle, G. W. Miltimore	171,835
Car axle, lubricator, G. M. Morris	171,690
Car brakes, hand crank for, H. Wakeman	171,749
Car coupling, G. H. Ames	171,755
Car coupling, G. W. Brady	171,763
Car coupling, J. Kensler	171,730
Car coupling, D. W. Vowles	171,889
Car heater, Lemeunier & Martin	171,826
Car mover, J. G. Wilber	171,896
Car replacer, Bride & Blakeslee	171,765
Carburetor, A. Wiggin	171,751
Carousal or roundabout, R. Steel	171,878
Carpet cleaning machine, J. Hothersall	171,727
Cattle wash, A. Sievers	171,875
Chair, Grems and Fowle	171,664
Chandeliers, spring extension, L. T. Lawton	171,825
Cheese turner, C. Barlow	171,758
Chisel, C. E. L. Jelliffe	171,815
Cloth-shearing machine, I. L. Holmes	171,808
Coffins, show case for, E. W. Wilcox	171,897
Colter, A. Muir	171,692
Comb, B. F. Britton	171,717
Cooler, milk, W. H. Johnson	171,816
Copies of writing, etc., E. De Zuccato	171,780
Corkscrew, F. T. Witte	171,752
Corn coverer, T. B. McChesney	171,829
Corset, G. W. Reynolds	171,863
Corset, abdominal, E. Turner	171,748
Cradle, Wilson & McAdams	171,900
Cradle spring attachment, H. S. Hale	171,798
Cultivator and plow, L. R. Wright (r)	6,836
Dental engine, S. S. White	171,750
Desk, folding or portable, J. Miller	171,693
Dice box, A. Walker	171,707
Die, Porter & Platt	171,854
Distilling phosphorus, A. G. Hunter	171,813
Door check, W. G. Hoffman	171,807
Door sill, A. Saur	171,870
Drills, bit for metal, T. P. Farmer	171,786
Dust pan, W. J. Parker	171,740
Elevator for buildings, Bevins & Wels	171,716
Engine, direct acting, J. W. Mathieson	171,679
Engine, direct acting pump, J. W. Mathieson	171,678
Engine house gong, E. Bragg (r)	6,831
Engine, rotary, T. Swinburn	171,704
Engines, electric regulator for, Sangster *et al*	171,869
Engine, reversing valve, Bevins & Wels	171,715
Engine slide valve, Kelly & Gardiner	171,819
Eyelets, setting, L. C. Buettner	171,770
Fabric, padding, H. Howard	171,728
Fan and blower, P. A. Schwenzfeier	171,872
Fare register, electrical, S. Bergmann	171,714
Faucet, U. Bohren	171,646
Felting machine, J. J. O'Sullivan	171,693
Fertilizer, St. J. Ravenel	171,857
Fertilizers, making, H. O. P. Lissagaray	171,848
Fishing hook, J. H. Place	171,697
Fishing tackle, J. T. Buel	171,769
Fishing tackle double spoon, J. T. Buel	171,768
Fluting machine, J. Broughton	171,718
Food extract from fish, S. L. Goodale	171,662
Furnace for heating blanks, J. W. Bonta (r)	6,837
Furnace, heating, S. D. Vose	171,868
Furnace, hot air, J. F. Pease	171,846
Furnaces, lining puddling, J. A. Burden	171,772
Game counter, pretzel and Sternheimer	171,784
Gas stove, W. M. Jackson	171,814
Glass, furnace for melting, N. Snyder	171,876
Globe holders, T. F. McGann	171,735, 171,840
Grain binder, C. G. Crosse	171,652
Grain conveyer, H. W. Caldwell (r)	6,838
Grain drill, E. Kuhns	171,907
Halter, T. Gingras	171,661
Harness saddle, R. Spencer	171,745
Harrow, J. R. Van Orthwick	171,887
Hat-blocking machine, H. A. Graeff	171,794
Hay loader, J. A. Bower	171,647
Hay or straw, twisting, A. A. Wells	171,709
Hoisting apparatus, L. T. Pyott	171,855
Hoops, shaving, S. Parker (r)	6,842
Horse power for drilling wells, G. A. Newman	171,840
Horseshoe nails, making, J. B. Mills	171,711
Hose carriage and engine, J. A. House	171,809
Hub-boring machine, E. B. Decker	171,779
Ice cream freezer, S. M. Gosson	171,663
Indicator, cashier's, T. Olsen	171,842
Iron ores, deoxidizing, A. G. Hunter	171,811, 171,812
Istle machine, G. R. Welke	171,708
Kettle and vegetable cooker, F. D. Lepper	171,827
Ladder expansion jack, F. Rote	171,742
Lamp, miner's, J. C. Marshall	171,675
Lard-rendering tank, P. Andrew	171,756
Lasting machine, F. S. Hunt	171,810
Latch, gate, W. H. Key	171,731
Lathe, gage, J. M. Parker	171,696
Leather-dressing machine, W. H. Rosengteel	171,867
Leather dubbing, E. F. Dietericha	171,719
Leather, treating, H. W. Adams	171,753
Lightning rod, C. H. Smith	171,744
Lightning rod, H. W. Spang (r)	6,835
Line fastener, F. Wagner	171,890
Lock, combination, G. F. Knight	171,820
Lock for doors, etc., H. S. Shepardson	171,873
Locomotive head light, Mills, Bell, and Carey	171,834
Lozenge machine, T. Robertson	171,699
Magnetic machine, electro, J. Kidder (r)	6,840
Map exhibitor, J. Lichtenberger (r)	6,841
Mashing machine, T. A. McIntyre	171,832
Medicines, strup for, R. S. Peyton	171,848
Metal beams, bending, Jenkins and Funk	171,729
Metal plates, coating, E. Morewood	171,684, 171,685
Metal plates, coating, Morewood *et al*	171,686, 687, 688
Metal shapes, former for, A. Ball	171,642
Meter, liquid, J. C. Guerrant	171,665
Mill, wine and cider, C. Boul	171,761
Mitering machine, R. A. Williams	171,899
Monument, J. C. Stinson	171,881
Music-leaf turner, T. Donnelian	171,781
Nut lock, G. W. Henry	171,804
Nut lock, J. F. Wiles	171,898
Nut blanks, rolling, J. Ostrander	171,843
Ore concentrator, J. M. Thompson	171,747
Organ stop action, reed, J. A. Smith	171,702
Paddle wheel, J. Kampman	171,818
Padlock, J. L. Hirsch	171,806
Paint, liquid, J. Peart	171,845
Pan, milk and cheese, H. W. Horton	171,667
Paper box, R. Ritter	171,866
Paper fastener, J. Adair	171,712
Paper for postage stamps, etc., J. Schnoble	171,871
Paper pulp stock grinder, J. P. Labrousse	171,822
Pencil box, J. Reckendorfer	171,860
Perambulator, J. Lauer	171,824
Piano truck, C. A. French	171,667
Pillow, dress, B. and E. B. Witherell	171,903
Pipe, water, J. C. Bohrman (r)	6,834
Pipes, trap for sewer, W. A. Pitt	171,849
Planter, corn, A. C. Burgner	171,771
Planter, corn, Galt and Tracy	171,791
Planter, corn, M. P. Noel	171,841
Plow, W. A. Estes	171,785
Plow, hand, M. Y. Thompson	171,706
Pocket book fastening, D. M. Read	171,859
Pocket book lock, D. M. Read	171,858
Press, cotton, J. W. Macumber	171,674
Pump, H. M. Wyeth	171,905
Pump, rotary, W. O. Crocker	171,651
Pump, steam and vacuum, B. C. Vanduzen	171,886
Purifier, middlings, G. Milbank	171,833
Railroad, N. Gibson	171,721
Railroad rail, G. R. Dunbar	171,782
Railroad rail joints, fish bar for, J. M. Atkinson	171,713
Railroad switch, J. A. Green	171,796
Railroad switch, W. A. Weant	171,892
Railroad switch, street, T. Newman	171,737
Railroad transfer table, C. Hathaway	171,726
Rake, horse, Clarke, Utter, and Gorham	171,777
Rake, horse, W. J. Lane	171,734
Rake tooth fastener, Galt & Tracy	171,790
Rope clamp, L. H. Page	171,738
Ruler, parallel, J. G. Henderson	171,803
Safe, fireproof, W. Hagerty	171,724
Sash fastener, J. R. Payson	171,694
Sash fastener, J. G. Perry	171,847
Sash holder, J. R. Payson	171,695
Scales, hydrostatic, F. Bockhacker	171,760
Scales, weigh, W. C. King	171,670
Scraper, road, W. H. Bowman	171,762
Screw thread tap, J. J. Grant	171,795
Scythes, cradle finger for, W. Hamilton	171,666
Sewing machine, Glines & Stiles	171,712
Sewing machine, E. Shaw (r)	6,843
Sewing machine needle threader, H. A. Ellis	171,654
Sewing machine shuttle, R. H. St. John	171,879
Sewing machine treadle, T. F. Woodbridge	171,904
Sewing machine thread guide, W. A. Springer	171,877
Sewing machine, straw, M. P. Carpenter	171,771
Shade holder, J. Ellis	171,784
Shafting, W. L. McNair	171,680
Shearing machine, P. Broadbooks	171,766
Sheet metal clamp, Kittredge & Clark	171,671
Skylight, Querner & Burke	171,856
Sleigh runner, M. S. Brooks	171,767
Sleigh knee, W. P. Wentworth	171,893
Soldering compound, L. Houriet	171,668
Spark arrester, W. H. Richardson	171,865
Spark arrester and damper, A. Winton	171,901
Spectacle holder, G. Meyer	171,681
Stair rod, M. Krickl	171,733
Stand for plants, G. C. Setchell	171,700
Stove, cook, Brown & Askin	171,649
Stove, gas, W. M. Jackson	171,814
Stove, heating, Morse & Knox	17 ,691
Stove, oil-burning, E. G. Adams	171,641
Stove, parlor, E. T. Bussell	171,773
Stove pipe thimble, J. T. Hall	171,800
Stoves, burner for gas, T. J. Kelly (r)	6,833
Straw cutter, J. R. Whittemore	171,895
Stud and button, J. B. & W. Bennett	171,644
Syringe, C. E. Koechling	171,821
Syringe tube, rectal, M. Mattson	171,677
Table slide, extension, H. G. Porter	171,853
Testing machine, J. T. Munnich	171,838
Thill coupling, D. D. Whitney	171,710
Thrasher and separator, bean, C. S. Hall	171,724
Threshing machines, beater reel for, C. S. Hall	171,725
Toy gymnast, R. A. Smith	171,703
Toy watches, G. Powell	171,850, 171,851, 171,852
Track clearer, W. Hamilton	171,906
Trap, fly, E. Littlefield	171,673
Treadle, C. Brandtner	171,648
Truck, piano, C. A. French	171,657
Trunk, W. J. Large	171,823
Turbine, D. B. Flint	171,656
Tweer, C. M. Morgan	171,836
Umbrella handle, W. H. Blake	171,645
Umbrella rib tip retainer, H. B. Stillman	171,880
Umbrella runner, G. W. Hatch	171,802
Valve, flexible, F. Kahl	171,817
Vehicle brake, Adamy & Whittemore	171,754
Vehicle seat spring, W. F. Baird	171,757
Vehicle spring brace rod, A. Cliff	171,778
Vehicle spring brace, C. L. Rice	171,864
Velocipede, F. J. Reinhold	171,862
Ventilator for windows, P. Mihan	171,682
Wagon beds, end extension for, J. B. Mooney	171,736
Wagon bolster, O. E. Griswold	171,797
Wagon, side bar, C. B. Wood	171,908
Warping machine, Follensbee & Entwistle	171,788
Washing machine, J. Bartoo	171,759
Washing machine, G. W. Edmondson	171,783
Washing machine, L. C. Hall	171,799
Washing machine, W. R. Reed	171,741
Washing machine, Templeton & Moulton	171,885
Waterproofing compound, T. H. Dunham	171,720
Water trap supply, etc., J. H. Morrell	171,689
Water wheel, C. Chalfant	171,775
Whiffletree bolt, T. Skelly	171,743
Wire stretcher, Taber & Morgan	171,705
Wrench, pipe, T. P. Franke	171,769

DESIGNS PATENTED.

8,884.—SEWING MACHINE ATTACHMENTS.—H. C. Goodrich, Chicago, Ill.

8,885.—BREASTPIN.—W. H. Halsey, Newark, N. J.

8,886.—BOXES.—M. F. Bell, Fulton, Mo.

8,887.—COFFIN PLATES.—R. H. Burr, West Meriden, Ct.

8,88.—WATCH PLATES,—A. H. Potter, Chicago, Ill.

SCHEDULE OF PATENT FEES.

On each Caveat	$10
On each Trade mark	$25
On filing each application for a Patent (17 years)	$15
On issuing each original Patent	$20
On appeal to Examiners-in-Chief	$10
On appeal to Commissioner of Patents	$20
On application for Reissue	$30
On filing a Disclaimer	$10
On an application for Design (3½ years)	$10
On application for Design (7 years)	$15
On application or Design (14 years)	$30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, December 23, 1875, to January 10, 1873.

5,531.—A. Ramsay, Montreal, P. Q. Station indicator. Dec. 23, 1875.

5,537.—L. Hurd, Kewannee, Ill., U. S. Edible compound. Dec. 23, 1875.

5,538.—R. Lean *et al*., Stratford, Ont. Fanning mills and separator. Dec. 30, 1875.

5,539.—L. Flagg, Central Falls, R. I., U. S. Automatic gate. Dec. 30, 1875.

5,540.—L. E. Hurd, Cleveland, Ohio, U. S. Compound to prevent scale in steam boilers. Jan. 5, 1876.

5,541.—A. Christin, Chicago, Ill., U. S. Bottle stopper. Jan. 3, 1876.

5,542.—A. D. Crosby, Cuba, N. Y., U. S. Chain pump bucket. Jan. 3, 1876.

5,543.—S. C. Hamlin, Ypsilanti, Mich., U. S. Rubber bucket for chain pumps. Jan. 3, 1876.

5,544.—H. N. Slater, Webster, Mass., U. S. Process of flocking cloth. Jan. 3, 1875.

5,545.—H. Gillmore, Simcoe, Ont. Sash holder. Jan. 5, 1876.

5,546.—H. Wells, Ottawa, Ont. Revolving drag harrow. Jan. 8, 1876.

5,547.—W. P. Widdifield, Siloam, Ont. Weather strips. Jan. 8, 1876.

5,548.—A. Newell, Chicago, Ill., U. S., *et al*. Constructing dead pulleys. Jan. 10, 1876.

5,549.—D. S. Cornell, Warwick, Ont. Barrel. Jan. 10, 1876.

5,550.—D. S. Cornell, Warwick, Ont. Barrel and cylindrical box. Jan. 10, 1876.

5,551.—G. J. Tandy, Kingston, Ont. Boiler for steam engines, etc. Jan. 10, 1875.

5,552.—J. Hawes, Worcester, Mass., U. S. Egg beater and mixer. Jan. 10, 1876.

5,553.—G. W. Robinson, Bennington Center, Vt., U. S. Hand corn planter. Jan. 10, 1876.

5,554.—A. Smith, Clifton, Ont. Applying liquid fuel to the heating of metals, etc. Jan. 10, 1876.

5,555.—A. W. Shaw, Saccarappa, Me., U. S. Hydraulic cement. Jan. 10, 1876.

5,556.—W. D. Edy *et al*. Fanning mill and elevator attachment. Jan. 10, 1876.

5,557.—G. W. Johnson, Yarmouth, N. S. Pump. Jan 10, 1876.

5,558.—C. L. Jeffords, Jamestown, N. Y., U. S. Converting cast iron into steel. Jan. 10, 1876.

5,559.—F. Beauchemin, Bolton Falls, P. Q. Dough mixing machine. Jan. 10, 1876.

5,560.—W. Milner, Strathroy, Ont. Door base protector. Jan. 10, 1876.

5,561.—J. H. Grant, Grimsby, Ont. Mowing and reaping machine. Jan. 10, 1876.

5,562.—A. S. Buckelew, Jersey City, N. J., U. S. Watch case spring. Jan. 10, 1876.

5,563.—T. J. O'Sullivan, Hamilton, Ont. Heating drum. Jan. 10, 1876.

5,564.—R. D. O. Smith, Washington, D. C. Water closet. Jan. 10, 1876.

5,565.—F. G. Butler, Bellows Falls, Vt., U. S. Horse rake. Jan. 10, 1876.

5,566.—T. Northey, Hamilton, Ont. Steam pump or boiler feeder. Jan. 10, 1876.

5,567.—W. T. Lintner *et al*., Fort Plain, N. Y., U. S. Pad for chair legs. Jan. 10, 1876.

5,568.—B. Barker, Ellsworth, Me., U. S. Stave-jointing machine. Jan. 10, 1876.

5,569.—J. Woolridge, Dean's Corner, Ill., U. S. Land roller. Jan. 10, 1876.

5,570.—G. Blatchford, Mitchell, Ont. Reed organ. Jan. 10, 1876.

Advertisements.

Back Page ------ $1.00 a line.
Inside Page ----- 75 cents 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 Friday morning to appear in next issue.

STAVE, SHINGLE, HANDLE AND CABINET Maker's Machinery, etc. etc. Address T. R. BAILEY & VAIL, Lockport, N. Y.

TO EVERY WORKER IN IRON OR WOOD.—The Instantaneous Self Acting Copying Paper does its own work without the use of apparatus or tracing of lines, and instantly produces perfect impressions of Leaves, Flowers, Laces, Embroideries, Scroll or Fretwork, or any flat, opaque, or transparent article where perfection in a copy is desired. Chemicals and instructions, 50 cts. Address COPYING PAPER CO., Mendota, Ill.

STRONG TESTIMONY.

"I have thoroughly tried your Gothic Furnace, and find it in every way satisfactory. The air is mild and pleasant. I an recommend it in every respect."
CHARLES E. BREEDEN, Bloomfield, N. J.
To ALEX. M. LESLEY, 226 West 23d St., New York.
☞ Catalogues sent by request.

SAFETY VALVES. By Richard H. Buel, C. E. Forming No. 21 Van Nostrand's Science Series. 18mo, boards. 50c.
D. VAN NOSTRAND, PUBLISHER,
23 Murray St. and 27 Warren St., New York.
. Copies sent free by mail on receipt of price.



Made from pure long fiber Asbestos, Self-Lubricating, adapted for Locomotive and Stationary Engines, and, owing to its indestructibility, will save ten times its cost in the one item of repacking, besides requiring less oil than any other packing in use. Send for testimonials, Price List, etc.
H. W. JOHNS, 87 Maiden Lane, N. Y.,
M'f'r of Patent **Asbestos Roofing, Steam Pipe, and Boiler Coverings, Paints, Fire Proof Coatings, etc.**

WANTED—Situation by a young man of good sober disposition, as Assistant Engineer or Surveyor; good references furnished. Address C. E., Box 73, Harveysburg, Warren Co., Ohio.

ON THE CAUSES OF KNOCKING IN HIGH PRESSURE ENGINES. By Joshua Rose. With Nine Engravings. A valuable practical treatise. Price 10 cents. Contained in Nos. 1 and 2 of "Scientific American Supplement," to be had at this office, and of all newsagents.

GOOD THINGS.
I want to sell, cheap, my two Patents for Palace Style of Carpeting Stairs and Sham Pillows. Both original, important and will be monopolies. Or would make arrangements with reliable parties to make and introduce on small royalty. T. F. WALTER, Gen. Upholsterer, 1304 Jefferson St., Philadelphia, Pa.

WHIPPLE'S
Patent Door Knob.
Awarded a Bronze Medal at the American Institute Fair for 1874. The Judges say: "We consider this method of fastening DOOR KNOBS a great improvement over anything yet invented for the purpose, as it obviates the use of side screws and washers, and can be regulated to suit any thickness of Doors." Send for Circular.
THE PARKER & WHIPPLE COMPANY,
West Meriden, Conn., or 97 Chambers St. N. Y.

Established in 1854.
LOVEJOY, SON & CO.,
ELECTROTYPERS and STEREOTYPERS,
15 Vandewater Street, New York.

Cotton Seed Huller.
D. Kahnweiler's Celebrated Patent, for Oil Mills and Plantations. Used by every Mill in New Orleans and others. Grinds and cracks corn and peas. Hand Machine, $75. Power Huller, $175. 120 Center St., New York.

NOTICE.
The undersigned has assumed the Personal Property, including accounts, finished and unfinished Machinery, good will, &c., connected with the manufacture of MACHINIST'S TOOLS as conducted by Mr. Lucius W. Pond since 1847, and will continue the said business at the old stand, cor. Union and Exchange Sts., Worcester, Mass., under the name of DAVID W. POND, Successor to Lucius W. Pond.
CARD.—Having assumed the business mentioned above, I solicit Inquiry and Patronage with guarantee that present standard of Workmanship, and quality of Machinery shall be maintained. A large quantity of NEW AND SECOND-HAND TOOLS, ALL STYLES AND SIZES, for Sale at Low Prices. Send for list of second hand tools. Store at 98 Liberty St., New York, will be discontinued from Feb 1, 1876, and all sales made from manufactory.
Respectfully, DAVID W. POND,
Successor to LUCIUS W. POND

MUNSON CABLE LIGHTNING CONDUCTOR has received the endorsement of all Modern Scientific Men who have examined this beautifully drawn sharp-edged wires—having in its construction thousands of Sharp Points, from the top of the Rod to the bottom—by which is demonstrated, to a certainty, that the sharp edges dissipate the volume of electricity, and by so doing renders it powerless to do harm. Parties desiring to purchase this article, please address
DAVID MUNSON, Indianapolis, Ind.



THE
Bigelow Engine,
The Cheapest and Best Portable Engine offered to the Public.

Price, 4 Horse Power			$300
" 6 "	"		400
" 7 "	"		475
" 8½ "	"		540
" 12 "	"		725
" 15 "	"		900

Price of Stationary Engines: Without Boilers.

4 Horse Power	$150
6 " "	175
7 to 8½ Horse Power	225
12 to 15 " "	300

Send for Illustrated Circular and Price List.
H. B. BIGELOW & CO., New Haven, Conn.

Best Mill Spindles and Steps,
MILL GEARING,
Shafting, Pulleys & Hangers.
Address T. B. WOOD & CO., Chambersburgh, Pa.

FOOT LATHES.
W. E. LEWIS, Cleveland, O. Catalogues Free

IRON BRIDGE BUILDING—A complete description, with dimensions, working drawings, and perspectives of Girard Avenue Bridge, Philadelphia, Pa. With foundations of piers. Ten engravings. Price 30 cents. Contained in Nos. 1, 2, and 4 of SCIENTIFIC AMERICAN SUPPLEMENT. 10 cents per copy. To be had at this office, and of all news agents.

VISES.
IMPROVED, CHILLED-FACE, Warranted Superior to any in the market. A Standard for strength, weight, durability, and cheapness.

JAW.	WEIGHT.	PRICE.	JAW.	WEIGHT.	PRICE.
2 inch	15 lbs.	$3 50	5 inch	80 lbs.	$12.50
3 "	30 "	$6.00	6 "	125 "	$17.00
4 "	45 "	$8.00	7 "	200 "	$22.50

Liberal discount for wholesale orders.
Address, for circulars, H. B. SMITH,
Manufacturer of all kinds of Wood-Working Machinery, &c., Smithville, Burlington Co., N. J.
See description, page 56, Jan. 22, 1876.



Blowers
FOR
All Purposes
The CHEAPEST and BEST now in use.
ALL WARRANTED.
EXETER MACHINE WORKS,
Sole Makers,
140 Congress St.,
Boston, Mass.

SCIENCE RECORD
For 1876.



SCIENCE RECORD is a splendid book of 600 pages, published annually, about the 15th of January. Illustrated with many engravings. Price $2.50.

THE Volume for 1876 will be published about January 15th. Its contents will embrace the most interesting Facts and Discoveries in the various Arts and Sciences that have transpired during the preceding year, exhibiting in one view the General Progress of the World the following Departments:

CHEMISTRY AND METALLURGY,
MECHANICS AND ENGINEERING,
ELECTRICITY, LIGHT, HEAT, SOUND,
TECHNOLOGY, THE USEFUL ARTS,
BOTANY AND HORTICULTURE
AGRICULTURE,
RURAL AND HOUSEHOLD ECONOMY,
MATERIA MEDICA, THERAPEUTICS, HYGIENE,
NATURAL HISTORY AND ZOOLOGY,
METEOROLOGY, TERRESTRIAL PHYSICS,
GEOGRAPHY,
GEOLOGY AND MINERALOGY,
ASTRONOMY,
BIOGRAPHY AND NECROLOGY.

Every person who desires to be well informed concerning the Progress of the Arts and Sciences should have a copy of SCIENCE RECORD for 1876. It will be a most interesting and Valuable Book, and should have a place in every Household and Library.
600 pages Octavo. Handsomely Bound. Many Engravings. Price $2.50. Sent, post-paid, on receipt of price.

All the preceding volumes of SCIENCE RECORD may be had separately at $2.50 each, or $10 for the five volumes, 1872, 1873, 1874, 1875, and 1876.

MUNN & CO., PUBLISHERS,
37 Park Row,
New York city

READER,

Now, while you think of it, subscribe for THE ILLUSTRATED WEEKLY (costs $3.00 a year, or monthly part $1.75 a year)—it is worth $50 to any progressive man or family.

It is a most interesting paper—pure, instructive and amusing, portraying with pen and pencil current events; historical, household, and useful subjects; fun and fiction. Larger than N. Y. Ledger, but in character similar to The London Illustrated News—going alike to all sects and parties.

For 1876 it will be a grand illustrated history (and the best) of the Centennial year. James Parton, Chief Editor. A host of the best contributors. An illustrated supplement extra every week. Every subscriber is presented with a choice of the three finest and largest oil chromos ever produced, viz: "Beatrice," (portrait by Guldet); "The Snow Storm," (landscape by Kaufmann), or, "Gold Fish, Fruits and Flowers," (by Ramsey); each in 17 oil colors and 1 foot by 1½ foot in size. All postage on paper, supplements and chromos prepaid.

In a single year, this paper has attained the largest circulation save one among the illustrated journals of this country—best proof of its merit.

"THE ILLUSTRATED WEEKLY, of New York, is certainly giving its subscribers a wonderful amount of good pictures for their subscription."—*The Advance, Chicago.*

"If there is one paper that we can enjoy reading from end to end, that paper is THE ILLUSTRATED WEEKLY."—*The Capital, Detroit.* "The inducements offered are fully carried out."—*The Independent, N. Y.*

AGENTS

actually make from $10 to $20 a day during winter months. This combination sells itself. Be quick to secure an agency. Send address for specimens and liberal terms, or better yet, to save time, send $1.00 (C. O. D. $1.50) for a complete outfit, and make a hundred dollars while you would otherwise be waiting. You are sure to take hold anyhow. *Money refunded if not perfectly satisfied.* Branch houses for convenience of agents at Boston, Chicago and Atlanta, Ga. For subscriptions, outfits or circulars, Address CHAS. CLUCAS & CO., Publishers ILLUSTRATED WEEKLY, 31 Dey St., N. Y.

FOREIGN PATENTS AND *THE CENTENNIAL.*

There is no doubt that our Centennial Exposition will attract to our shores multitudes of representative people from all parts of the world, and they will take home with them many of our best improvements to introduce into their own manufactures.

An unusual opportunity will be offered for selling to these people such foreign patents as have been secured on good American inventions in the respective countries from which these visitors come.

At the reduced prices for which patents are obtained abroad, our people will lose a chance not likely to occur again, if they do not avail themselves of the opportunity of securing their inventions in foreign countries at once, so as to have their patents ready to negotiate the coming summer.

For cost of patents in the different countries and the conditions on which they are granted, send for pamphlet containing full information.

Address MUNN & CO., 37 Park Row, New York.

BRANCH OFFICE, cor. F and 7th Sts., Washington, D. C.

Gardiner's Pat. Centring & Squaring Attachment



R. E. STATE & CO., Springfield, Ohio.

HOME-MADE TELESCOPES.—Directions for their construction, with engravings showing the proper arrangement of lenses and tubes. By Prof Van Der Weyde. Price 10 cts. Contained in No. 1 of SCIENTIFIC AMERICAN SUPPLEMENT, to be had at this office, and of all news agents.

Boult's Patent

Reverse Motion Paneling, Variety Moulding and Dovetailing Machine, cuts Panels of any design or style of mould in the solid wood with neatness and dispatch. Is a first class Shaper, Edge and Scroll Moulder. Does general Dovetailing with thick or thin stuffs. *Simple*



Durable, and Efficient.



☞ Send for Pamphlet and Sample of work.

Improved Solid Steel Cutters for all kinds of Variety Moulders made to order, and warranted by the

B. C. MACHINERY CO., Battle Creek, Mich

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and Molding, Tenoning, Mortising, Boring, Shaping, Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-Off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty Street New York.

CELEBRATED FOOT LATHES.



Foot Power Back-geared Screw Lathes, Small Hand and Power Planers for Metal, Small Gear Cutters, Slide-rests, Ball Machines for Lathes, Foot Scroll Saws, light and heavy, Foot Circular Saws. **Just the thing for amateurs and artisans,** Selling everywhere. Send for Illustrated Catalogues N. H. BALDWIN, Laconia, N. H.

SCREW PROPELLERS, THEIR SHAFTS AND FITTINGS. By Hamilton W. Pendred, M.E. An able treatise, shewing the present practice, its advantages and defects. With 25 figures. Price 10 cents. Contained in No. 4 of SCIENTIFIC AMERICAN SUPPLEMENT. To be had at this office, and of all news agents.

BIG PAY to sell our RUBBER PRINTING STAMPS. Terms free. TAYLOR & HARPER, Cleveland, O.

10 **DECALCOMANIE,** or TRANSFER PICTURES, with book of 24 pp., giving full instructions in this new and beautiful art, sent post paid for 10 cts, 100 assorted pictures, 50 cts. They are Heads, Landscapes, Animals, Birds, Insects, Flowers, Autumn Leaves, Comic Figures, &c. They can be easily transferred to any article so as to imitate the most beautiful painting. Also, 6 beautiful GEM CHROMOS for 10 cts.; 50 for 25 cts. Agents wanted. Address J. L. PATTEN & CO., 162 William Street, New York.

CLARK & COMPANY'S PATENT SELF-COILING, REVOLVING STEEL SHUTTERS

Can be readily fitted to Store Fronts, Rear Windows or other openings, making them FIRE AND BURGLAR PROOF, and affording absolute protection; also, **WOOD SHUTTERS** in various kinds of wood, suitable for Store Fronts, Private Houses, Offices, and School Partitions. Clark's shutters are self-acting, require no machinery or balance weights, and cannot get out of order. They are handsome in appearance, and are the best and cheapest shutters in the world. Are fitted to the new *Tribune* Building, Delaware and Hudson Canal Building, Manhattan Building, Lenox Library Building. Have been for years in daily use in every principal city throughout Europe, and are endorsed by the leading architects of the world.

JAMES G. WILSON, Manager, 218 West 26th St., New York, and at London, Paris, Vienna, Berlin, Melbourne, &c., &c.

AGENTS WANTED.

The TOLL-GATE! Prize Picture sent free! An ingenious gem! 50 objects to find! Address with stamp, E. C. ABBEY, Buffalo, N. Y.

OPIUM and Morphine habit absolutely and speedily cured. Painless; no publicity. Send stamp for particulars. Dr. Carleton, 187 Washington St., Chicago, Ill.

WILLIAM HENRY KING—ALBUMEN MANUFACTURER, 78 & 80 St. Andrew Street, Liverpool, Eng.

Planing & Matching,

Moulding, Re-sawing and Tenoning Machines, Scroll Saws and General Wood-Working Machinery. JOHN B. SCHENCK'S SONS' { Matteawan, N. Y. / 118 Liberty St., N. Y. city. Send for Catalogue.

PATENT

Planing and Matching

and Molding Machines, Gray and Wood's Planers, Self-oiling Saw Arbors, and other wood-working machinery. S. A. WOOD'S MACHINE CO., { 91 Liberty St., N. Y. / 67 Sudbury St., Boston. Send for Circulars, etc.

$250 A MONTH—Agents wanted everywhere. Business honorable and first class. Particulars sent free. Address J. WORTH & CO., St. Louis, Mo.

OTIS' SAFETY HOISTING Machinery.

OTIS, BROS. & CO., No. 348 BROADWAY, NEW YORK.

RACING BOAT STOCK.

SPANISH & WHITE CEDAR.

Extra lengths and quality, from 3-16th thick up, planed and unplaned. Also, full stock of HARD-WOOD LUMBER and VENEERS, MAHOGANY, SATINWOOD, ROSEWOOD, WALNUT, &c.

Inclose Stamp for Catalogue and Price-List.

Geo. W. Read & Co.,

186 to 200 Lewis st., ft. 5th & 6th sts., E. R., N. Y.

THE IMPROVED

NIAGARA STEAM PUMP,



90 to 97 Pearl St., Brooklyn, N. Y. Agency at 40 John St., New York.

Hubbard & Aller,

SOLE MANUFACTURERS, ENGINES AND BOILERS, *Pulleys, Shafting and Hangers a Specialty.*

The Myers Portable Engine, 4, 5, 6, 8 h.p. Something new. Best for price. Circulars.

SECOND-HAND IRON AND WOOD WORKING MACHINERY. CHAS. PLACE, 101 Reade Street, New York.

$12 a day at home. Agents wanted. Outfit and terms free. TRUE & CO., Augusta, Maine.



BLAKE'S PATENT

Stone and Ore Breaker

Crushes all hard and brittle substances to **any required size.** Also, any kind of STONE for ROADS and for CONCRETE, &c. Address BLAKE CRUSHER CO., New Haven, Conn.

WITHERBY, RUGG & RICHARDSON, Manufacturers of Woodworth Planing, Tongueing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, and Wood-Working Machinery generally, 36 Salisbury Street, Worcester, Mass. (Shop formerly occupied by R. BALL & CO.)

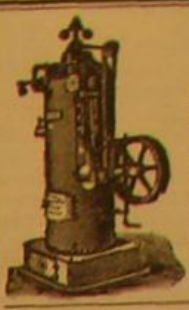
L. B. WITHERBY. G. J. RUGG. S. M. RICHARDSON.



THIS MOUSTACHE produced by the use of DYER'S BEARD ELIXIR without injury, or will forfeit $100. Safe and sure. With full directions postpaid, 25c. A. L. SMITH & Co., Agts., Palestine Ill. N. B. For a HEAVY GROWTH use this preparation. Mention this paper.

VINEGAR HOW MADE IN 10 HOURS from Cider, Wine or Molasses, **without using drugs.** Address F. I. SAGE, Vinegar Maker, Springfield, Mass.

$77 A WEEK to Agents, Old & Young, Male & Female, in their locality. Terms & OUTFIT FREE. Address P. O. VICKERY & CO., Augusta, Me.



THE

TRADE ENGINE.

Noiseless in operation—Perfect in workmanship—all light parts of Cast Steel.

Every Engine indicated, and valve corrected to give the highest attainable results.

Warranted superior to any semi-portable Engine in the market.

Send for Price List and Circular.

HERRMAN & HERCHEL-RODE M'F'G. CO., Dayton, Ohio.

FOR SECOND HAND MACHINERY—Apply to S. C. HILLS, 31 Cortlandt Street, New York.

INDIA RUBBER,

For Inventors and the Trade, made into any pattern at short notice, by F. H. HOLTON, 45 Gold St., New York Established in 1860.

With Disston's Saws.



4 Sizes

Sold by Hardware Trade. LANGDON MITRE BOX CO., Millers Falls, Mass. ☞ Send for Circular.

PATENT DOUBLE ECCENTRIC CORNICE BRAKE. Manufactured by THOMAS & ROBINSON, Cincinnati, O. Send for Circulars.

MACHINERY.

IRON & WOOD WORKING MACHINERY OF EVERY DESCRIPTION.

Cold Rolled Shafting.

HANGERS, PULLEYS, COUPLINGS, BELTING, &c. Send for Illustrated Catalogue and Price List.

GEORGE PLACE, 121 Chambers & 103 Reade Sts. N. Y. City.

PARR'S Damascus Spring Steel Self-Adjusting *Bracket and Fret Saw.*

Sweep, 8 10 12 14 16 in.
Price, $1.25 1.50 1.75 2.00 2.25
With each frame is included 12 inimitable and original fret or scroll patterns, 8 bracket saws, 4 blades, 1 sheet impression paper, 1 brad awl, with full instructions. By mail, prepaid, on receipt of price named. 100 scrollwork designs free, on receipt of stamp. GEO. PARR, Buffalo, N. Y.

Profit & Pleasure! A WORKSHOP COMPLETE FOR - - $1.25

Machinists' Tools,

All sizes at low prices. E. GOULD, Newark, N. J.

Munn & Co's. Patent Offices.

Established 1846.

The Oldest Agency for Soliciting Patents in the United States.

TWENTY-NINE YEARS' EXPERIENCE.

MORE PATENTS have been secured through this agency, at home and abroad, than through any other in the world.

They employ as their assistants a corps of the most experienced men as examiners, specification writers and draftsmen that can be found, many of whom have been selected from the ranks of the Patent Office.

SIXTY THOUSAND inventors have availed themselves of Munn & Co.'s services in examining their inventions, and procuring their patents.

MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine inventions confer with inventors, prepare drawings, specifications, and assignments, attend to filing applications in the Patent Office paying the government fees, and watch each case step by step while pending before the examiner. This is done through their branch office, corner F and 7th streets, Washington. They also prepare and file caveats, procure design patents, trademarks, and reissues, attend to rejected cases (prepared by the inventor or other attorneys), procure copyrights, attend to interferences, give written opinions on matters of infringement, furnish copies of patents, and, in fact, attend to every branch of patent business both in this and in foreign countries.

A special notice is made in the SCIENTIFIC AMERICAN of all inventions patented through this Agency, with the name and residence of the patentee. Patents are often sold, in part or whole, to persons attracted to the invention by such notice.

Patents obtained in Canada, England, France, Belgium, Germany, Russia, Prussia, Spain, Portugal, the British Colonies, and all other countries where patents are granted at prices greatly reduced from former rates. Send for pamphlet pertaining specially to foreign patents which states the cost, time granted, and the requirement for each country

Copies of Patents.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a 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 the laws and 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 handbook of reference for everybody. Price 25 cents, mailed free. Address

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

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

WE can sell these First-Class 7¼ Octave Rosewood Pianos for **Two Hundred and Ninety Dollars,** because we employ no agents and allow no discounts to dealers—they swindle you out of more than twice the real cost of all Pianos. We are a responsible incorporated Company, and refer by permission to the Chemical National Bank of New York City, which any Bank in the United States will satisfy you is by far the strongest Bank in America. We make this statement to prove that our 5 years' warrant guarantees our Pianos to be fully equal to any Piano in the known world at any price. If you will send for our Catalogue, containing over 1,000 names and residences of prominent citizens everywhere, who have bought our pianos *during the* past seven years, you will be sure to find some of them at your very door in your own or some adjoining town, where you can see and try our Pianos. We send them everywhere for trial. Please state where you saw this notice.



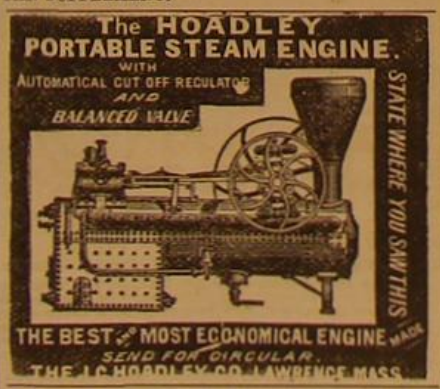
STURTEVANT HOUSE, New York, Sept. 15, 1874.

TO WHOM IT MAY CONCERN.—We have used the U. S. Pianos for the past six years. We have two of them in our public parlors. *In our opinion* there is no Piano more durable, or possessing superior musical qualities.

L. & G. S. LELAND, PROPRIETORS STURTEVANT HOTEL.

Address, United States Piano Co., 810 Broadway, New York.

THE CENTENNIAL INTERNATIONAL EXHIBITION OF 1876.—The full History and Progress of the Exhibition, maps of the grounds, engravings of the buildings, news and accounts of all the most notable objects, are given weekly in the SCIENTIFIC AMERICAN SUPPLEMENT. Terms, $5 for the year; single copies 10 cts. To be had at this office, and of all news agents. All the back numbers, from the commencement on January 1, 1876, can be had. Those who desire to possess a complete and splendid Illustrated Record of the Centennial Exposition, should have the SCIENTIFIC AMERICAN SUPPLEMENT.



THE BASTET MAGNETIC ENGINE AND BATTERY, for running Sewing Machines, Dentists' and Jewelers' Lathes, Printing Presses, Pumps, Blowing Parlor and Church Organs, or working any Machinery that can be moved by Hand or Foot. SIMPLE—DURABLE—ECONOMICAL. Local Agents wanted in every town and county. For circulars and price list address, with stamp, THE BASTET MAGNETIC ENGINE CO., 1113 Chestnut Street, Philadelphia, Pa.

PUNCHING AND DROP PRESSES. For the **Best** and **Cheapest,** address THE STILES & PARKER PRESS CO., MIDDLETOWN, CONN.

WROUGHT IRON BEAMS & GIRDERS

THE UNION IRON MILLS, Pittsburgh, Pa.—The attention of Engineers and Architects is called to our improved Wrought-Iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided. We are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere For descriptive lithograph, address Carnegie Brothers & Co., Union Iron Mills, Pittsburgh, Pa.

COMPRESSED AIR MOTIVE POWER.—For particulars of the most recent practice, send 20 cents for SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 1 and 2, containing 5 engravings of the "Compressed Air" Locomotives now in use at St. Gothard Tunnel Works, with dimensions, etc.



CENTENNIAL DRILL CHUCK—Warranted perfect and durable. Holds .64 to 1-2 in. Sent by mail on receipt of price, $1.25. Send for new reduced List of Chucks.

A. F. CUSHMAN, Hartford, Conn.

Machinery of Improved Styles for making **SHINGLES, HEADING AND STAVES.** Sole makers of the well known IMPROVED LAW'S PATENT SHINGLE AND HEADING SAWING MACHINE. For circulars, address TREVOR & CO., Lockport, N. Y.

ICE BOATS—THEIR CONSTRUCTION AND MANAGEMENT. For working drawings and full particulars, send 10 cents for SCIENTIFIC AMERICAN SUPPLEMENT, No. 1.

EAGLE FOOT LATHES,



With Scroll and Circular Saw Attachments, Slide Rest, Tools, &c.; also Small Engine Lathes, Metal Hand Planers, &c. Neatest designs, superior finish. **Low Prices.** Our new Catalogue describes these and every tool necessary for the Amateur or Artizan. Send for it.

WM. L. CHASE & CO., 95 & 97 Liberty St., New York.

PATENT SCROLL SAWS.

Our specialty is Scroll and Band Saws. Over 300 Machines in use. SUPERIOR TO ALL AND LESS PRICE. CORDESMAN, EGAN & CO., Cor. 2nd & Central Ave., Cincinnati, O.

Horse Shoe Nails.

The undersigned desire to improve their Machinery for the Manufacture of Horse Shoe Nails by use of a Pointing Machine, and to arrange with competent, reliable, and experienced machinists to take the works, when complete, and manufacture nails on a guarantee of quality and price. Undersigned will furnish Room, Power, Machinery, Iron and Coal, and take the product of the works. Proposition for machinery and the manufacture of the nails solicited. Parties proposing to manufacture will require sufficient capital to pay labor and incidental expenses. We also solicit correspondence with parties having patented articles pertaining to the Hardware Trade, and desiring them manufactured, on royalty or otherwise. For further information, address PRATT & CO., Buffalo, N. Y.

ELLIPTICAL GEARING. By Prof. C. W. MacCord, of the Stevens Institute of Technology. With Eight Engravings. A most clear and excellent exposition of the subject. Price 10 cents. Contained in "Scientific American Supplement," No. 2. To be had at this office, and of all news agents.

DO YOU WANT MONEY Male or female. Send your address and get something that will bring you in honorably over $150 a month sure. **Inventor's Union,** 173 Greenwich Street, New York.



Advertisements,

Back Page - - - - - $1.00 a line.
Inside Page - - - - - 75 cents 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 Friday morning to appear in next issue.

WILLIAMSON'S
TANNATE of SODA
Prevents Scale in Boilers. 25 lb. boxes, $6.25, C. O. D.
D. D. WILLIAMSON, 268 West St., New York.



Upright Stationary Engines,
Strong, Simple, Safe, and Serviceable!
4, 6, and 8 Horse Power.
GRIFFITH & WEDGE,
Zanesville, Ohio.



and Shaped Diamond Carbon Points, indispensable for Turning Emery Wheels, Grindstones, also Truеing up Hardened Steel and Paper Calender Rollers, etc. Address J. DICKINSON, Patentee, 64 Nassau St., N. Y.

WANTED—A GOOD 2ND HAND HORSE POWER.
S. H. TILESTON, Say Brook, Conn.

FOREMAN BOILER MAKER WANTED.
Address Box 1653, Portsmouth, N. H.

AMERICAN
Journal of Science,
DEVOTED TO
CHEMISTRY, PHYSICS, GEOLOGY, MINERALOGY, NATURAL HISTORY, ASTRONOMY, METEOROLOGY, ETC.

PUBLISHED MONTHLY, AND MAKING TWO VOLUMES A YEAR OF OVER 450 PAGES EACH.

Editors and Proprietors: J. D. DANA, B. SILLIMAN, and E. S. DANA.
Associate Editors: Professors GRAY and GIBBS, of Cambridge; NEWTON, JOHNSON, BRUSH and VERRILL, of Yale; PICKERING, of Boston.
☞ Subscription price $6.00 a year, with 12 cents for prepaid postage.
Address, DANA & SILLIMAN, New Haven, Ct.

PATENT COLD ROLLED SHAFTING.
The fact that this shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS,
Try Street, 2nd and 3rd Avenues, Pittsburgh, Pa.
190 S. Canal Street, Chicago, Ill.
☞ Stocks of this Shafting in store and for sale by FULLER, DANA, & FITZ, Boston, Mass.
GEO. PLACE & CO., 121 Chambers St., N.Y.
PIERCE & WHALING, Milwaukee, Wis.

THE SOUTHERN STATES AGRICULTURAL AND INDUSTRIAL
EXPOSITION
Will be Held on the Fair Grounds, at New Orleans, Commencing February 26, 1876, and Continuing Ten Days.
L. N. MARKS, PRESIDENT.
SAMUEL MULLEN, GENERAL SUPERINTENDENT.
Executive Committee.
A. BALDWIN, Chairman;
JAMES I. DAY, W. B. SCHMIDT,
COLONEL J. D. HILL, JOHN G. FLEMING.

It is the aim of the Board of Commissioners to make it a thorough Exposition of the Agricultural and Mechanical Products of the Southern States, Mexico, and Central America; but it will be open to competitors throughout the country, and the general premium list will embrace all articles comprehended in the general design of an Agricultural and Industrial Exposition, including special premiums for strictly Southern products.
The Mechanical Department has been devised with great care and on the most extensive scale. The Premium List will be ready for distribution November 20th.
Ample arrangements have been perfected for the transportation of goods and visitors from every section at reduced rates. For detailed information, address
SAMUEL MULLEN, GEN'L SUP'T,
No. 80 Camp St., New Orleans.

FOR CHARLIE'S PRESENT.
Get the TOM THUMB TELEGRAPH, put up in neat little boxes containing working sounder, telegraph apparatus, battery, key, wires, and chemicals, complete, ready for operation. Price $3.50, with full directions. Can be seen in practical operation at the "Scientific American" office, 37 Park Row; at Packard's Business College, 805 Broadway; and many other places. Besides telegraphing, many beautiful experiments can be made, such as the magnetic curves, electric light, lifting weights, making compasses, magnetizing knives, electro-plating, &c. F. C. BEACH & CO., makers, 246 Canal St., near Center St., New York.

Todd & Rafferty Machine Co.
MANUFACTURERS OF
The celebrated Greene Variable Cut-Off Engine; Lowe's Patent Tubular and Flue Boilers; Plain Slide Valve Stationary, Hoisting, and Portable Engines. Boilers of all kinds. Steam Pumps, Mill Gearing, Shafting, &c., Silk Tow Oakum, Bagging, Rope, Flax, and Hemp Machinery. Agents for the New Haven Manufacturing Co.'s Machinist's Tools; for Judson's Governors and Stop Valves; Sturtevant Blowers; and Differential Pulley Blocks. WAREROOMS, 79 HARCLAY STREET, NEW YORK. WORKS PATERSON, NEW JERSEY.

PERFECT
NEWSPAPER FILE.
The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription, "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address MUNN & CO.,
Publishers "SCIENTIFIC AMERICAN."

$5 to $20 per day at home. Samples worth $1 free. STINSON & Co., Portland, Me.

An Unprecedented Success.
THOUSANDS ALREADY SOLD.
Wrinkles and Recipes
Pronounced, by the best Scientific and Mechanical Authorities, the most valuable Handbook ever compiled for Engineers and Mechanics of every class.
Contains the CREAM of the Practical Mechanism Series by Joshua Rose, which has appeared during the past year in the SCIENTIFIC AMERICAN—Useful new papers on mechanical operations by distinguished experts—Hundreds of knotty points in Mechanics and Engineering fully explained in terms that every one can understand. No high mathematics or intricate formulæ. Recipes of all kinds for industrial processes, for cements, for making simple instruments, etc. Hints for farmers and for housekeepers. The whole is a collection of the very best practical hints and suggestions which, for several years, have been sent to the SCIENTIFIC AMERICAN by its correspondents and contributors, together with an immense variety of new material.
☞ Price $1.50, post paid. Handsomely bound; 250 pages. Large pocket-book size.
Wrinkles and Recipes and Scientific American for one year $4.30.
Address H. N. MUNN, Publisher,
P. O. Box 772. 37 Park Row, New York.



Water Wheels.
More than four times as many of Jas. Leffel's Improved Double Turbine Water Wheels in operation than any other kind. 24 sizes made, ranging from 5½ to 96 in. diam., under heads from 1 to 240 ft. Successful for every purpose. Large new pamphlet, the finest ever published, containing over 30 fine illustrations, sent free to parties interested in waterpower
JAS. LEFFEL & CO.,
Springfield, O., & 109 Liberty St., New York City.

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. S.—The suit against Imbaeuser & Co., of New York was decided in my favor, June 10, 1874. Proceedings have been commenced against Imbaeuser & Co. for selling, contrary to the order of the Court, and especially the clock with a series of springs in the cover, and marked Pat'd Oct. 20, '74. Persons using these, or any other clocks infringing on my Patent, will be dealt with according to law



"Lowest Priced and BEST."
Do Your Own Printing!
$3 Press for cards, labels, envelopes, etc. Larger sizes for larger work. **Business Men** do their printing and advertising, save money and increase trade. Pleasure and profit in **Amateur Printing.** The Girls or Boys have great fun and make money fast at printing. Send two stamps for full catalogue of presses, type, etc., to the Manufacturers,
KELSEY & CO., Meriden, Conn.

$42 A WEEK.—Agents wanted everywhere. Business permanent and first-class. For further particulars, address
J. KENNEDY & CO., Richmond, Ind.

ROGERS' TANNATE OF SODA BOILER SCALE PREVENTIVE. JOS. G. ROGERS & CO., Madison, Ind.
☞ Send for book on Boiler Incrustation.

The NILES ENGINE.
The LATEST and the BEST. Engine independent from boiler on the same base. 2, 4, 6, 8, and 10 Horse Power. Warranted the best Semi-Portable Engine in the United States.
Send for Illustrated Price List.
Niles Tool Works,
Hamilton, Ohio.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.
HARTFORD, CONN.

Schlenker's Stationary
AND
Revolving-Die Bolt Cutters,
MANUFACTURED BY THE
HOWARD IRON WORKS,
BUFFALO, N. Y.
☞ Send for Circular.



Niagara Steam Pump Works
ESTABLISHED 1862.
CHARLES B. HARDICK,
No. 23 Adams Street,
BROOKLYN, N. Y.

IRON PLANERS,
ENGINE LATHES, DRILLS, &c. Send for Price List.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

TRADE MARK. CONCORD (USE) N.H. **GENUINE CONCORD AXLES**
The Standard—Best Stock—Finest Finish.
MANUFACTURED ONLY BY
D. ARTHUR BROWN & CO., Fisherville, N.H.

TOULMIN'S ELLIPSOGRAPH—Draws ellipses in ink from 6-16 to 8 inches. See Scientific American, Oct. 9, 1875. Boxed, with lock and key, for $12.50. Larger sizes to order. TOULMIN & CO.,
Lock Box 152, Washington, D. C.

BUILDERS Send for Catalogue of books. BICKNELL & CO., 27 Warren, N.Y.

W. C. DUYCKINCK,
IMPORTER, MANUFACTURER, AND DEALER IN
Railway, Machinists' and Engineers' Supplies,
50 AND 52 JOHN STREET,
P. O. Box 4101. NEW YORK.
DAMPER REGULATORS **BEST** AND LEVER GAGE COCKS.
MURRILL & KEIZER, 44 Holliday St., Balt.

☞ T. V. Carpenter, Advertising Agent, Address Box 773, New York city.

NOYE'S
Mill Furnishing Works
are the largest in the United States. They make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys and Gearing, specially adapted to flour mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

THE BEST INJECTOR
For Locomotive and Stationary Boilers.
FRIEDMANN'S PATENT.
Over 15,000 Now in Use Here and in Europe
Throws more and hotter water, with less steam, than any others. It has two Waterways, fixed Nozzles, and no movable parts to get out of order
NATHAN & DREYFUS, Sole Manufacturers,
108 Liberty St., New York.
☞ Send for Catalogue.

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

Portland Cement,
From the best London Manufacturers. For sale by JAMES BRAND, 55 Cliff St., N. Y.
A Practical Treatise on Cement furnished for 25 cents.



Bollinger's Patent Turbine
WATER WHEELS
AND
Mill Machinery.
☞ For Circulars, address
YORK MANUF'G CO.,
York, Pa

THE NATIONAL
Steel Tube Cleaner.
For Cleaning Boiler Tubes.



PATENTED JULY 28 1874.
Adopted by U. S. Navy. For sale by dealers. Send for Circular
NON-COMBUSTIBLE STEAM BOILER & PIPE
COVERING
WITH "AIR SPACE" IMPROVEMENT.
Saves 10 to 20 per cent. CHALMERS SPENCE CO., foot E. 9th St., N. Y.; 1202 N. 2nd St., St. Louis, Mo.

THE
SCIENTIFIC AMERICAN
For 1876.

The Most Popular Scientific Paper in the World.
THIRTY-FIRST YEAR.

Only $3.20 a year including Postage.
☞ Send 10 cents for Specimen copy.

THE SCIENTIFIC AMERICAN, now in its 31st year, enjoys the widest circulation of any weekly newspaper of the kind in the world. A new volume commenced January 1, 1876. Published weekly. Now is the time to subscribe and to form clubs.

THE CONTENTS OF THE SCIENTIFIC AMERICAN embrace the latest and most interesting information pertaining to the Industrial, Mechanical, and Scientific progress of the world; Descriptions, with beautiful Engravings, of New Inventions, New Implements, New Processes, and Improved Industries of all kinds; Useful Notes, Recipes, Suggestions and Advice, by Practical Writers, for Workingmen and Employers, in all the various arts.

EVERY NUMBER contains sixteen large quarto pages, elegantly printed and illustrated with many engravings. The year's issue contains 832 large pages, equal to *four thousand book* pages, at a cost, including postage, of only $3.20 a year to the subscriber.

Engineers, Mechanics, Telegraphers, Inventors, Manufacturers, Chemists, Photographers, Physicians, Lawyers, Clergymen, Teachers, and People of all Professions, will find the SCIENTIFIC AMERICAN most useful and valuable. Its pages teem with interesting subjects for thought, study, and conversation, and are an unfailing source of new and instructive information. As an Instructor and Educator, the SCIENTIFIC AMERICAN has no equal. It is promotive of knowledge and progress in every community where it circulates, It should have a prominent place in every Household, Reading-Room, and Library.

☞ *Specimen copies sent, prepaid, on receipt of 10 cents.*

TERMS OF SUBSCRIPTIONS.—POSTAGE PAID BY US.

One copy Scientific American, one year	$3.20
One copy Scientific American, six months	1.60
One copy Scientific American, three months	1.00
One copy Scientific American and one copy Scientific American Supplement, both for one year, post-paid	7.00
One copy Scientific American, one year, and one copy Science Record	5.20

☞ We make a liberal discount and give advantageous premiums to those who form Clubs or procure Subscriptions. A beautifully illuminated Subscription List, also Prospectus and Rates, *sent free.* Address
MUNN & CO.
37 PARK ROW, NEW YORK.

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

THE SCIENTIFIC AMERICAN SUPPLEMENT.



$5 a year by mail, post-paid. Send 10 cents for Specimen Copy.

TO ILLUSTRATE AND DESCRIBE the many interesting themes and objects presented in the GREAT CENTENNIAL INTERNATIONAL EXPOSITION OF 1876, and also to meet the wants of that large class of readers who desire an increased supply of Scientific Information, particularly of the more Technical and Detailed character, we shall issue a SPECIAL PUBLICATION, entitled the SCIENTIFIC AMERICAN SUPPLEMENT, to be printed weekly during the Centennial year of 1876, and, perhaps, permanently thereafter. Each number will have sixteen large quarto pages, issued weekly, printed in the best style, uniform with the SCIENTIFIC AMERICAN, but separately paged.

The SCIENTIFIC AMERICAN SUPPLEMENT, in addition to the special matter pertaining to the International Exposition, will embrace a very wide range of contents, covering the most recent and valuable papers by eminent writers in ALL THE PRINCIPAL DEPARTMENTS OF SCIENCE AND USEFUL KNOWLEDGE, to wit:

1.—**Chemistry and Metallurgy.**—Embracing New Chemical Discoveries, Improvements, and Processes, with engravings. New Processes of Working Iron, Steel, Lead, Copper, Gold, Silver, and the Various Metals, with engravings of New Apparatus, New Information, etc.

2.—**Mechanics and Engineering.**—The latest and best papers upon Steam Engineering, Railway Engineering, Mining, and Civil Engineering, Mill Work, Textile Industry, with engravings and working drawings.

3.—**Electricity, Light, Heat, Sound.**—Latest Improvements in Telegraphy, Telegraph Engineering; Improvements in Galvanic Batteries, Electric Engines, New and Useful applications of Electricity in the Arts, with engravings.

4.—**Architecture.**—Examples of the best New Structures, with details and drawings.

5.—**Technology.**—New and Useful Invention and Discoveries relating to THE ARTS; Improvements in Photography, Printing, New Implements, New Machinery, New Processes, New Recipes, Improvements pertaining to Textile Industry, Weaving, Dyeing, Coloring, New Industrial Products, Animal, Vegetable, and Mineral—with engravings.

6.—**Agriculture, Botany, and Horticulture.**—New and Useful Information in all branches of Agriculture. Descriptions of New Plants, Trees, Shrubs, and Flowers, New, Useful, and Interesting Facts in relation to Cultivation, Propagation—with engravings.

7.—**Rural and Household Economy.**—The Latest Information concerning Building Materials, New and Valuable Recipes, and a great variety of Miscellaneous Information pertaining to Rural and Household affairs—with engravings.

8.—**Materia Medica, Therapeutics, Hygiene.**—Exhibiting the progress of Medical Science in various branches; New Medicinal preparations, New Health Appliances, and much Interesting Information.

9.—**Natural History and Zoology.**—The Latest Investigations, Discoveries, and most Interesting Information in this department of Science.

10 & 11.—**Meteorology, Terrestrial Physics, Geography.**—Accounts of Interesting Atmospheric and Terrestrial Phenomena, Travels, Explorations and Discoveries, etc.

12.—**Geology and Mineralogy.**—The Latest and most Interesting Geological Investigations and Reports, and New Discoveries.

13.—**Astronomy.**—Recent Interesting Discoveries and Information, with Reports of Astronomical Phenomena, Progress, New Instruments, etc.

TERMS:—Scientific American Supplement, One year, post-paid, $5.00; half year, $2.50 three months, $1.25. Three copies, one year, $13.50; five copies, $20.00; ten copies, $38.00. One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year post-paid, $7.00.

Address MUNN & CO., Publishers, 37 Park Row, New York.

SCIENTIFIC AMERICAN

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

Vol. XXXIV.—No. 7. [NEW SERIES.] NEW YORK, FEBRUARY 12, 1876. [$3.20 per Annum. [POSTAGE PREPAID

THE NEW TELESCOPE IN THE PARIS OBSERVATORY.

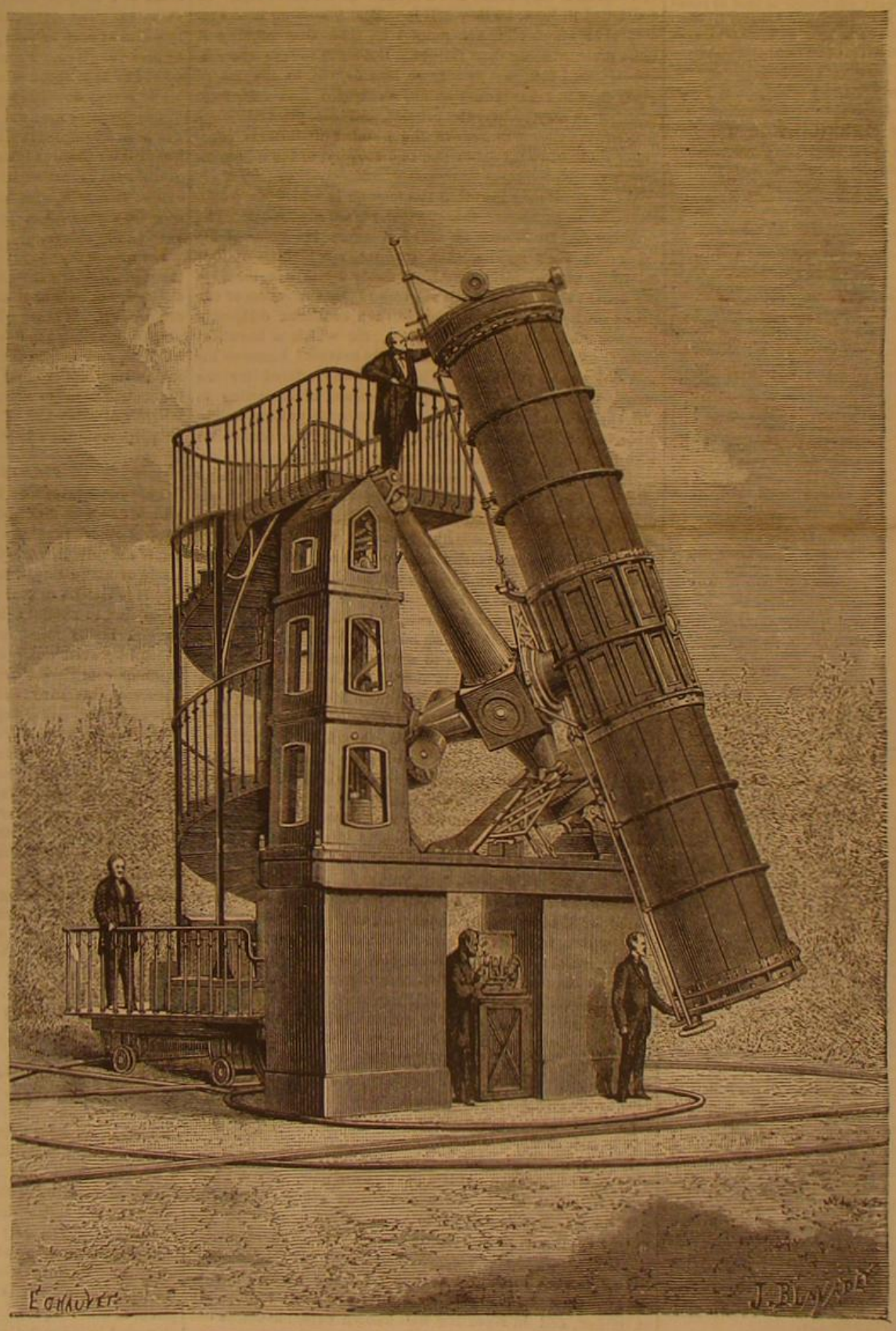
An immense reflecting telescope, equaling in size the similar instrument located at Melbourne, Australia, has lately been constructed under the supervision of M. Leverrier, at the Observatory at Paris, France. The reflector, which is 46·8 inches in diameter, is mounted in a tube 23·3 feet in length, which is composed of a central cast iron cylinder, to the extremities of which two smaller tubes, 9·6 feet long each, are secured. The end tubes are formed of four rings of wrought iron connected by 12 longitudinal bars of like material. The whole tube is covered with thin sheets of steel, and weighs 5,280 lbs. At the lower extremity is affixed the cast iron barrel which holds the reflecting mirror; at the upper end a circle, movable on the open orifice of the telescope, supports a plane mirror which reflects sideways the cone of rays previously reflected by the large glass, and directs them into the field of the eyepiece.

It will be seen from the above that the telescope is constructed on the Newtonian system, and differs from the Melbourne instrument in that the latter is built on the Cassegrainian plan. The weight of the huge reflector in its barrel is 1,760 lbs., and the eyepiece, with its accessories, aggregates the same. The poising of the mass is so perfect that even in the most unfavorable positions the mirrors are exactly concentric, and not the least deflection is perceptible. For the accommodation of the observer a carriage running on rails, as shown, is used, which supports a lofty balcony. The latter is sufficiently elevated to allow easy access to the eyepiece, which can be adjusted at any point around the orifice of the instrument.

The equatorial mounting turns on an axis of cast iron and steel, the direction of which is parallel to the axis of the celestial sphere. The telescope can be inclined more or less on this axis by turning around a second steel axis, which traverses the first at right angles, and participates in its movement of rotation. The two axes taken together are a marvel of mechanical accuracy. With the telescope they weigh 22,000 lbs., and yet so perfect is the machinery that the great tube follows the movements of the heavenly bodies, in obedience to the regulation of a chronometer, with as much certainty and delicacy as move the hands of the timepiece itself.

The optical portion of the telescope is as perfect as the adjusting mechanism. Both mirror and eyepiece are faultless, and the former, it is stated, reflects fully nine tenths of the light received. With an instrument, therefore, uniting in itself so many highly important advantages, it may be hoped that valuable discoveries will be made.

M. Wolf, the well known astronomer, to whom has been confided its care, proposes to begin with the study of the planets and their satellites, with the view of investigating many unsolved questions relative to the rotation of the worlds furthest removed from our own; and at the same time, an extended series of spectroscopic and photographic studies of the fixed stars will be prosecuted.



THE GREAT TELESCOPE AT PARIS, FRANCE

Treatment of Horses in Winter.

A writer in the Baltimore *Trade Review* is of the opinion that horses that have been in the habit *of running* in the pastures during the summer suffer very much during the winter, for the want of green food to which they have become accustomed. They give evidence, he says, of this by the loss of appetite, by becoming hide-bound, and losing the glossy appearance of their coats. When the coat of an animal loses its gloss and assumes a dry, dull appearance, it is a sure indication that that animal needs green food or medicine capable of supplying the place of green food. Green food is much to be preferred, for an animal in such condition, to medicine for two reasons, partly because it is cheaper and leaves no bad after effects, and partly because it is better, being the remedy provided by Nature, and Nature is always more skillful than art in providing natural remedies for natural evils, just as a genuine diamond is of more value than any paste imitation. A couple of carrots, chopped up very small and mixed with the feed of horses, has upon them a very beneficial effect. They are slightly cathartic, and, given two or three times a week to horses standing in stables during the winter, they keep them in good condition, supply to a great extent the need of green food, increase their appetite, and prevent their coats from becoming *dry, dull*, and hard. Horses are very fond of them. When the weather is dry and not very windy, horses that are not much used should, *in town*, be taken out for exercise daily, and, in the country, should during the day be allowed to run at large in the fields, or they will become cramped and stiff from long standing.

Decreasing Flow of Rivers.

The Vienna Academy of Sciences is occupied with a question which concerns all Europe—the decrease of the quantity of water in springs, rivers, and water courses. A circular, accompanied by a very instructive report, has been addressed to the scientific societies of other countries, inviting them to undertake observations which, in time, may yield useful results. The Academy calls attention to the fact that during a certain number of years there has been observed a diminution in the waters of the Danube and other large rivers, especially since the practice of felling forests has become common. The Austrian Engineers' and Architects' Union are also occupied with this question, and have appointed a hydrostatic commission to collect facts and prepare a report The Danube, the Elbe, and the Rhine have each been assigned to two members, while two others will be occupied with the metereology relating to the same subject and with the influence that glaciers and Alpine torrents may exercise on the general result. The commission considers the question urgent, and recommends the immediate adoption of measures to remedy the evil. According to the *Revue des Eaux et Forêts*, it is unanimous in declaring that the prime cause of the disastrous decrease of the water is the devastation of the forests.—*Nature*.

Remarkable Locomotive Accident.

The Rochester *Democrat and Chronicle*, of January 20, states that on January 17, while a train, bound for Attica, on the Buffalo division, was nearing the river bridge about a mile west of the village of Avon, an accident occurred which was most singular in itself and serious in its results. The iron network over the top of the smokestack on the locomotive became clogged up with cinders, etc., in such a manner that the gas generated could not escape from it; consequently it was pent up within the furnace, and as soon as the fireman loosened the fastening of the door to open it an explosion occurred, the fire being blown with great force out into the cab, enveloping the persons in it in a sheet of flame. The fireman, William Russell, who was nearest the door, was flung backward with great force. His leg was broken and his body was badly burned. William Farnum, the engineer, was not so badly hurt. His left hand was burned in a painful manner, and the whiskers of the left side of his face were burnt off. M. Breen, a brakeman, who happened at the time to be

in the cab, was very seriously injured. His face and shoulders were terribly burned, and his eyes were so injured that is thought he will be blind for life.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

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

TERMS.

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

Club Rates.

Ten copies, one year, each $2 70, postage included.....$27 00
Over ten copies, same rate each, postage included..... 2 70

☞By the new law, postage is payable in advance by the publishers, and the subscriber then receives the paper free of charge.

NOTE.—Persons subscribing will please to give their full names, and Post Office and State address, plainly written, and also state at which time they wish their subscriptions to commence, otherwise the paper will be sent from the receipt of the order. When requested, the numbers can be supplied from January 1st, when the volume commenced. In case of changing residence, state former address, as well as give the new one. No changes can be made unless the former address is given

If any of our readers fail to receive their numbers regularly; if the direction is not plainly written; if premiums are not received; or if there is fault of any sort at this office, we will thank our friends to send us postal card complaints, and repeat the same, if need be, until the remedy is effected. *Do not hesitate to complain.* We desire to keep all matters between ourselves and patrons right and satisfactory.

VOLUME XXXIV., No. 7. [NEW SERIES.] *Thirty-first Year.*

NEW YORK, SATURDAY, FEBRUARY 12, 1876.

Contents.

(Illustrated articles are marked with an asterisk.)

Air, compressing (31)..... 107
Almanac, adjustable*..... 102
Answers to correspondents*..... 106
Aqueduct, proposed new..... 103
Atlantic ferry, the 97
Atmosphere, moisture in the (17) 106
Battery for heating wire (6, 12)... 106
Battery for telegraph (8)..... 106
Bells, electric (7)..... 108
Blasting powder, new..... 102
Boilers, setting (40)..... 107
Business and personal..... 106
Carriage jump seat*..... 102
Centennial appropriation bill, the 101
Cereal, the supposed new..... 101
Circular motion, to describe a*... 101
Clothes dryer*..... 29
Coal dust, burning (20)..... 106
Cooler, meat, to construct a (15).. 106
Cradle, automatic*..... 99
Cylinders, measuring, etc. (38)... 107
Dissection, shall we undergo 97
Earth's poles, obliquity of the (26) 107
Earth's rotation, the (24) 107
Edison's phenomenon, Mr..... 101
Education in N. Y., compulsory. 99
Electric experiments, further*.... 100
Electricity as an executioner..... 100
Electricity, personal (36)..... 107
Electricity, velocity of (11)..... 106
Electromotive force (9)..... 106
Ellipse, measuring an (4)..... 104
Employers and trade unions..... 100
Engineer, a brave and modest..... 101
Engines for boats, etc. (19)..... 106
Felting and its uses 96
Fingers, cracked (39)..... 107
Fireproofing fabrics and wood.... 103
Fish hawks, the*..... 103
Flax, thrashing (25)..... 107
Force, Mr. Edison's new..... 10
Force, the new (14)..... 106, (21) 107
Freak of nature, a..... 100
Gas, compression of (29)..... 107
Gilding without a battery (1)..... 106
Harness tugs, repairing..... 98
Hartford, Conn., industries of.... 103
Hydraulic ram troubles (35)..... 07
Hydrogen in antimony..... 104
Implements, take care of your.... 99
Inclined plane, force on an (37)... 107
Inventions patented in England.. 105
Iron and steel, friction on (2)..... 106
Koumiss..... 99
Language, telegraphic value of.... 101
Life, what is 104
Lightning on vines, effects of.... 98
Locomotive accident, a..... 95
Locomotives, improvements in*.. 98
Locomotive speed, to get up (41). 107
Looms, power*..... 104
Magnetism in steel (5)..... 106
Magnets, wire for (6) 106
Microscopic enlargement*..... 100
Mineral wool..... 97
Moon's rotation, the..... 107
Nature, universal..... 103
New books and publications..... 105
Niagara, abrasion of rock at (32). 107
Nickel plating, faulty (23)..... 107
Oak stain 102
Patent matters before Congress . 97
Patent office, the Canadian..... 101
Patent proceedings in Congress.. 101
Patents, American and foreign... 105
Patents, official list of..... 107
Pond, L. W., conviction of..... 101
Preacher said, what the..... 101
Quails, eating..... 101
Railroad, the Chinese..... 102
Recipes, useful..... 101
Re-discoveries and re-inventions. 96
Rest, no 97
Rivers, decreasing flow of..... 95
Scientific American, value of the. 100
Screw-cutting gears (34)..... 107
Skeletonising leaves..... 99
Spoons, sulphur-tarnished..... 104
Steam trap, a new*..... 99
Telegraphs, open circuit (18)..... 106
Telescope, the new French*..... 95
Timber waste a national suicide.. 97
Tin plate scrap, utilizing..... 102
Ultramarine in bread..... 104
Vaccine virus, preparing..... 102
Vanillin, artificial..... 101
Ventilators, proportions of (16)... 106
Water, wells of mineral..... 100
Weight and velocity (30, 33)..... 107
Wood, incombustible..... 101
Zinc for ground plates (28)..... 107

THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 7.

For the Week ending February 12, 1876.

TABLE OF CONTENTS.

I. TECHNOLOGY. With 18 figs.—Magnesia for Cotton Fabrics.—Enameling Metal.—Soda Works, Colorado.—Tinning of Iron Tacks.—Epsom Salts for Dyeing.—How to Make Beautiful Household Articles, 6 engravings.—Cedar Mines of New Jersey.—Manufacture of Coke.—Diamond Stone Dressers.—Twenty-eight Dyeing Recipes.—Boiling of Sulphuric Acid.—Millstone Cutters.—Arsenical Poisons.—Improved Eyepiece for Telescopes, 6 figs.—New Geographical Globe, 1 fig.—Welt and Skiving Machine, 2 figs.—Sand Dryer, 1 fig.—Apparatus for Blast and Vacuum, 2 figs.—Etching on Glass, full process.—Coloring Matter for Glass.—Determination of Mixed Oils.

II. MECHANICS, ENGINEERING, ETC. With 14 figs.—Running Railways by Telegraph.—An Infant Revolver.—Injurious Effects of Snow on Steel Rails.—New Plan for Channel Steamer.—Manchester to be Made a Seaport.—Sea Telegraphy, 2 engravings.—Ventilation of Mines.—New Croton Aqueduct.—Oil Wells of Baku.—Sewerage at Boston.—Express Passenger Locomotive, 2 engravings.—St. Gothard Tunnel Accumulator and Hydraulic Pumps, 10 figs.—Recollections of Steam Engine Improvements, by JOHN BOURNE.—Practical Hints on Milling.

III. INTERNATIONAL EXHIBITION OF 1876, 2 engravings.—Centennial Notes.—Memorial Hall.—Flax at the Centennial.—Profits of International Exhibitions.—The Centennial Appropriation.—Indiana State Buildings, 2 engravings.

IV. ELECTRICITY, LIGHT, HEAT, SOUND, ETC. With 6 engravings.—Tone of Elastic Bars.—Artificial Low Temperatures.—Telegraphy by the Auroral Current.—Professor Mouchot's Solar Boiler, 1 engraving.—Steam Power from Sun Heat.—Organic Elements as Electro-Motors.—Magnetization by Double Touch.—Temperature of the Upper Air.—Transparency of Flames.—A Solid Gas Flame.—Electrical Wind Recorders.

V. CHEMISTRY, METALLURGY, ETC.—Electrolysis of Aromatic Series.—Electrolytic Oxygen on Glycerin.—Wood Petrified by Lime.—New Poisonous Principle in Spoiled Corn.

VI. AGRICULTURE, HORTICULTURE, ETC.—Potato Growing Extraordinary.—Large Pears.—Fruit of Southern California.—Remedy for Red Spider.—The Goat and its Commercial Products.

VII. GEOLOGY, MINERALOGY, NATURAL HISTORY.—Celestialite.—Marble Quarries of Paros.—The Musical Spider.—How to Handle Snakes.

VIII. PROCEEDINGS OF SOCIETIES.—Academy of Sciences, San Francisco.—French Academy of Sciences.

IX. MEDICAL.—Physiology of Fatigue.—Curious Brain Wounds.—Drunk or Dying.—Tying the Carotid Artery in Neuralgia.

X. MISCELLANEOUS.—The Nature of Science.—Practical Cremation.—Ice Prospects on the Hudson.—The Spiritualists Outdone.—American Reef in England.—Military Idlers.—Houses for the Poor in Rome.—The Coal Trade statistics.—Explosion of a bucket of Water.—Fires of 1875.—Statistics of Whaling.—International Colossus, by PROFESSOR BARNARD.—The Graphic Method of Teaching, by PROFESSOR W. HAWKINS.—Cameron in Africa.

THE SCIENTIFIC AMERICAN SUPPLEMENT is uniform in size with the 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 SCIENTIFIC AMERICAN SUPPLEMENT will be sent together for one year, postage free to subscribers, on receipt of $7.00.

Remit by postal order. Address

MUNN & CO., PUBLISHERS,
37 Park Row, New York.

☞ Single copies of SUPPLEMENT sent to any address on receipt of 10 cents.

RE-DISCOVERIES AND RE-INVENTIONS.

The investigator who thinks he has hit upon some new and important fact, but finds, on publishing his discovery to the world, that he has merely re-discovered an old and long-known phenomenon, is very much in the position of an inventor who has spent months in perfecting some machine which he believes to be new, but which, as the Patent Office examiners tell him, was patented years ago: perhaps it was used and abandoned before he was born. The airy castles each has been building are dashed to the earth, and dire disappointment destroys the searcher's peace of mind. Under these trying circumstances, it is difficult for him to sit patiently down and feel that the experience gained while prosecuting his work is a sufficient reward for his time and toil. Yet such is frequently the case; and but for the fact that most inventors and investigators are dependent on their daily labor for the bread they eat, they could in all cases feel that an honest, conscientious labor in the pursuit of a noble end, whether successful or not, is its own sufficient reward. Failure is to some minds a spur to greater exertion; it incites them to increased care, and thus proves more beneficial than success would have done. That man (or crew) that comes out of a race second best is generally confident of his ability to win next time; and he goes into training with eagerness for another chance to test his power. To another class of minds, failure is very discouraging. They have not perseverance enough to try again; or if they stand the shock of a few failures, they break down at last under the weight of continued ill luck, as they call it. That "nothing is so successful as success" is not more true than that nothing is more disheartening than failure. But since failure and disappointment fall, in a greater or less degree, to the lot of every man in every undertaking, we would first offer such balm as we may to heal the bruises, and then prescribe some preventives that will reduce the number of failures, especially those of re-invention and re-discovery, to the minimum number.

We have already hinted at the manner in which we would have the unsuccessful investigator regard his labors. The searcher for truth can no more measure the value of his labors by their results, than can the competitors in our intercollegiate contests, whether literary or athletic, measure the benefit they derive from the training by the value of the prizes conferred. A school boy of ten or fifteen diligently pursues the study of some subject, for which a beautiful prize is offered, with that prize and its inherent honor as his sole object and incentive. The prize was offered for the purpose of teaching the boy perseverance, of imparting to him the habit of study, and, in some cases, of putting him in possession of the knowledge thus acquired. The competitor who has labored industriously for the prize, but failed to obtain it, is benefited quite as much by the training he has received as the one who is successful, provided only that disappointment does not breed discouragement. While boys may strive for prizes with no higher end in view, it is beneath a man, and more especially an investigator, to work with that aim only. Work undertaken in the proper spirit is never without benefit to him that does it; and although it does not yield the expected fruit, it has been all the while conferring other benefits, more lasting, if less pleasing. There is a story, no doubt familiar to most of our readers, about an old man, who, when on his death bed, told his sons that treasure had been buried somewhere on his farm. Eager for gold, they explored every field, digging over every foot of it to a considerable depth. Of course, they found no gold; but the increased fertility of the land amply repaid their labor. Parallel cases are abundant, wherein the object sought was never found, but where incidental results proved of immense importance. The old alchemists worked with but two aims before them, to transmute the base metals into gold, and to find the elixir of life. They succeeded in neither, but they gave us many substances more valuable than either. Many of the acids and metals, as well as phosphorus, were prepared or discovered by them, and their experiences have been woven together to form the foundation of the science now called chemistry. Unfortunately, however, their selfish jealousy induced them to conceal rather than promulgate their discoveries, and many of their most important secrets were buried with them. It is only recently that men have begun to observe and carefully record the little incidental discoveries. These little facts, trifling and disconnected as they are, may some day find a place of importance in the science, or they may become the seed which, falling on the fertile soil of some other active brain, will there spring up in a new and unexpected form.

Reader, if you are an experimenter, carefully record all your experiences, and publish such as are new, for you know not which of these tiny sparks will start a huge conflagration, or which trifle will be to some active mind what the falling apple was to Newton, or the oscillating chandelier to Galileo.

To give such directions as would aid the investigator to save his time and energies, on subjects already thoroughly examined, and in repeating well known experiments, is not difficult. Scientific men of the present century have been careful to record in permanent form most of their investigations, and hence it becomes possible for a person, before beginning a research, to ascertain just what has already been done, provided he has access to a good scientific library, such as the Astor or the Columbia College School of Mines Libraries in this city, both of which are free to all and possess excellent catalogues and obliging librarians. The method of study will be somewhat as follows: Suppose a chemical student is about to attempt the preparation of some new compounds of cobalt. He may first, if he chooses, make use of the excellent dictionaries of chemistry published in each of the principal languages, for our student ought to read French and German with some fluency. The best works to consult are Watts,' Wurtz, and Fehling, but every accessible work should receive attention. Having obtained a general idea of the subject in hand, he next proceeds to search the scientific journals one by one, from volume I to the latest number. Among the most important of these we would mention the *American Journal of Science and Arts*, 1818 to date, 110 volumes. The task of examining these numerous volumes is not so very great, since every tenth volume contains an index to everything in that and the preceding nine, so that only 11 indices have to be consulted. Poggendorff's *Annalen* now embraces over 230 volumes, from 1799 to date, but the titles of all the articles are registered in half a dozen indices. Dingler's *Polytechnisches Journal* now in its 218th volume, has 3 indices. The *Annales de Chimie et de Physique*, which now number 275 volumes, beginning as far back as 1789, have several index volumes. The same holds true of most of the scientific journals where original papers are to be looked for. *Comptes Rendus* is an unfortunate exception to this rule.

Before beginning this search, a suitable note book should be procured, and so arranged that every reference can be quickly recorded as soon as found, either chronologically or in some other systematic order. Or the references may be taken down in a blotter, and subsequently posted in the order desired, care being taken to give date, subject, name of author, and name of journal, with page and volume. Such an index of a subject, carefully carried out, will be found invaluable. The student now has a guide book which will direct him at once to the spot where just such information as he seeks is given. From these, it is easy to ascertain just what has been accomplished, and hence it is almost impossible to repeat unwittingly what another has already done.

The inventor may not find it quite so easy to learn what has been attempted in his line, as inventors usually jealously guard their ideas as invaluable secrets. The patent records of different countries, however, afford material for quite an extensive search, and, as in the case of the chemist, will be of great assistance in preventing a waste of time in re-inventing old things.

Let no one say that it takes too much time to make all these preliminary examinations, for it will prove a saving in the end, not only of time and labor, but of good nature and enthusiasm. If those who can afford the time would join in preparing reliable indices of the whole literature of different subjects, and permit them to be published by the Smithsonian Institute or other scientific body, they would be valuable contributions to Science, and great aids to their fellow laborers of today and of the future; and they would serve to perpetuate the compilers' own memories.

FELTING AND ITS USES.

The employment of felt for other purposes than hats, which use was described in a recent number, has created several other branches of industry. The most common products are felts in flat layers like cloth, and the most usual mode of manufacture is a kind of wadding (by means of a machine similar to that used for the same purpose in cotton mills) and to submit this to the felting process, often felting several layers together so as to obtain great thickness. With improved modern machinery, such wadding may be made of considerable dimensions. A special and peculiar article of this kind, and of great comparative value, is the felt used for the covering of the hammers of pianofortes. The best material for this purpose is derived from the wool of sheep found only in Hungary. They are called the Esterhazy flock; and the wool gives a more elastic felt, resisting better the cutting effect of the strings, which soon wear other kinds of felt away. These felts come in the trade in elongated pieces, very thick at one end and quite thin at the other, so as to suit the requirements, which are that the hammers striking the bass strings should be covered with thick felt, the substance being gradually diminished for the higher tones, so that the hammers striking the strings producing high tones have a very thin covering. The pianoforte makers have then only to cut those felts into strips to have all the needed assorted degrees of thickness, it being a first requisite of the pianoforte, and in fact of every other musical instrument, to attain equality of tone, avoiding sudden changes in power when passing from one tone to another of the scale.

Other felts are manufactured into carpets, and printed with figures, forming the so called rugs, and others, well known, are blankets and materials for cloaks, women's skirts, socks, slippers, insoles for boots and shoes, etc. Some kinds of fine felts are saturated with varnish or paint, and changed into a material not unlike patent leather; this is used for the shades of caps, by carriage makers, etc., being much more tenacious and elastic than pasteboard, in which the fibers are not interlaced, and only are held together by a simple adhesion originated by great pressure during the process of manufacture. We must also mention the use of felt for roofing, for which purpose it is saturated with asphaltum, coal tar, pitch, or other equivalent waterproof material; and felt is also used in shipbuilding, as a layer below the copper sheeting, and on steam cylinders, conduits, and boilers as a non-conductor of heat, for which purpose it is often prepared with various ingredients, intended either to make it less combustible or to increase its capacity for retaining heat. A modern industry of this kind sprang up during the late war. Contractors, in order to increase their gains, had blankets and even soldiers' clothes made from felts of which the hair was not of the proper kind, but consisted of the offal of woolen factories, fibers too short to be spun, but which, by felting, could be made to hang together and form an apparently woven fabric; which, however, soon showed its tru

nature by its lack of strength. This material has obtained the name of shoddy; and while felt made from the proper kind of hair, of sufficient length, is as strong as any good woven fabric, this shoddy, or felt made from unsuitable kinds of hair and hairs of insufficient length, is comparatively worthless. Unfortunately thousands of dollars have been made in this disgraceful way before the nature of the deceit became known.

NO REST.

Science teaches us that the crust of our earth is perpetually moving, and that the sea level is constantly changing. Our globe has its daily rotation on its axis and its yearly revolution about the sun. The sun, with all its satellites, sweeps on toward a moving point in the constellation Hercules. Every so-called fixed star is in motion. Fifty thousand years ago the constellation of the Great Bear or Dipper was a starry cross; a hundred thousand years hence the imaginary Dipper will be upside down, and the stars which form the bowl and handle will have changed places. The misty nebulæ are moving, and besides are whirling around in great spirals, some one way, some another. Every molecule of matter in the whole Universe is swinging to and fro; every particle of ether which fills space is in jelly-like vibration. Light is one kind of motion, heat another, electricity another, magnetism another, sound another. Every human sense is the result of motion; every perception, every thought is but motion of the molecules of the brain translated by that incomprehensible thing we call "mind." The processes of growth, of existence, of decay, whether in worlds or in the minutest organisms, are but motion.

TIMBER WASTE A NATIONAL SUICIDE.

"At a meeting held this 29th day off Aprill, 1699, in Breucklyn (Brooklyn), Benjamin Van de Water, Joris Haussen, Jan Garritse Dorlant" were chosen officers to consider the "greate inconvenience and lose" that the inhabitants of the town suffered because that unauthorized tradesmen "doe ffall and cutt the best trees and sully the best woods."

This appears to be the first step toward the first law promulgated in this country against the wasteful hewing down of timber: trees a proceeding recognized as an important waste, be it noticed, at a period when vast forests stood on the sites of our now most popular western cities, and when, so far as human knowledge of the continent went, the supply of wood might be inexhaustible. Since the date of this local ordinance, State legislatures and the general government have enacted laws carrying with them penalties, apparently of sufficient severity to deter the reckless use of the axe. The United States statute of March, 1875, imposes $500 fine or a year's imprisonment for wanton destruction or injury to, or the unlawful cutting of, "any timber tree or any shade or ornamental tree, or any other kind of tree" on national grounds; and $200 fine, or six months' imprisonment, for permitting cattle to injure trees and hedges on similar territory. Despite, however, the stringency of the various laws, their effect has not been to stop the waste, and the denudation of our timber lands continues at a rate which may be well deemed a matter of grave alarm.

In the very admirable statistical atlas prepared by General Francis A. Walker, Superintendent of the last census, appears a chart showing accurately the distribution of forests throughout the country. It seems to us that the government would do a good work if it would lithograph this map and scatter it broadcast, with copies of the statutes forbidding the destruction of forests, over the whole land; for it certainly shows, in a manner little less than startling, how very small are the heavily wooded tracts having 360 or more acres of timber to the square mile. Of the western domain, Nevada has no such districts, neither has Arizona, nor New Mexico, nor Texas, nor Colorado, nor Dakota, nor Nebraska, nor Kansas, nor the Indian Territory. In fact, considering the whole face of the country, there is a patch of heavy forest in Maine and New Hampshire, a small one in New York, large areas covering half of Minnesota, Wisconsin, and Michigan; the largest tract of all is located in the far northwest corner of the country; and there are heavily-wooded districts in Florida, Georgia, Alabama, Tennessee, Virginia, and the Carolinas. After eliminating these widely separated regions, the total area of which appears to be about equal to that of the Atlantic States, of the remainder of the country (fully four fifths of our whole territory), one half has no timber at all; the map shows a uniform blank.

Although there are no available statistics to show the exact rate of speed with which we are using up our wood supply, it is easy to see that we are doing so with great rapidity. Taking the legitimate use of lumber alone, industries based on its manufacture constitute the second in point of magnitude in the country, and are only exceeded by the iron interest. About 150,000 persons are employed in producing sawn lumber alone; $143,500,000 are invested therein, and 1,295,000,000 laths, 3,265 000,000 shingles, and 12,756,000,000 feet of timber are yearly manufactured. Considering next in order the secondary industries based on the use of lumber as a raw material, carpentry, cabinet making, shipbuilding, and so on through all wood workers, we shall find millions of our people employed. Now add to this Professor Brewer's assertion that wood forms the fuel of two thirds the population, and the partial fuel of nine tenths the remaining third, and some general idea will be obtained of the enormous drain upon our forests that is constantly in progress. If we restricted our use of wood to manufactures and its limited employment as fuel: in other words, if we rigidly cut off every source of waste, did not burn forests to render the land fit for agriculture, and took proper measures to prevent those forest fires of unknown origin which, just at present, are a colossal source of waste, and if we constantly planted trees: the timber yield would, without doubt, be practically sufficient for our needs for some long period to come. But this is exactly what we are not doing, and as a result we are drifting to a condition which few adequately realize.

With these considerations before us, it is easy to foresee that, with the disappearance of the forests, the conditions of all our territories will change, and that eventually, when the land no longer becomes suited to the needs of our descendants, then gradually but surely they will abandon it. It may take centuries for this to be brought about, but not many, if the present rate of waste be maintained; and thus we are led to face the fact that a period, so near as to be practically tomorrow, as compared with the history of the race, is at hand when our existence as a nation will end.

SHALL WE UNDERGO DISSECTION?

To yield up our lives for the advancement of Science is something that few of us would be willing to do, but to yield our bodies as a sacrifice on the altar of truth and knowledge, after we no longer have any use for them, is not a very hard thing; and therefore we are not surprised to read that a society has been formed in Paris, the members of which bind themselves, by a special testamentary disposition, not to be interred after death. Their bodies are to be delivered to the dissecting rooms of the various medical schools for dissection.

The cremation fever of 1873–4 accomplished something in the way of making people more indifferent to the disposition of this earthy tabernacle when life has fled. There were thousands of people who had firmly resolved that, if the projected cremation societies had their furnaces in successful operation, they would "give their bodies to be burned." The cremation cry is smoldering, the cremation corporations have turned to smoke and vanished in thin air, the gasmen will not take our carcasses, and what are reformers to do? They are now offered the expedient of our Paris friends, who invite them to throw themselves on the dissecting table, and be of some use to the world after they are dead, if they never have been before. We are not afraid that the whole world will follow this example, and flood the market with useless corpses. There will still remain those who desire an old-fashioned burial. The scarcity of subjects in many countries at the present time, the attendant necessity of working on those in an advanced stage of decay, and the premium offered in some localities to body snatchers are a few of the reasons that may be advanced in favor of the formation of mutual dissecting societies. One of the great objections urged on moral grounds against cremation, that it would shield crime by destroying its chief witness, does not apply to dissection. The first duty, of the student into whose hands the body fell, would be to determine beyond a doubt the cause of death. If this fact alone did not deter the poisoner or malpractioner from his nefarious work, it would at least have the effect of bringing to light many crimes which now are hidden without any suspicion being aroused. It might even prove a protection to a man's life to be known as a member of a mutual dissecting club.

PATENT MATTERS BEFORE CONGRESS.

Our abstract of the patent bills now before Congress, given in another column, exhibits the opening raid of the sewing machine monopolists, proving that these indefatigable individuals, nothing daunted by repeated defeat in previous Congresses, are about to bring all their forces to bear on the present one. The country is indebted to Mr. Dobbins, of New Jersey, for the presentation of the Wilson petition, which aims at a third term of seven years for the feed motion patent, used in the Wheeler and Wilson and other machines. The effect of this job, should it succeed, will be to render the whole sewing machine trade of the country tributary to the owners of the patent, and thus to saddle the people with a most oppressive and irksome monopoly, but little less obnoxious and gigantic than the old combination; in fact, it is advocated by, and in the interests of, the same parties. The second term ended November 12, 1871, and every Congress since that date has been besieged to give the expired patent new life; but, to their credit, thus far they have refused. It is to be hoped that the bill will meet a like fate this winter. Senator Logan revamps the Akin and Felthouser sewing machine compensation grab, which the Congresses of 1873 and 1874 rejected. Both of the above measures are presumably well known to the older members of the National Legislature, and it behooves them to keep watch that no ingenious lobbying or parliamentary sharp practice results in the passage of either of the bills. For the benefit of newly elected members, who may be unfamiliar with the tactics of the sewing machine monopolists, a brief statement of the merits, or rather demerits, of their claim may prove suggestive. A. B. Wilson's patent was granted for one of the first abortive attempts to make a sewing machine. This patent was construed to cover all styles of feeding devices in which the cloth can be turned round the needle, or in which the cloth is fed between two clamping surfaces. It was extended for seven years, and then, for the small sum of $50,000, Wilson transferred all his rights to the trustees of the Wheeler and Wilson, Grover and Baker, and Singer companies, in the hands of which corporations the patent has proved an effectual instrument for the complete monopoly of the sewing machine business. Now because Wilson got but $50,000 for his patent, he asks Congress for another term of seven years for the benefit, there is but little doubt, of the same combination. Wilson might, from other capitalists, have obtained probably twenty times the above named sum for his rights; but so large a consideration would not look so well when the next application to Congress for a second extension was to be made, so the payment of a small amount to the patentee was a necessary part of the job.

In previous years, members of the lobby have been unsparingly retained, and large sums have been spent in attempts to secure a passage of the bill. It is probable that still further and more determined efforts will be made this year. It remains, then, for every congressman who has the interests of his constituents at heart to scrutinize keenly and narrowly every move made by those who are manipulating this gigantic extortion, and to oppose its progress by his vote at every point. It remains, beside, for the people to let their representatives understand their will in this matter in a way that cannot be mistaken. As matters stand now, the patent is public property, free to all users: the door is open to fair competition, and the sewing machine, which has been somewhat reduced in price since the expiration of the patent, will be furnished to the public at a still lower price when the manufacturers outside the ring are insured, against injunctions and suits by the monopolists, by Congress rejecting the petitioner's application. Every housewife, every seamstress, every philanthropist, is interested in having all bills defeated which have for their purpose the protection of any combination of sewing machine manufacturers.

We shall watch with interest the discussion and votes on these bills when they are reported from the committees.

THE ATLANTIC FERRY.

The *Herald* has published an excellent report of the steamship lines plying between New York and Europe, with the names and tunnage of all the vessels, the number of trips made by each line, the number of passengers carried, the amount of freight, and other particulars of interest in regard to the character of the vessels, the kind of merchandise carried, quick trips, the improvements made in the different fleets, etc. We select from the report the following items of information:

The oldest line is the National, plying between New York, Liverpool, and London. It employs 12 iron steamers, full powered and among the largest in the service, having an aggregate tunnage of 51,486 tuns. These vessels made, during the year 1875, 81 regular trips, carrying 25,521 passengers and 464,709 tuns of cargo.

The Cunard Line—New York to Liverpool—employs 17 vessels, aggregating 53,200 tuns, and made 206 voyages, carrying 15,000 cabin and 27,550 steerage passengers, and 465,000 tuns of cargo. The quickest passage from Queenstown to New York was made by the Russia in 8 days and 14 hours; the quickest eastward was by the Scythia in 8 days and 10 hours.

The White Star Line—New York to Liverpool—employs 6 vessels, with an aggregate tunnage of 25,251 tuns. During the year they carried 24 100 passengers (5,174 in cabin), and 185,000 tuns of freight. They made 50 trips in all, the fastest by the Germania in August, time 7 days, 22 hours, and 8 minutes. In October the Adriatic made the run in 7 days, 22 hours, and 57 minutes.

The Anchor Line—New York to Glasgow and the Mediterranian—employs 27 vessels, with an aggregate tunnage of 57,289 tuns. They made 87 voyages from New York, 53 from Glasgow to New York, and 37 from Mediterranean ports to New York, carrying in all nearly 20,000 passengers (cabin 4,569, steerage 15,363), and 341,723 tuns of cargo.

The Inman Line—New York to Liverpool—employs 13 vessels, aggregating 42,975 tuns. They made 55 trips each way, 110 in all, and carried 300,000 tuns of cargo, and 34,389 passengers, 6,592 of them cabin passengers. The fast trips were, by the City of Richmond from Sandy Hook to Queenstown, 7 days and 18 hours; by the City of Berlin, westward, 7 days, 18 hours, and 2 minutes; eastward, 7 days, 15 hours, and 48 minutes.

The Hamburg-American Packet Company—New York to Hamburg—employs 15 vessels, which carried nearly 30,000 passengers (cabin 7,426, steerage 23,496), and 137,000 tuns of merchandise.

The North German Lloyds—New York to Bremen—employs 15 vessels, aggregating 48,710 tuns. They made last year 51 trips each way, carrying in all over 30,000 passengers (cabin 6,935, steerage 23,748), and 114,500 tuns of cargo. The best time made was 9 days and 10 hours.

The new State Line—New York to Glasgow—employs 7 vessels, aggregating 17,000 tuns. They carried 4,000 passengers and 48,900 tuns of freight from New York. Number of trips and amount of freight from Glasgow not given. Quickest trip, 9 days and 15 hours.

The Williams and Guion Line—New York and Liverpool—employs 6 vessels, aggregating 22,360 tuns. They made 38 trips each way, and carried 150,000 tuns of cargo; number of passengers not given.

The French Line—General Transatlantic Company—New York to Havre—has 6 vessels, aggregating 24,300 tuns. They made 28 trips each way, and carried 6,900 passengers.

The whole number of passengers carried by all these lines was about 225,000, and the freight over 2,000,000 tuns.

Mineral Wool.

The method of manufacture at the Krupp Works, Essen, Prussia, is as follows: The pig iron furnace is provided with a tap an inch in diameter, out of which a continual stream of slag is allowed to flow and to fall a distance of 2 feet 6 inches, at which point the falling stream of slag is met by a strong blast of cold air, the effect of which is to separate the slag into myriads of hairlike threads, as white as snow, resembling the finest wool. These fibers, like spun glass, if handled, will penetrate the skin. The mineral wool is used for packing steam pipes, boilers, etc., and is a valuable product.

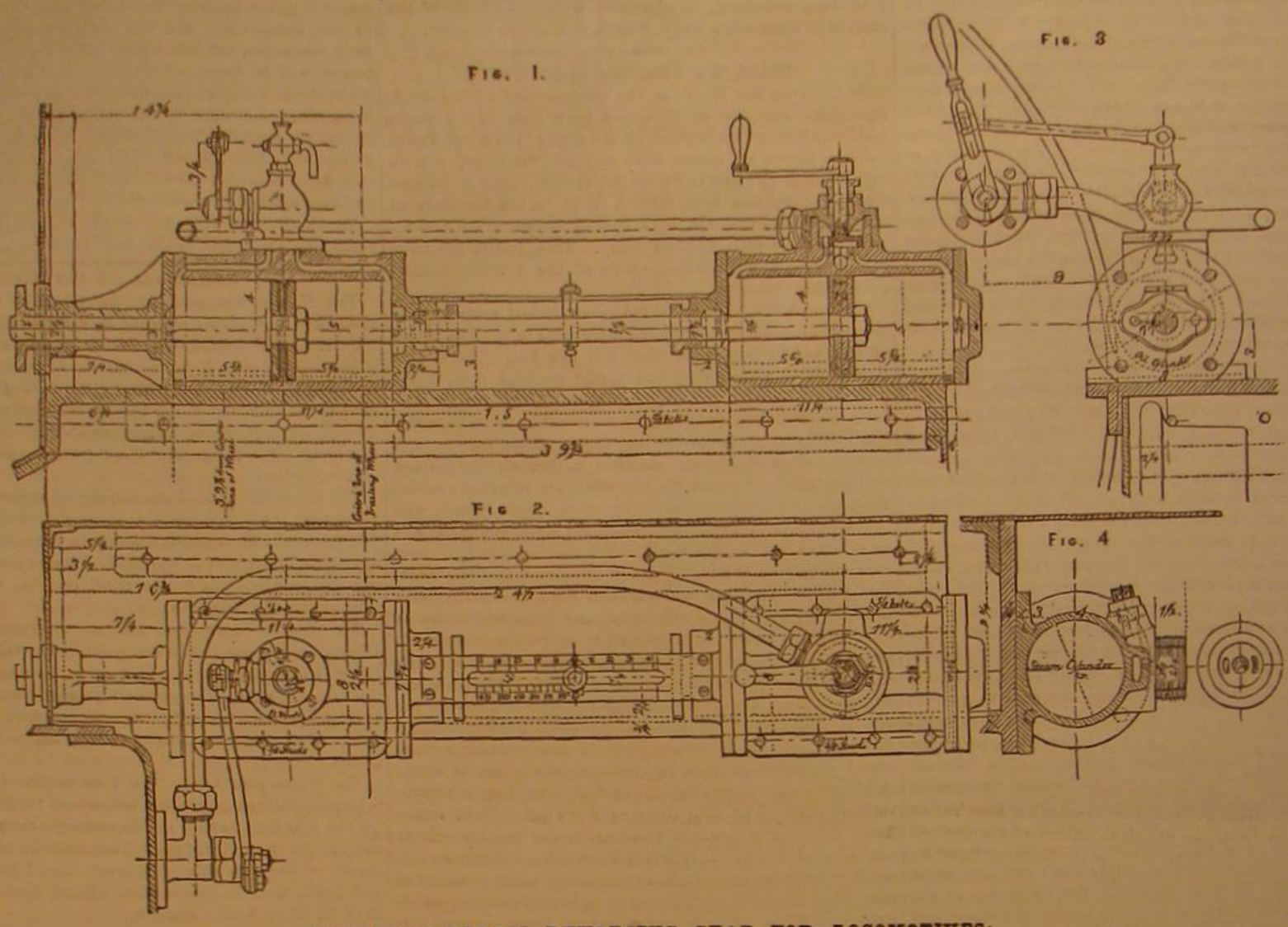
RECENT IMPROVEMENTS IN LOCOMOTIVE ENGINES.

A lively competition between three leading railroad lines carrying passengers and freight between London and Scotland has continued for some time past; and some very important improvements in locomotive construction have already been produced by the rivalry. The morning express train on the Great Northern Railway accomplishes the distance from London to Edinburgh, 399 miles, in 9¼ hours, including all stoppages, one of which is long enough to allow the passengers to take dinner, and the London and Northwestern Railway is by no means behind its competitor in speed. The authorities of the Glasgow and Southwestern line, over which passes a vast amount of traffic from London to the manufacturing districts of Scotland, have recently constructed some new locomotives, which deserve the attention of all persons interested in rapid and economical railway communication. These engines have two pairs of driving wheels, coupled outside by horizontal bars, and four leading wheels are united in a bogie in front of the engine. The cylinders are 18 inches in diameter by 26 inches stroke, and the driving wheels are 7 feet 1 inch in diameter. Each engine shows a heating surface of 1,111·8 square feet: this total, which is large for a narrow gage engine, being obtained by using boiler tubes of small diameter. Mr. James Stirling, the locomotive engineer of the line, has managed to make tubes of 1¼ inches diameter thoroughly efficient; and our locomotive friends are well aware that this is a problem of considerable importance, owing to the difficulty of cleaning such tubes. Mr. Stirling hinges the exhaust pipe on one side at the bottom, so that, by slackening a bolt, it can be turned out of the way, giving free access to the center tubes of the boiler.

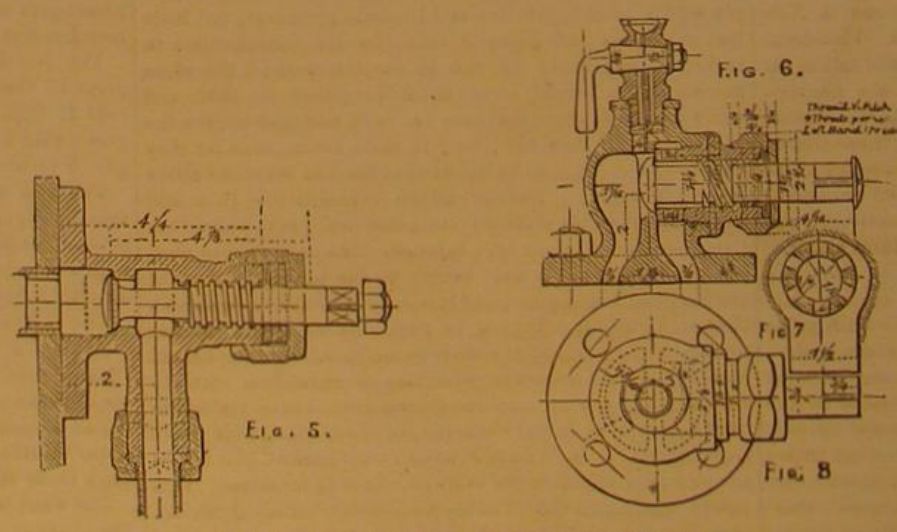
But we must now call attention to the most important improvement, which successfully solves the difficulty which locomotive engineers have hitherto found in applying steam power to the reversal of the engine: the introduction of which gives the engineer control over his engine to a degree which is found to be of the highest value when any accident happens or the signals are against him. Our readers are doubtless familiar with the ordinary reversing gear of a locomotive, constructed by attaching the ends of the rods of two eccentrics (set nearly diametrically opposite to each other) to the ends of a link, in which the die attached to the slide valve rod runs. This link regulates the cut-off of the slide valve by controlling its travel, and the position of the link is regulated by the way shaft and the reversing lever notch plate, into which the lever controlling the link is fastened. But if the engineer lifts the lever out of a notch while the steam is on, the speed of the engine and the difficulty of reversing the travel of the slide valve under steam pressure will prevent his altering the position of the link; and even when he has shut off steam, he will find great difficulty in moving the link and slide valve till the engine has considerably slackened speed. To apply steam power, therefore, to the immediate reversal of a locomotive, both when at full speed and when engaged at work which requires frequent reversal, such as shunting, is a great desideratum; and we think that our readers will find that the object has been successfully achieved in the apparatus of Mr. James Stirling, shown in Figs. 1 to 8 of the accompanying engravings.

As will be seen from the views given, the apparatus consists of a pair of cylinders (each 5 inches in diameter, and of sufficient length to accommodate a stroke of about 9 inches) bolted down to a cast iron bed plate, which forms the top of the right hand trailing wheel cover. The two cylinders are almost identical, being cast from the same pattern, but in one of them—that next the firebox—the exhaust port is omitted, there being merely two passages leading from the ends of the cylinder to the face on which the regulating valve (shown in detail by Figs. 6, 7, and 8) is fixed. The other cylinder has the usual two steam ports with the exhaust port between them, and these ports are covered by a kind of revolving slide valve which can be turned so as to place either of the cylinder passages in communication with the exhaust, the other passage being at the same time made free to receive steam through an opening in the valve itself. Thus with the valve position in which it is shown in Fig. 1, the steam would be admitted to the front end of the cylinder, and exhausted from the rear end. The cylinder of which we are now speaking is fitted with an ordinary steam piston, while the other cylinder—which we may term the cataract cylinder—is fitted with a cylinder packed by two cup leathers as shown. Both pistons are attached to one rod, which passes out through the front cover of the front cylinder, and is controlled by the piston in the front cylinder, this cylinder being completely filled with oil, which, as the piston moves, is forced from one end to the other through the regulating valve, which we have already mentioned as being fixed on the top of that cylinder. As will be seen from the detail view, Fig. 6, there is provided at the top of this valve a cock, through which oil can be supplied when required to make up any losses by leakage, and thus all slack can be kept properly taken up.

One of the leading features of the arrangement is that, when the steam cock is closed, the valve regulating the flow of the oil is closed also, and thus, when the steam is shut off, the gear is firmly locked in the position it then occupies. As will be seen from the view (Fig. 3), the steam cock and oil-regulating valve are connected so that they are opened or closed together, the connection between the two being such as to admit of all requisite adjustment of their respective movements. Altogether the arrangement is very simple, and the details are well worked out, while in practice the apparatus is found to act admirably. "We may add," says *Engineering*, to which we are indebted for the engravings, "that, as the engine cannot be reversed when out of steam, it is an established rule that all engines fitted with this steam-reversing gear should be left by the drivers in mid-gear and with the handles locked. Mr. Stirling has now worked this arrangement for upwards of a year, and has experienced no bad results from moving the engines fitted with itin either direction when cold."



STIRLING'S STEAM REVERSING GEAR FOR LOCOMOTIVES.



STEAM REVERSING GEAR FOR LOCOMOTIVES.

Peculiar Effects of Lightning on Vines

At a recent meeting of the *Société Helvétique des Sciences Naturelles*, Professor Dufour mentioned a lightning stroke which in the month of June last struck simultaneously two vineyards, distant over 360 feet apart. In one, the surface affected measured 57 feet square, and included some 330 vines. In the other the surface was about 32 feet square and about 100 vines appeared to be destroyed, while others were partially so. In August, however, those vines which appeared to be the most severely injured threw out vigorous branches, and early in September were covered with new bunches of young grapes. But on the other hand, those grapes already started, and which, had the lightning not intervened, would have formed the year's crop, ceased all development.

In his treatise on lightning, Arago cites, as remarkable facts of rare occurrence, lightning strokes apparently divided into two or three branches. Here, however, the lightning divided into two branches to strike vineyards considerably distant from each other, and then the branches must have produced 330 and 100 jets respectively in order to strike the separate vines.

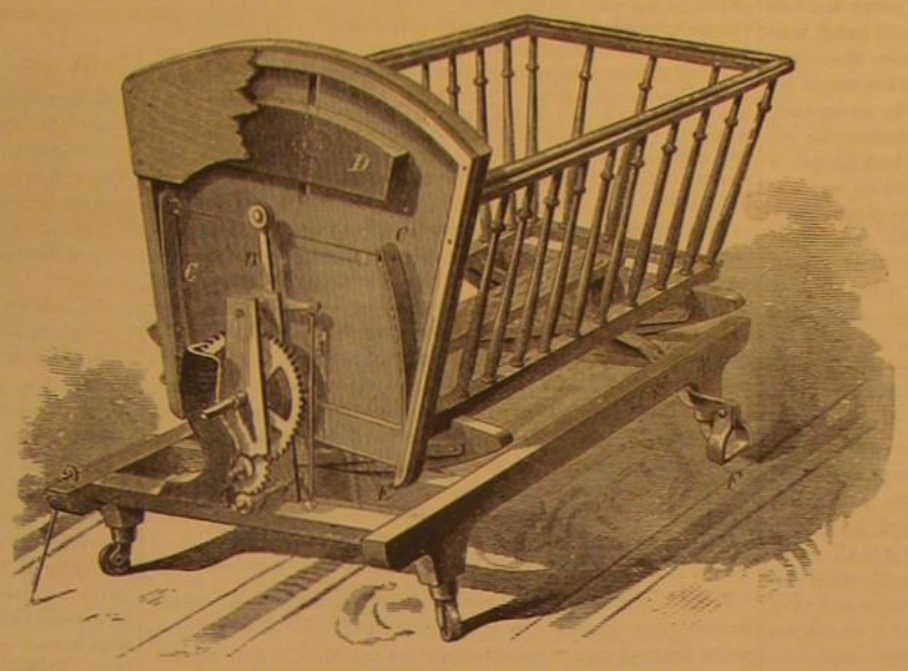
It is not a difficult matter to mend harness tugs so long as harness leather, copper rivets (¼ inch) and a good steel punch are at hand. Cut two strips of leather as wide as the tug and eight inches long; join the broken ends with a strip on each side, punch three holes each side of the break, and rivet. This makes a neat, strong job.

IMPROVED AUTOMATIC CRADLE.

The accompanying engraving represents a new form of cradle, which, by means of suitable clockwork, may be caused to rock itself for periods ranging from thirty minutes to an hour and a half, according to the strength of the actuating mechanism. The cradle proper is mounted on its pedestal in a novel manner, and is so connected with the rocking device that its motion may be uniform without reference to the position of its occupant.

The clockwork, as shown in the engraving, rotates a crank shaft which, through the medium of the pitman, A, oscillates the bell crank, B. On the vertical arm of the latter is a spool, around which passes a cord, which is extended between two springs, C, attached, as represented, inside the hollow head board. The rotation of the crank shaft determines the oscillation of the bell crank, the spool of which, traveling along the extended cord, alternately depresses the ends thereof, and so communicates motion to the cradle. It will be obvious that the inclination of the cradle is compensated for the self-adjustment of the springs, C, so that these, with the cord, form an automatic regulator, by which the rocking lever is always adjusted in proper position to operate. As the child might be placed far over to one side in the cradle, thus giving the latter a prominent "list" in that direction, the utility of the above device, which causes the rocking to be always uniform, will be readily appreciated. The motion or swing of the cradle is regulated by the weight, D, within the headboard; said weight is adjustable by a screw clamp attached thereto, which works through a slot in the headboard (see dotted lines).

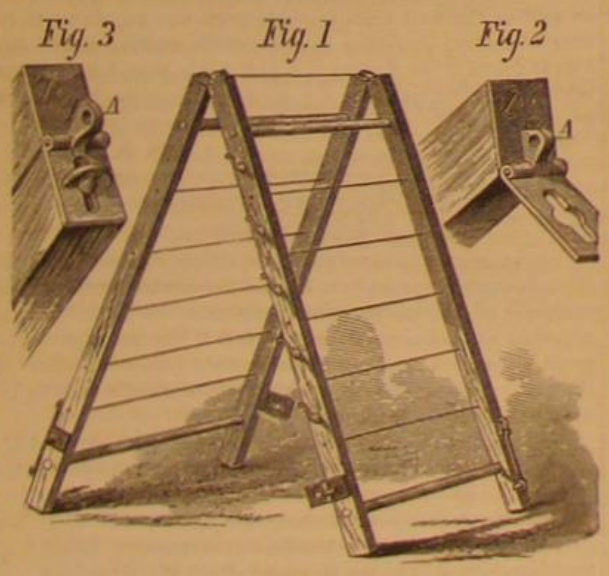
The mode of attaching the rockers to the base or pedestal consists simply in the pivoted connecting bars, E. On the rear rocker, the bar, F, is extended and terminates in a treadle, as shown, thus affording an easy means of rocking the cradle by the foot when it is not desired to use the spring. Patented November 23, 1875. For further information relative to sale of rights, royalties, etc., address the inventors, Messrs. W. V. and N. W. Vandervort, New Antioch, Clinton county, Ohio.



VANDEVORT'S AUTOMATIC CRADLE.

BROOKS' IMPROVED CLOTHES DRYER.

The new portable clothes dryer, illustrated in the annexed engraving, is so constructed as to admit of its being opened, either as shown in Fig. 1, or with its frames vertical, after the manner of an ordinary clothes horse. To adapt it to be placed in either position, the inventor has attached a novel hinge, which forms the principal feature of the device. The construction of the hinge will be understood from Figs. 2 and 3. One portion of it has apertures through which the attaching screws pass; the other has a slot to accommodate a button which, when inserted and pinned as in Fig. 3, fastens that side of the hinge. There is also a stop, A, which prevents the hinge from opening too far, and also has an aperture through which a cord is passed to afford additional accommodation for the clothes.



The location of the hinges is apparent from Fig. 1. Two at the upper extremities of the vertical pieces of the frames connect the latter together, so that they may be adjusted as shown. When it is desired to set the frames up, clothes-horse fashion, one of the upper hinges is disconnected; and the vertical bars being brought together, their lower parts are fastened by the hinges shown near the bottom.

Patented November 2, 1875. For further particulars relative to sale of State and county rights, address the inventor, Mr. G. A. Brooks, Norwich, Conn., or J. W. Heaton, Bridgeport, Conn

The Art of Skeletonising Leaves.

"The subject having excited a little interest among some horticulturist lately, owing to the exhibition of some beautifully executed examples at some of the large provincial exhibitions held in the Northern and Midland counties of England, I took the liberty of appealing to a lady friend, who has been very successful as a skeletoniser of foliage, requesting her to favor me with the *modus operandi* by which she produces her specimens with such perfect completeness.

"My informant states at the outset that the art of skeletonising leaves and flowers would be found much less difficult of accomplishment were the nature and character of the various plants thoroughly studied at first. This is, no doubt, a very important matter. For instance, it would be but a poor direction to the learner to say: "Gather the leaves on a certain day," unless proper attention be also paid to the leaves chosen. They must have reached a certain degree of maturity, neither too old nor too young; and as all leaves do not reach this point at the same time, it is obvious that care must be taken that each kind must be gathered when fit for use. The leaves of the magnolia, for instance, may be gathered when the plant is in bloom, varying in time from June till August. They will require from a month to six weeks time to be well immersed, and so be easy to dissect, as the fiber is so strong. The leaves of the ivy rank among the most difficult, and, because of the peculiar beauty of the fiber, will amply repay the trouble involved in the preparation. These may be immersed from the beginning of May to October, but should be leaves of the previous year's growth. All leaves will not answer for dissecting, but those that have been most successfully operated on are from the magnolia, ivy, pear, rose, holly, orange, poplar, willow, elm, lime, service tree, Spanish and horse chesnuts, and the oak. The leaves of the last-named should not, however, be put into the same vessel with the others, as it affects them in an undesirable manner. Seed vessels may also be dissected in an admirable manner; such are those of the stramonium, winter cherry, poppy, etc.

"To procure good specimens, put the leaves into a deep jar, and cover them with soft water, which must not be changed; the jar is then to be put into a cool place. When, upon examination, the leaves are found to be quite soft, they must be carefully brushed in a weak solution of chloride of lime for a short time, to whiten the fiber, and afterwards washed well in two or three waters, and dried carefully between sheets of blotting paper or linen; after which they are ready for mounting. To make stems for this purpose, thread, stiffened with gum, is most useful, and it has a natural appearance. The leaves may be formed into bouquets or wreaths, according to the taste of the operator, and should be placed under glass shades to preserve them from harm.

"I have seen groups of leaves so prepared, that formed most acceptable table ornaments in sitting and drawing rooms; and it suggests a pleasant employment for the fair sex, with which to fill up moments of leisure. It is evident that much nice discrimination in the selection of the right leaves is required; and a light and careful manipulation is also essential; and in the case of failure from a first attempt, no small amount of patience is needed to carry the operator through to ultimate success."—*R. D., in Land and Water.*

Compulsory Education in New York.

A recent report of the Superintendent of Truancy to the Board of Education of this city exhibits the practical working of the compulsory education law, which went in force on the 1st of Feburary, 1875. By comparing the figures showing the average attendance on the above date, and those showing the same at the close of December last, there appears an increase of 6,443 in the number of pupils registered, and of 6 515 in the daily average attendance. Including the increase of average attendance at the industrial schools also, the last mentioned figures are augmented to 7,614. In other words, in ten months and at an expense of $14,355 88 for the period, nearly 8,000 children have been induced to abandon a course of idleness and vagrancy, fitting them to becoms paupers and criminals, and to enter upon a course of industry and instruction, preparing them to be future thrifty and intelligent citizens. This is an admirable and encouraging showing for the first workings of the law, although one which we may hope to see improved upon after the lapse of another year.

Koumiss.

The foreign medical journals are giving considerable prominence to the discussion of the utility of koumiss as a remedy for that, now to all intents, incurable disease, consumption. It is to this peculiar preparation that the Tartars attribute their total immunity from the disease; and that this immunity has long since been traced to koumiss by Russian physicians is proved in the fact that the latter as frequently send consumptives to regions where koumiss is constantly used as the physicians in this country dispatch patients to the orange orchards of Florida for the winter.

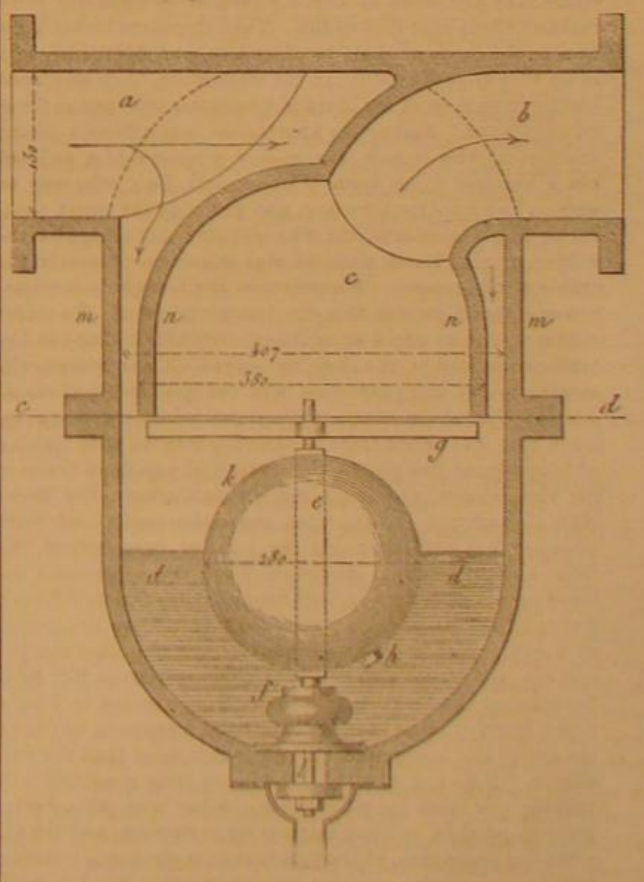
The Tartars, above all other people, excel in the manufacture. The material is an alcoholic liquor produced by the fermentation of mare's milk. A certain quantity of the latter is placed in a wooden vessel, and one sixth of its amount in water is added. A similar amount of cow's milk is next poured in, and then the receptacle is covered with a thick cloth, and either buried in the earth or subjected to a moderate heat for 24 hours. The mixture becomes sour, and thick clots form on its surface, but these last are again incorporated by brisk stirring, which is continued until the liquor becomes homogeneous. Another twenty-four hours' repose follows; the liquid is transferred to a higher and narrower vessel, and the stirring and beating operation is repeated. It is then ready for use, although the stirring has to be done over again every time the contents of the vessel are drawn upon after any period of rest.

The taste is agreeable, and of a kind of acid sweet. A dose of something less than a quart is intoxicating, even to persons habituated to its use. It appears to act on the faculties of nutrition like alcohol and raw meat, that is, it moderates the consumptive action of the disease. The patient gains in weight.

In the large cities of Europe, koumiss has, in cases where large quantities of mare's milk were unattainable, been made of cow's milk alone, or mingled with asses' milk. To use it as a medicine, it is bottled, and a tube is forced down through the stopper, as in the siphon jars so much in use by mineral water makers, said tube having a suitable faucet. The pressure of gas generated in the bottle is always sufficient to drive out the koumiss forcibly, so that it can be drawn off at pleasure, like artificial seltzer water.

A NEW STEAM TRAP.

We extract from the Belgian *Bulletin du Musée de l'Industrie* the annexed engraving of a new steam trap, for drying saturated steam during its passage from the boiler to the engine cylinder. The apparatus is composed of a cast iron chamber, *m*, which is surrounded by felting or other non-conducting material. The steam enters at the opening, *a*; and in its descending course between the sides, *m* and *n*, and in rising in the bell, *c*, it deposits the water of condensation, which, sinking to the lower portion, *d*, of the receptacle,



there accumulates. In order to allow this water to escape, a double seated valve, *f*, is placed at the bottom. On the stem, *l*, of the valve, a spherical float, *e*, is carried. The stem is fixed in a tube which traverses the sphere, and is guided above by three arms, at *g*. When the water level rises in the receptacle, the float is raised and the valve beneath lifted, allowing of an escape until the sphere falls sufficiently to close the valve. The weight of the float may be r gulated by admitting a suitable amount of water at the opening closed by the plug, *h*. The dry steam makes its exit above and is conducted to the cylinder by the pipe, *b*.

THOUSANDS of dollars are lost by farmers through neglect to shelter their farm machinery during winter. It only takes about two winters' exposure to rot the wooden portions at the joints, and to render the bolts loose and weak.

Correspondence.

Employers and Trade Unions in England.

To the Editor of the Scientific American:

As I told you in my previous communication (published in your last issue), the workman Tom continued in his course, determined to let the matter work itself out; but while he was in this state of mind, matters assumed an entirely new phase, inasmuch as the foremen began to urge the day work men to do more work, complaining that the cost of day work must be made to approximate that of piecework. Some men were reduced by being put back from the erecting pits to the fitting benches, one or two were threatened with dismissal, and apprentices just out of their time were not given the full amount of the usual rise in their wages. One old hand, who had performed some twenty years of service under that company, and nearly all of it in the same shop, had his wages reduced, and the whole shop became, as it were, in an uproar, Tom was charged with injuring his fellow workmen; he replied that he had nothing to sell but his labor, and he had a right to realize the most of it that he could; and he was answered that no man had a right to injure a whole community, that the rights (and even the privileges) of the individual were ignored by governments when the welfare of a community demanded it. He was told how the discoverer of gold in California had his lands seized by the people, and had been utterly unable to obtain any redress at the hands of the courts. Another said: "See here! I was engaged to work for this company; I have given them satisfaction for years; I am doing the same amount of work that I always did, but I no longer give satisfaction. I am given to understand that I must do no more work for the same price. I would not object to your doing what you like with your labor; but when you are set up as a standard by which I am to be measured, a standard by which we are all to be measured, to our detriment, what are we to do?" Still another said: "Do not you see that your perseverance and skill are merely taken advantage of to our detriment? You are not given any credit for any unusual ability, but our employers set you up as an average, and say that, if you can do so much work, others must do it. Doctors and lawyers have legal charges which they can enforce, the one so much a visit, the other so much for each professional service; but we have no protection whatever." Tom replied that he was not answerable for the actions of the company, and that in a matter of business he had a right to consult his own interests only. They replied that it was a matter of business to them also, and that they had a right to consult their interests only. The result of his work had been a business detriment to them, and he must thereafter expect no favor from them.

Here was an entirely new disturbance. The foremen got into difficulty, the superintendent said that it looked badly on the books for a workman to be making so much money, and also for one man's work to be done so much more cheaply than another's. The foremen were unable to get others to either take piecework at Tom's prices, or to make day work cost anywhere near that of his. They therefore looked upon Tom as the cause of their troubles also, and dealt with him in no very friendly spirit. In the meanwhile, Tom employed another man to work for him and sometimes two, and at times an apprentice. Among the apprentices was a certain young gentleman (who is now the master mechanic of a railroad not a hundred miles from Williamsport, Pa.), who was an earnest and assiduous worker, and probably the most skillful of Tom's assistants, and who will probably recognize the subject of this letter, since he was cognizant of nearly the whole of the contest. The result of the foremen's displeasure was that Tom was likely to lose his position. He learnt that it was to be urged upon the superintendent that the disturbance created in the shop by piecework was more detrimental to the company than was the piecework advantageous. The claim was probably not without foundation, since Tom was on his entry to the shop greeted with ringing of hammers on iron plates, the erection of a gallows frame in his vise, shouts, and other similar salutations, the better class of workmen looking upon these demonstrations with pleasure, but holding aloof; the inferior ones helped the folly, hoping it would intimidate Tom; the apprentices entered into it with a gusto, half from deviltry and half from a desire to become popular among the men. Then the groups of workmen and apprentices would argue the question, *pro* and *con*, and would not, as a rule, commence work till one or the other of the foremen appeared. This aroused in Tom a direct spirit of opposition; he took more piecework, cut down the prices still lower, and still he earned more than the regulation "time and a half." His work was repairing and making new work for old engines. A few men were continually engaged in building engines by piecework, and thus it often happened that, at the time that Tom was doing a certain job for one engine, another man was doing similar work from the same drawings for another, the castings being from the same patterns. Tom's price was, as the books of the company attest, never less than 25 per cent lower than that of the men referred to; and yet, because Tom earned more money, or, in other words, because he did more work, he was harassed by his employers, and came into indirect conflict with them, by reason of their insisting upon his voluntarily reducing his prices, although his rival was not even requested to reduce, and was *allowed to continue at the old price, although he did not do so much work.* He did not earn so much money, and was therefore considered to have committed no offence.

It has not been attempted, in this letter, to show the bitterness attending Tom's struggle, both with the workmen and the foremen, but merely to illustrate the difficulties of the piecework system; but Tom finally decided to go to the United States, and, wishing to have an introduction to some one there, called upon Mr. Zerah Colburn, then editor of *Engineering*, a mechanical newspaper well known to your readers. Mr. Colburn had heard of Tom, and gave him letters of recommendation to several prominent engineering gentlemen in the United States. I subjoin an exact copy of one of them:

London, 11th day of February, 1867.

MY DEAR SIR:

Mr. ———, who will hand you this, has been engaged for some years at the ——— railway works. He has taken by piecework almost every part of the finished work of locomotives, and I believe he has succeeded very well at moderate prices. Indeed he has brought down the displeasure of the union men, with whom the workshops of this country are unfortunately overrun, for having been more industrious and therefore more prosperous than their regulations allow of. He has determined to go to America; and I trust that, if you cannot find a place for him, you may be able to recommend him, as I think you may with confidence as a hard-working, capable, and valuable man. In this latter case, will you kindly return to him this letter, and endorse it to any of our mutual acquaintances whom you think likely to further his wishes? ZERAH COLBURN.

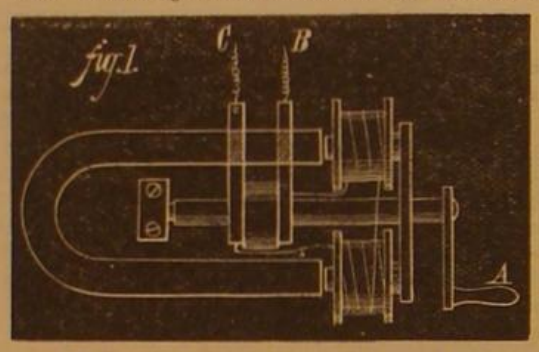
Tom came here, found immediate employment, and in a very few weeks was working piecework; but in less than two years he found that "so much work for so much money," as illustrated by the piecework system, is (as a means of advancement) a delusion and a snare, since his value as a workman was sufficient to render his employment in a higher position questionable in a money point of view. Tom, however, still believes that piecework, carried out with a desire on the part of both employer and workman to be reasonable and just, would be a decided advantage to both.

New York city. PIECEWORK.

Some Further Electric Experiments.

To the Editor of the Scientific American:

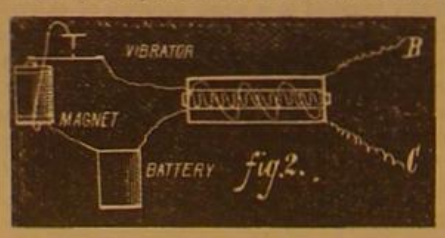
I send you notes of three electrical experiments, which any of your readers can try for themselves. Fig. 1 represents the common magneto-electrical machine in general use



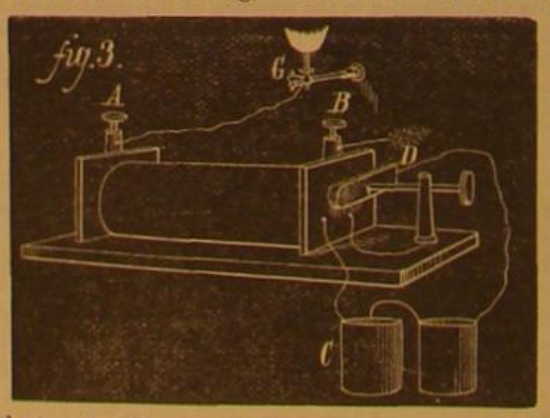
By turning the crank, A, sparks can be obtained either at B or C. These sparks can be obtained at the free or open end of a conductor, by proper connection.

Fig. 2 represents common voltaic induction, and the sparks can be obtained either at B or C, and transmitted the same as by the magneto electrical machine, but with better results.

Fig. 3 represents the Ruhmkorff induction coil. C is the battery, D the vibrator, and A and B the ends of the fine wire



or second coil. Sparks can be obtained at either A or B, by touching the knob with a wire or piece of metal. A physiological effect can be obtained by slightly touching the free or open end of the wire leading, from either A or B, to the end



of the tongue. It makes no difference from which, A or B, you lead the wire, the spark will appear; and of course, by touching A and B together, you have the common result of the coil. Connecting A to the gas pipe, G, thereby grounding the whole coil, does not affect the sparks or physiological effect at B, or their transmission through conductors. The sparks can be made to produce mechanical effects in this form, and they can be made to produce mechanical effects similar to those obtained by Mr. Edison. M. B.

A Freak of Nature.

To the Editor of the Scientific American:

In a forest in the vicinity of this place, there are two trees of the variety known as red oak, which, at about 12 feet from the earth, are united by a limb growing from one to the other. The trees are about 2 feet 6 inches apart. The one from which the limb extends is 44 inches in circumference near the earth, 41 below the limb and 36 above. The other is 26 inches in circumference at the stump, and 24 below and 33 above the junction with the limb, which is 22 inches around. In the large tree, the trunk is healthy below the limb, but the top evinces signs of decay. The top of the small one is healthy and flourishing, while its trunk is nearly dead, and has scarcely grown an inch in several years. The large tree is about 30 feet high, and the small one over 40.

If any museum would like to obtain the specimen, it will be put on the cars at Farley, addressed to any person who may give me necessary directions.

Farley, Iowa. W. J. MCGEE.

Wells of Mineral Water.

To the Editor of the Scientific American:

It is well known that mineral water in wells, by reason of its greater specific gravity, sinks to the bottom, while water which contains little or no mineral floats to the surface. Hence it is impossible to obtain pure water by the use of the common pump: for since the pump draws from the bottom, it must of course draw the mineral water first, leaving the pure water in the well. To remedy this, I suggest the following:

Provide a piece of ⅞ inch oak plank about 15 inches square, and boil it well in clean water to remove the sap. Procure a piece of rubber hose about 1¼ or 1½ inches in diameter, and of sufficient length to reach from the bottom of the well to the surface of the water when at its highest point. Split one end of the hose in halves to the length of 3 inches, open the mouth thus formed about 2 or 2½ inches, and join it to the center of the square plank by means of tacks through the edges of the lips, the slots on the two opposite sides being distended at least 1 inch. Attach the other end of the hose to a spile of 1½ inch bore inserted in the pump stock about 10 inches from the bottom, stopping up all other water inlets below the surface. The hose may be lashed on the spile with a well waxed cord. Introduce the pump, with the hose thus attached, into the well, allowing the plank supporting the upper end of the hose to flat on the surface, and the pump is ready for use.

The advantages of this plan are that, as no water can enter the pump but through the slots in the hose under the plank, all the pure surface water will be drawn off before the mineral water is reached, and no *débris* or sediment of whatever kind can enter the pump from below, nor floating foreign bodies from above. And the floating plank will rise and fall with the varying hight of water, so that none but surface water, the purest in the well, can be drawn.

Alma, Ohio. J. TAYLOR.

Value of the Scientific American.

To the Editor of the Scientific American:

In your issue of January 15, current volume, is an extract headed: "Make a Note of It!" My advice to everybody is, instead of keeping a notebook and pencil always ready, and looking very much like a city local reporter, subscribe, like a sensible man, to the SCIENTIFIC AMERICAN, read it carefully and then lay it away. I can assure you that, if anything worth making a note of is published, it will be sure to come out in its volumes; and by looking over back numbers, as well as the new ones as they come out, any one will be sure of finding anything that is worth making a note of. I have found it so during the few years that I have been taking your journal, and for my small business it has been as good as a large cash capital. "Knowledge is power."

Wilson, N. C. H. B. BENTON.

Electricity as an Executioner.

To the Editor of the Scientific American:

In your paper of January 8 is an article on the above subject. It is very suggestive. Should the electric fluid be used to shuffle off the mortal coil of criminals, the judge in pronouncing sentence would have to say: "The sentence of the court is that you be taken to the county jail, and thence to the place of execution, where you will be struck with lightning until you are dead, dead, dead!"

We might go still further with improved methods of dealing with culprits. Experiments could be made to determine whether human beings could be frozen in such a manner that life would return when the body was thawed out, as is the case with fish and other animals. If successful, instead of long imprisonment at the expense of the State for food and clothing, and the risk of escape, criminals could be securely incased in blocks of ice, and stored away in refrigerators during their allotted term. Had Tweed been thus immured, there would now be less anxiety about him. Then, again, any one dissatisfied with the hard times could step into the machine, and request a friend to block him up in ice until specie payment was resumed.

The length of this kind of improvement would add years, but not age, to the prisoner. With proper care, we should be immortal. A hundred years would be as one day. Troublesome mothers-in-law could be disposed of for a time, care being taken not to break them in two in the act of storing. S. BROWN.

Philadelphia, Pa.

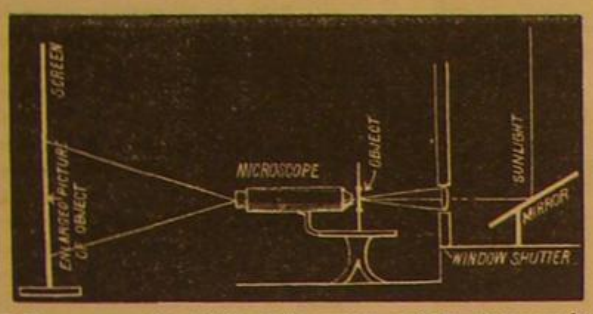
Enlarged Images Projected on a Screen with a Microscope.

To the Editor of the Scientific American:

In your issue of December 18 (Notes and Queries, No. 43) you say that a person cannot throw an enlarged image on a screen with a compound microscope. It had been my good fortune to listen to a course of lectures, by Professor Bolles

on the microscope, in which he stated that he produced some of his images on the screen in that way. To confirm my impression, I wrote to him and received the following:

"The answer in the SCIENTIFIC AMERICAN is only true in one way. It is true that you cannot use the microscope to project objects to any size on the screen, if you use the ordinary illumination employed for viewing objects, because the light (a gas jet, a candle, ordinary daylight, a kerosene lamp) is not intense enough to give a bright picture when diffused so much as it must be on the screen. But if you increase your illumination, you can project the smallest objects which the microscope can show. The enlarged objects which I showed in New Bedford were projected from a microscope placed in front of the calcium light. Dr. J. J. Woodward, of the Army Medical Museum in Washington, has done the finest work of this kind. He uses sunlight, thus:



You can see the object on the screen; and if a photographic plate be substituted for it, a negative can be taken. In this way Dr. Woodward has photographed the most difficult things, such as Nobert's 19th band, five-lined diatoms, etc. His results, published by the government, are the best in this way in the world. A great deal of this sort of thing has been done, and almost any book on the microscope has something about it. Any microscope and any lens can be used if there is a light intense enough. I often photograph microscopic objects direct from the lantern. E. C. BOLLES."

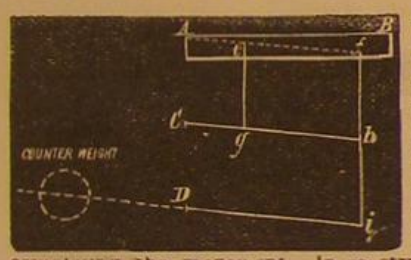
I believe this will be interesting to your many readers.

New Bedford, Mass. D. W. C.

To Describe a Circular Motion Around an Inaccessible Center.

To the Editor of the Scientific American:

The following problem recently came up in practice. It became necessary to tip the leaf of a bench or table about an axis which was inaccessible for using a hinge or trunnion. Sliding arcs as guides were also inadmissible, and nothing should project above the surface of the table. The device shown in the engraving accomplishes the object.



A B is the leaf to be raised or lowered about the corner, A. C and D are pivots upon a fixed frame. C *h*, D *i*, and *i f* form the well known parallel motion. Upon C *h* is erected the connecting link, *g e*, completing the movement. In construction, A *f*, C *h*, and D *i*, should be equal, *g e*=*h f*, and *g h*=*e f*.

Smithville, N. J. JOHN SALTAR, Jr.

Mr. Edison's New Force.

To the Editor of the Scientific American:

I notice in your SUPPLEMENT No. 5 an article upon the "phenomenon of induction," by Professor Houston of Philadelphia, copied from the *Journal of the Franklin Institute*, in which he claims that etheric force is nothing but inductive electricity, and that he observed the same phenomenon in 1871. He attributes my failure, to obtain indications with the test instruments used, to the fact that the positive and negative currents from the vibrator followed each other with great rapidity, and thus prevented the instruments from responding. In reply, allow me to state the gentleman is entirely wrong in his conclusions, and that he cannot be familiar with the extra currents of low resistance magnets; otherwise he would have known that, upon connecting the battery, the extra current is provided with a circuit in which it may pass, consisting of the battery, connecting wires, and electromagnet. Under the conditions by which I obtain etheric force, no spark should theoretically be obtained, even if it were due to extra current upon closing the circuit; and in all my experiments none has ever been obtained. Neither is the brilliancy of the spark reduced by replacing the iron core of the electromagnet (used in one form of experiment) with a copper one, which should be the case were the spark due to extra current.

In regard to the Professor's claim of priority, I have on every occasion stated that the spark has been observed by electricians for many years, and attributed by them to inductive electricity; and all that I can lay claim to is that perhaps (if that is not too strong a word) I was the first to discover that it was not due to electricity.

In conclusion, I suggest that, as I have freely laid myself open to criticism by presuming to believe in the capacity of Nature to supply a new form of energy, which presumption rests upon experiment, it is but fair that my critics should also back up their assertions by experiment, and give me an equal chance as a critic. T. A. EDISON.

Newark, N. J.

The Nature of the Phenomena Discovered by Mr. Edison.

To the Editor of the Scientific American:

Allow me to correct a slight typographical error in the last paragraph of my article on page 39 of your current volume, where it said: "Another argument that this force is not electricity itself, and is only related to electricity," etc. This makes me say the reverse of what I wished to convey. It should read: "Another argument that this force, if not electricity itself, is related to electricity only, and not to heat," etc.

New York city. P. H. VANDER WEYDE, M.D.

Sixty Quails in Sixty Days.

We wonder if there is anything epidemic in the desire to eat thirty quails. Two or three weeks ago we found a story about some one in Indiana accomplishing that most nauseous of gastronomic operations, and transferred the recital to these columns. Now come two Frenchmen in Louisville, Ky., who have been trying their hands, or their stomachs rather, at the same proceeding, and they also have succeeded. We are beginning to lose faith after all in the assertion that the task is difficult: at all events, it is one which has been mastered, apparently, by the indomitable will of the Gallic gourmands.

But this is not all. One of the twain, after smacking his lips over quail No. 30, sighed, Alexander-like, for more quails to conquer. Thirty quails had glanced harmlessly from that flinty stomach, and the hero of the astonishing organ felt justified in beginning on quail No. 31. He continued until five birds had been engorged, and then outraged nature rebelled; but with a burst of that gigantic will, which, in Napoleon, surmounted the rocky barriers of the Alps, the intrepid eater hurled himself upon the seventh bird, and, in his own words, "chewed him up, bones and all." Like the old guard at Waterloo, that stomach, "which dies, but never surrenders," withstood the onslaught of bird after bird, until finally, after the thirtieth quail, its heroic owner quaffed off a goblet of wine, and announced that for the last ten meals he had enjoyed his repast. After this, these columns will be rigidly closed to any further stories about the impossibility of eating quails.

Patent Proceedings in Congress.

The following is an abstract of patent measures brought before Congress, up to the period of the going to press of this issue.

HOUSE OF REPRESENTATIVES.

Mr. Dobbins, of New Jersey, January 11, presented the petition of A. B. Wilson for extension of his patent on sewing machines. Referred to Committee on Patents.

Mr. Hartzell, of Illinois, January 12, introduced a bill to amend section 4,898 of Revised Statutes relating to patents. This bill was reported from the Committee on January 26, with the recommendation that it pass. It was accordingly read a third time, and passed. Mr. Hartzell also introduced, on January 18, a bill relating to sections 4 910 and 4,916. Referred to Committee on Patents, and ordered to be printed.

Mr. Foster, of Ohio, January 18, introduced a bill authorizing extension of Horace Woodman's patent for a card-stripping machine. Same disposition as preceding bill.

Mr. Hoar, of Massachusetts, January 14, offered petition of Samuel A. Knox for extension of his patent on plows. Referred to Committee on Patents.

Mr. Vance, of North Carolina, January 13, reported a resolution "that the chairman of the Committee on Patents, and the acting chairman of any sub-committee thereof, be authorized and empowered to administer oaths when deemed by them necessary in any and all investigations before them." Adopted.

Mr. Seelye, of Massachusetts, January 24, offered a petition for the renewal of Thomas A. Weston's patent. Referred to Committee on Patents.

Mr. Whitehouse, of New York, January 24, introduced a bill for extending Reynolds' patent for brake for power looms. Same disposition as the preceding.

Mr. Warren, of Massachusetts, January 24, presented a bill relative to copyrighting patterns for castings. Referred to Committee on Manufactures.

Mr. Caldwell, of Alabama, January 24, introduced a bill to enable Charles A. Fondé to make application to the Commissioner of Patents, for the extension of his letters patent for a dredging machine. Referred to Committee on Patents.

The bills amending sections 4,898, 4,910, and 4916 of the Revised Statutes, referred to in our abstract, are designed to give to the assignment of patents and interests in patents the same solemnity and formality that attach to conveyances of real estate. They authorize officers commissioned to take acknowledgments of deeds to take acknowledgments of assignments of patents, which assignments are of effect from date of record in the Patent Office.

Mr. Douglas, of Virginia, on January 26, reported from the Committee on Patents a bill which is aimed at a custom, said to be prevalent among clerks at the Patent Office, of searching the records and procuring information for claimants at a distance. The bill makes the acceptance of money or any valuable thing, other than his salary, by any officer, clerk, or employee of the Patent Office, for work pertaining to the Patent Office, a misdemeanor punishable by fine and imprisonment. It extends to the Patent Office the provisions of section 190 of the Revised Statutes, which declares that no officer, clerk, or employee in any department or bureau of the government should act as counsel, attorney, or agent in prosecuting any claim pending in his bureau or department while in the government service. It also forbids his acting in such capacity within two years after leaving the public employment.

SENATE.

Senator Hamlin, of Maine, January 13, introduced a bill of the same tenor as that of Mr. Foster, of Ohio, in the House, above noted. Referred to Committee on Patents, and ordered to be printed.

Senator Logan, of Illinois, January 21, presented the petition of W. H. Akins and Jacob D. Felthouser, praying compensation for inventing new and useful improvements in sewing machines. Referred to the Committee on Patents.

Senator Eaton, of Connecticut, January 21, introduced a bill of same tenor as that of Mr. Seelye of Massachusetts in the House, above noted. Referred to Committee on Patents, and ordered to be printed.

Artificial Vanillin.

The details of Haarmann and Tiemann's process (mentioned on page 37 of our volume XXXI) for the manufacture of vanillin, are given as follows in the *Deutsche Industrie Zeitung:* Dissolve 10 parts of coniferin in hot water. Conduct this concentrated solution in a fine steam into a moderately warm mixture of 10 parts bichromate of potash, 15 parts sulphuric acid, and 80 parts water; then heat to boiling for three hours. The vanillin formed is either extracted by ether, or isolated by distilling in steam.

The Supposed New Cereal.

M. B. says: "In a recent issue of your paper I see an article concerning a new grain found in the crop of a wild goose. I discovered this identical grain in 1850, where civilized man had never before trod the soil; it was growing as an aboriginal product, in a gulch in the Utah Mountains. The location is northwest of Salt Lake. The grain was ripe, and resembled rye more than any other distinct type."

Incombustible Wood.

The invention of Mr. A. F. Richard, of Dax, France, relates to the preservation and incombustibility of wood by the aid of crystallized chloride of sodium in solution in water at between 6° and 24° by Baumé's aerometer, and of a solution of chloride of sodium and alum at between 4° and 27°, either mixed in variable proportions or employed separately.

What the Preacher Said.

A lady, residing at Joliet, Ill., writes to a friend in this city that, at church, the other day, the minister said that one very sure way of discriminating, between a good young man and one of frivolous habits, was by watching them as they went to the news stand for a paper. When a youth was seen to select the SCIENTIFIC AMERICAN instead of a daily or an illustrated story paper, the observer might feel pretty confident of that young man's future.

Business of the Canadian Patent Office.

According to the Canadian Patent Office *Record* for December, 1875, there were issued in Canada, from October 20 to November 24, 1875, inclusive, 127 patents, of which 81 were granted to citizens of the United States, 39 to Canadians, 6 to subjects of Great Britain, and 1 to a citizen of France. It will be understood from the above that nearly two thirds of all the fees paid to the Canadian Patent Office are furnished by American inventors.

The Conviction of L. W. Pond.

Mr. L. W. Pond, the once well known machine tool builder of Worcester, Mass., was captured some time ago in San Francisco, Cal., and brought back to Worcester for trial for the forgeries he had committed. Some thirty-two indictments were found against him; but on being arraigned, he plead guilty to three. Without considering the other charges, the court sentenced him to fifteen years in the State prison.

Passage of the Centennial Appropriation Bill.

The bill appropriating $1,500 000 for the purposes of the Centennial Exhibition has passed the House of Representatives by the close vote of 146 to 130. A few amendments were added, mainly with reference to the filing of bonds by those accountable for disbursements, and for regulating the payment of the sum from the Treasury.

Useful Recipes for the Shop, the Household, and the Farm.

To make cider: Take good sound apples (the sweeter the apples, the sweeter the cider) late in the fall, the later the better before the first frost. Early apples and windfalls may do for vinegar, but will not make cider that will keep for any length of time. Fill the barrel full, put in the cellar, take out the plug, and let the cider foam out for about ten days, keeping the barrel full with cider made at the same time. After the cider has worked about ten days, take a long slim bag that, when filled, will go in at the bung hole, put in about 1 lb. of English mustard for every 20 gallons, and drop into the cider; then cork the barrel airtight, and let it stand about three weeks, then draw off into another barrel.

A precaution relative to the care of carriages, which is often overlooked, is to prevent rust of the spring plates where they are joined together and not covered with paint. The joints should be lubricated; and the best material for this purpose, where dark colors are used in painting, is composed of 2 parts each of pure beef and mutton tallow to 1 part blacklead, well mixed, applied warm and in small quantities. When light colors are used in painting, diminish the quantity of graphite.

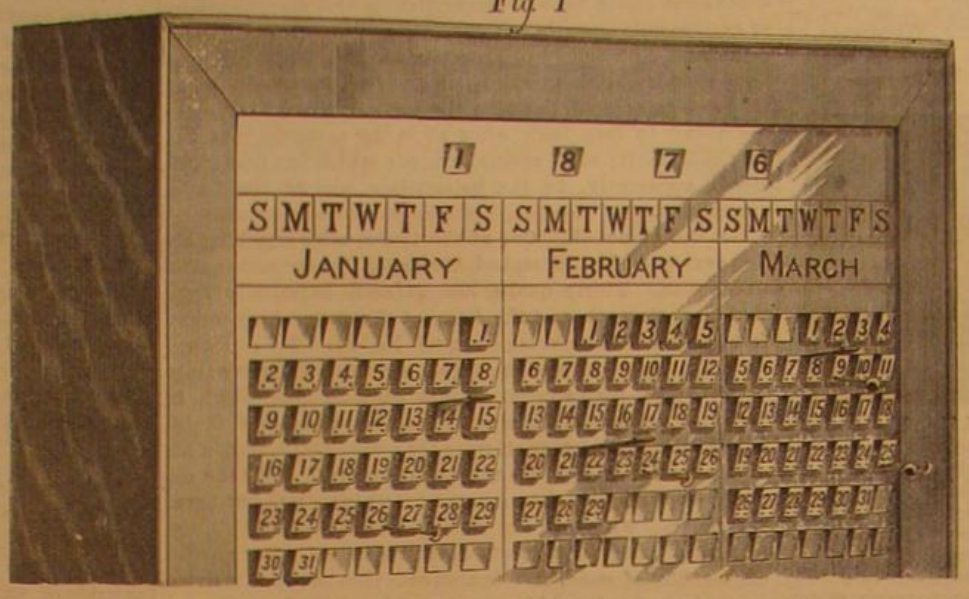
It is said that leather may be affixed to metal, so that it will split before it can be torn off, by means of the following composition: A quantity of nut galls reduced to powder is dissolved in 8 parts of distilled water, and after remaining for 6 hours is filtered through a cloth. This decoction is to be applied to the leather. Then take a similar quantity of water and add to it 1 part (by weight) of glue, which is to be held in solution for 24 hours, and then applied to the metals, which should first be roughened and heated. The leather is then laid upon the metal and dried under pressure.

IMPROVED ADJUSTABLE ALMANAC.

We illustrate herewith a new almanac, which, by a simple rearrangement of marked pegs inserted in cavities in a block, may be adapted for any year. In the annexed engraving, Fig. 1, a portion of the device (three months) is shown. The pegs are placed in columns in the month divisions of the wooden block. Each of said divisions, for the sake of uniformity, contains 42 pegs, and on these pegs are figures to denote the days of the month, so that, of course, as many blank pegs appear as the total number exceeds that of the days in the month.

The pegs are alike in size, and therefore are interchangeable in the block orifices. On the under side of each, at the same end as the figure marked, is inscribed the day of the year. The opposite extremity of the peg is blank, so that, according as it is inserted in the block, it shows either the plain or numbered end. To use the calendar, all the pegs are inserted so as properly to indicate the days of the month, but are pushed into the block to their full length. As each day arrives, its corresponding peg is drawn out until the number denoting the year day, on the under side of said peg, appears. Thus, for every day expired, a drawn peg will be shown, while those days yet to come are indicated by the untouched pegs, so that the last drawn peg points out the current day.

Fig. 1

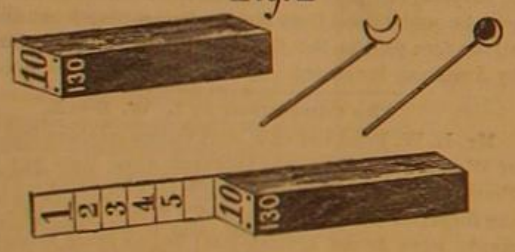


MILLER'S ADJUSTABLE ALMANAC.

The year in progress is shown at the top by similar movable pegs, which are also interchangeable with those already described. Those pegs not in use for indicating the year are inserted, rear end out, in the blank month spaces, and thus are conveniently stored until needed.

Each peg, as shown in Fig. 2, has a movable metal slide on its upper side. On this slide are figures, and, as the slide is moved out or in on the peg, said figures are shown in succession. This is called a "reminder," and the object is to denote that as many different matters are to be attended to, on the day shown by the peg, as are indicated by the last figure appearing on the slide. Another device may be used to symbolize events. In the engravings, pins are represented

Fig. 2



inserted in orifices in the pegs, to indicate the occurrence of full moons and eclipses—the former being denoted by a crescent-shaped head on the pin, and the latter by a head representing an eclipsed orb. Of course the peg shows the day on which these events are to take place.

Patented August 17, 1875. Canadian patent now pending. For further information relative to proposals for manufacturing on royalty, etc., address the inventor, Mr. David J. Miller, Santa Fé, New Mexico.

IMPROVED JUMP SEAT FOR CARRIAGES.

The accompanying engravings represent a novel construction for jump seats of carriages, which admits of both front and rear seats being brought together so as to occupy the space required for but one, and also of the front seat being altogether removed when desired. This arrangement tends considerably to economize room in the vehicle, and at the same time affords an easily adjustable and strong method of attaching the seat.

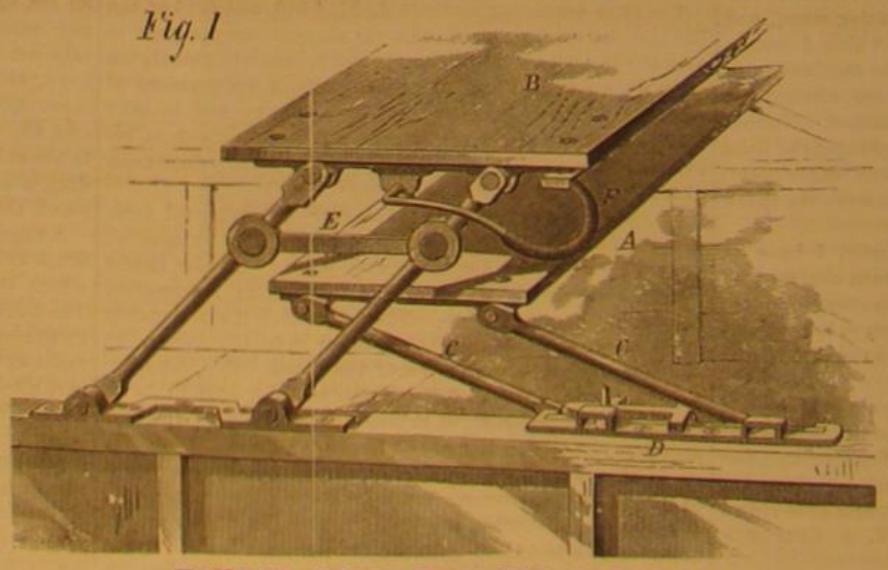
In Fig. 1, A is the front and B the rear seat. The uprights, C, of the front seat are pivoted to the seat support and also to an inside plate not shown, which enters a recess in the plate, D, which is secured to the side piece of the wagon. The inside plate may easily be lifted out of the recess, so that the mode of attaching or detaching the front seat from the wagon is obviously simple. On plate, D, is a pivoted double latch, having two opposite horizontal projections and a vertical thumbpiece. This serves to fasten the two plates together, when the inner one is inserted, while one of its projections always enters one of the loops shown on plate, D, thus causing the latch to furnish a support to the uprights of the front seat frame in whatever position the latter may be placed.

The arrangement of the rear seat is shown in Fig. 2 and also in Fig. 1. The uprights are pivoted directly to the wagon plate, and are provided with a connecting piece, which equalizes the strain on them. Here is also a handle, F, for convenience in adjusting the seat.

As shown in the illustration, the seats are brought together, but it will be readily understood how they can be swung apart. When it is desired to dispense with one seat, the front one is altogether removed and the rear thrown forward on its pivots. The construction is simple and strong, the supports being made of one half inch round iron, and there being no lateral play in the journals.

Patented through the Scientific American Patent Agency, May 5, 1874. For further particulars relative to sale of patent, with patterns, &c., or relative to sale of rights, address Messrs. Hanna & Brother, carriage makers, Bel Air, Harford county, Md.

Fig. 1



HANNA'S JUMP SEAT FOR CARRIAGES.

The Chinese Railroad.

We mentioned recently the undertaking of the first railroad in China, the material for which is already *en route* to the last mentioned country from England. We learn that the line, which is to extend between Shanghai and Woosung a distance of 9½ miles, will be completed by July next. There is in China an excessively strong prejudice against railroads, which it is hoped this new enterprise will aid greatly in overcoming. It was only recently that several newspapers, published in some of the principal Chinese cities, and edited by natives in other respects intelligent and well informed, published bitter articles against the introduction of the locomotive, and even went so far as to assert that even in America and Europe the number of casualties, due to swift trains rushing about the country, was so excessive that people never used the cars as means of conveyance except when forced to do so by lack of time or similar necessity.

We hardly share in the sanguine anticipations, of the promoters of the Chinese railroad, that, if the inhabitants of the Flowery Kingdom once get used to seeing traffic conducted on a short line, they will speedily abandon their present obstinate opposition. The Chinaman, say those who are familiar with the peculiar notions of his race, does not object to the railroad because of the dangers thereof, as above intimated, but purely on religious scruples. Every one knows how extremely solicitous the Chinese are as to the ultimate disposition of their dead. In San Francisco there are special companies who insure their compatriots burial in the ground of their native land, and who make it their business to convey back to China the remains of emigrants who die in this country. So also, when coolies are hired to go abroad, there is always a stipulation in the contract that the bodies of such as die shall be shipped back to the Chinese territory. China in fact has been described as one huge burial ground, and it is asserted that her soil is fairly packed with the dust of the countless number of generations which have formed her dense population during the long period of her national existence. This of course is more figurative than literal, but the circumstance nevertheless remains that it is particularly impossible for railroads to run, through the thickly settled districts, without in some measure approaching, and thus (in Chinese belief) profaning, the very hallowed resting places of the dead. Such, it seems, is the objection to railroads; and as long as it exists we imagine that the missionaries will have better success in counteracting it than the party of engineers and workmen who, it is expected, are to demonstrate, before the oblique ocular organs and to the equally oblique intellect of John Chinaman, the immense practical value of the iron horse.

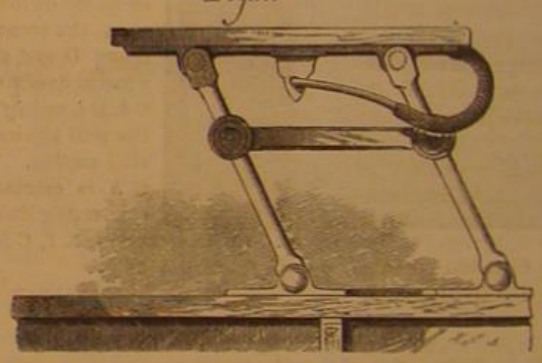
New Blasting Powder.

The new blasting agent *lignose* invented by Baron von Trutzschler Falkenstein, and apparently made of woody fiber prepared with nitroglycerin, has been recently tested (we learn from *Deutsche Industrie Zeitung*) in various mines in Upper Silesia. The results were on the whole not unfavorable, but the action was not always regular. The substance has not (as was at first claimed for it by the inventor) five times the force of an equal weight of ordinary black blasting powder, and even four times was doubtful; but a threefold force may be readily conceded. The price fixed by von Trutzschler is $33.75 per cwt., or three and a half times cheaper than the price of 3 cwt. of powder. The advantages of the new agent are less danger, as it does not explode on contact with open fire, and is but difficultly exploded by friction or concussion: and the fact that, to effect its explosion in a blast hole, the strand match may be used. The powder is very light, and in the loose state burns very slowly. A manufactory for the new agent has been established at Kieltsch.

Utilizing Tin Plate Scrap.

The invention of Mr. F. G. Morton, of Lynton street, London, England, has for its object a simple, economical, and efficient means of separating the tin from the iron of tin plate scraps, and generally for separating, from iron or other metal, tin, solder, zinc, or mixtures thereof which may be attached thereto in the form of a coating. The tin plate

Fig. 2.



HANNA'S JUMP SEAT FOR CARRIAGES.

scraps or other combination of metals to be operated upon are submitted to the action of a blast or current of highly heated air in an encased or jacketed vessel or chamber, provided with a perforated false bottom or grating, in such a manner as to melt the coating of tin, solder, zinc, or mixture of these, causing it to leave the iron or other metal and pass off through the false bottom or grating. The blast of air is caused to pass through or over a suitable furnace, and conducted into the jacket of the melting chamber, the internal shell of which is perforated to admit the heated air into the melting chamber, where it is diffused and caused to act upon the tin plate scraps or other substances to be operated upon as aforesaid, which substances are simultaneously agitated.

New Method of Preparing Vaccine Virus.

The following method has been recommended and used by one of our correspondents:

On the eighth day, or thereabouts, after vaccination, the calf being placed in a convenient position, the lymph from the vesicles is caused to flow into shallow dishes, and evaporated to dryness; then it is pulverized and put into tubes and hermetically sealed; and it is then ready for use.

The advantages of this mode of obtaining lymph are, first, you obtain a pure lymph free from all the contaminating matter which bovine virus is liable to, such as hair, cuticle, *pus*, *fæces* of the animal, dust, etc. Second, the lymph preserves its integrity very much longer than under the modes of preparation and preservation in ordinary use. Third, it is much easier for physicians to manipulate when vaccinating than the quills, ivory points, or liquid lymph in tubes.

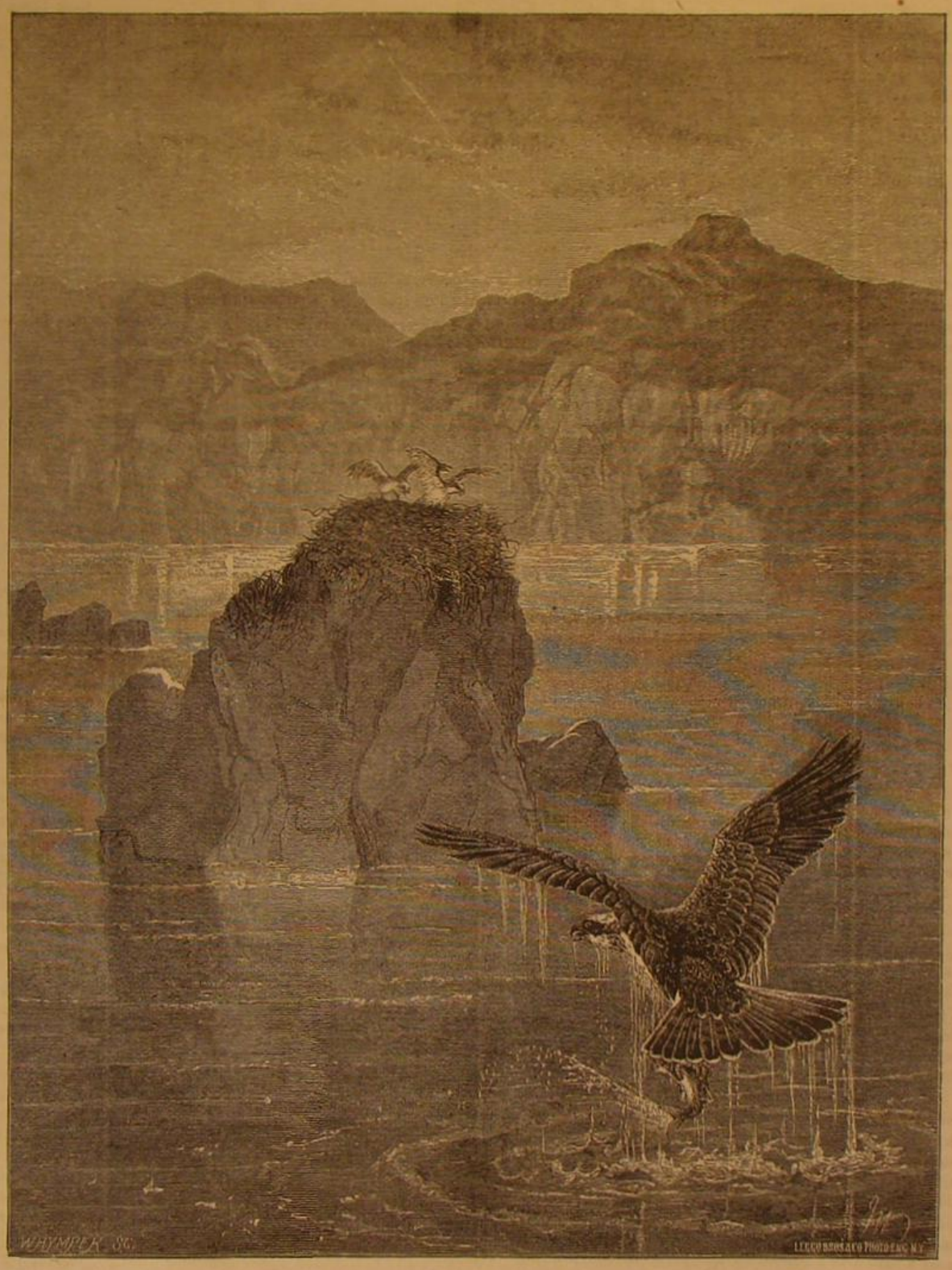
A good brown oak stain is produced by preparing the wood with a solution of 1 oz. catechu, boiled in 1¼ pints of water. When dry, brush over a solution of bichromate of potash 1 oz. to 1¼ pints of water.

THE FISH HAWKS.

The hawks are a family of birds containing members of varying characteristics, but the similarity of the branches is sufficiently obvious to show their relationship. The vultures, eagles, owls, and almost all other birds of prey are entitled to share in the attributes of speed, courage, and endurance with which we are accustomed to endow the hawks; and the beautiful specimen shown in our engraving, the osprey, embodies these characteristics thoroughly. It belongs to the sub family *aquilina* or eagles, of the family *falconidæ* or hawks, and Savigny further distinguishes as a separate genus, *pandion*. It is characterized by a short bill, curved from the base to the acute-hooked tip, and compressed laterally with slightly festooned margins; the wings extend to the tip of the tail. The general form of the bird is heavier and less adapted for rapid and vigorous flight than that of the eagles: the *tarsi* are short, and the toes are very rough underneath, long, and united at the base, and the claws are long, curved, and sharp. Three different species of osprey or fish hawk are known, inhabiting respectively America, Europe and Asia, and Australia. They all belong to the temperate regions, living in the vicinity of arms of the sea, lakes, and rivers; but they are sometimes found some hundreds of miles from land, especially in stormy weather. They usually keep at a moderate hight in the air, watching the surface of the water; upon the appearance of a fish within reach, the hawk closes its wings and plunges headlong, sometimes going entirely beneath the surface, but seldom failing to catch its fish. The rise of the bird with its prey is singularly characteristic and majestic; and the eminent naturalist and artist, Mr. Joseph Wolf, has seized the occasion, at this instant, to portray one of the most vigorous and delicate pictures of animal life which have come under our notice.

The scene is one of the highland lochs of Scotland, and the sky and distance, together with the rocks and water, are drawn with remarkable accuracy and delicacy of effect. The solitary rock with its roughly built nest, from which two hungry young ones are peering, is an effective center to the picture.

The fish hawk in this country, however, finds a formidable foe in the American or bald eagle, who disdains fishing on his own account, but has a great talent for obtaining that procured by the courage and industry of other birds. He usually watches the fish hawk till he thinks he has an opportunity, and then overcomes him by superior weight and strength, and carries away the prize.



THE OSPREY AND ITS PREY.

We select this beautiful engraving from the pages of a handsome volume of drawings by Mr. Joseph Wolf, which have been engraved by the celebrated brothers Whymper, and printed by one of the fraternity. Mr. Edward Whymper adds to his great artistic genius an undaunted spirit in scientific research; and he has gained great renown as a traveler in many almost inaccessible countries and as a member of the Alpine Club, of London. We shall, as occasion may arise, make some further selections from this volume, which is published by Mr. Alexander Macmillan, of London, England.

The Industries of Hartford, Conn.

While the statistics of the manufactures of Hartford, Conn., for the year 1875, are not on the whole encouraging, some of the companies manufacturing articles protected by patents seem to have been very successful, for instance: The Woven Wire Mattress Company has paid the largest percentage of return upon its capital. It divided $21,000 on a capital of $60,000, or at the rate of 40 per cent. The National Screw Company, which has since been absorbed by the American Screw Company of Providence, paid 22 per cent. The Willimantic Linen Company (which makes cotton thread), the Hartford Carpet Company, and the Gatling Revolving Gun Company declared each 20 per cent.

The Proposed New Croton Aqueduct for New York City.

The Commissioner of Public Works of this city has lately published a report relative to the proposed new aqueduct which is to bring in a sufficient supply of Croton water, the present aqueduct being, as is well known, altogether too small to meet the full requirements of the population. Surveys for this work have been in progress for the last five months. The city reservoirs, says the report, contain a supply for ten days only; and in case of an accident to the present aqueduct which would require repairs occupying more than ten days, the supply would entirely cease. It is appalling to contemplate the consequences of such a contingency. Even now the aqueduct requires repairs which are postponed because the water cannot be shut off long enough to make them. With two aqueducts, all necessary repairs to the one could be thoroughly made, while the other would be sufficient to supply the immediate demands. The Croton River drains an area of about three hundred and fifty square miles. From careful observations by the engineers of this department, extending over a period of many years, it is ascertained that an average daily quantity of 300,000,000 gallons of water flows over the Croton dam, nearly all of which could be brought to this city if we had sufficient storage and aqueduct facilities. The plans now presented contemplate the building of a dam on the Croton River, about one fourth of a mile above the head of Croton Lake, to an elevation of thirty feet above the top of the present dam, forming a settling basin of about 800 acres in extent, and a capacity of 1,180,000,000 gallons. Thence a tunnel is to be cut through the hills south of the Croton River, through which the water will be conveyed to the head of the aqueduct. The aqueduct is to be built on one of the two routes described—the Bronx River route, 36 8 100 miles in length, or the Saw Mill River route, 36 53-100 miles in length—to High Bridge. The masonry aqueduct will not be continued beyond a point in the vicinity of Jerome Park, in the newly annexed territory, where it is proposed to build a receiving reservoir of a capacity of 550,000,000 or 600,000,000 gallons. The *niveau* of this reservoir will be 42 feet above that of the Central Park reservoirs, and from there the water can be carried in iron pipes, the ground falling off abruptly towards the Harlem River, and rendering a masonry aqueduct impracticable. These pipes may cross the Harlem River either on High Bridge, which can readily be arranged for that purpose, or under the sidewalks of tunnels which the Department of Parks proposes to build under the Harlem River. In either case the expense would be comparatively small, and the pipes could be laid from time to time, as necessity demands. The new aqueduct is to have a capacity to deliver 150,000,000 gallons of water daily, thus increasing the supply by the two aqueducts to 250,000,000 gallons per day, with the additional and inestimable advantage of the elevation of head of the new supply of 42 feet above that of the park reservoirs, furnishing abundant water to the highest elevations in the city. The estimated cost of the new aqueduct is $10,000,000.

Fireproofing Fabrics and Wood.

In nearly all the recipes published for rendering ladies' dresses or woodwork uninflammable, the chief ingredient has been tungstate of soda; and although this salt has been proved to be very competent for that duty, its scarcity and the consequent expense puts it out of the reach of many. The following formulæ of Patera have been recently subjected to careful experiment at Vienna, and have been found most excellent.

1. A mixture of borax and sulphate of magnesia (Epsom salts) is prepared by dissolving 3 parts by weight of borax and 2¼ parts of Epsom salts in 20 parts of water. The efficiency of this mixture is due to the formation, upon the fiber of the cloth or the tissues of the wood, of the borate of magnesia, which is alike insoluble in hot and cold water; and the fiber being enveloped by it, the evolution of combustible gases is very difficult, and the flame is prevented from seizing upon them.

2. Another excellent material for fireproofing is a mixture of sulphate of ammonia and sulphate of lime or gypsum, in different proportions, according as it is to be used upon fine or coarse goods. The sulphate of lime seems to form, with the ammonia salt, a double sulphate which does not (or only in a very slight degree) possess the disagreeable properties of that salt. The action of this mixture of salts, which is capable of extensive use on account of its cheapness, depends, on one hand on its enveloping the fiber, and on the other on the volatility of the ammonia salt at a high temperature, whereby the flame is smothered; 1 part of sulphate to 2 parts of gypsum may be employed, and woodwork simply painted over with a concentrated solution of the salt is sufficiently protected from fire. The wood is not, indeed, incombustible, but it takes fire much less easily, gives but little flame, and ceases to burn of itself as soon as the igniting body is removed. Since roofs thus impregnated would lose this property because of the salt washing out, Patera sought to protect it by a coat of tar, oil paint, or oil varnish, and found that the fireproof quality suffered but little. If it were allowed to thoroughly penetrate the wood, as is done in protecting timber from rot, the effect would be increased; but no experiments have been made under those conditions. Patera also tried Fuchs' proposed method of mixing water glass with an insoluble substance, like elutriated chalk, bone ash, clay, glass, etc., and decided that his process was the best for wood.

Universal Nature.

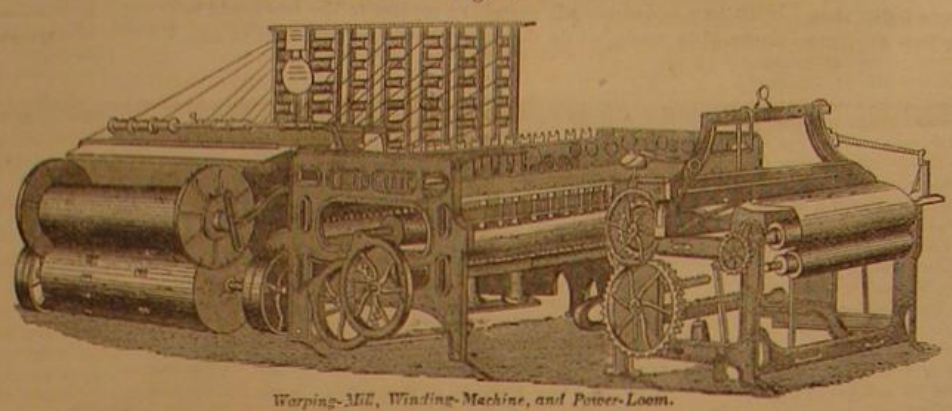
Nature has always had the credit of adapting her means to ends. The tenderness of her provision for the wants of the humblest of her creatures is illustrated by Mr. Darwin, who says that male grasshoppers use their hind legs to fiddle on the edge of their wings, and that the best fiddler first succeeds in fascinating the females. Behold how the industrious spider spins her web, and then sucks the blood of her husband and flings his carcass out in the back yard. Thus it is that the harmonies of life swell the grand diapason of the Universe, as it were.

POWER LOOMS.

We publish herewith engravings of two forms of power loom, selected from Knight's "Mechanical Dictionary,"* one of which is adapted for weaving patterned fabrics.

The first practical power loom was made by Dr. Edmund Cartwright, a clergyman totally unacquainted with mechanics, and his attention was directed to the subject by some one dropping the casual remark that when Arkwright's patents expired so many persons would go into the spinning business that no hands would be found to weave the cotton. Cartwright's first effort was a very rude affair. In his account of it, he says: "The warp was placed perpendicularly, the reed fell with the weight of at least half a hundred weight, and the springs which threw the shuttle were strong enough to have thrown a Congreve rocket." Two men were required to work the machine. It was novel, however, and he obtained a patent for it in 1785. Curiously enough, he then went for the first time to see how other people wove, and returned disgusted with the clumsiness of his own contrivance. His efforts to improve his machine, however, continued uninterruptedly, and he spent over $150,000 in perfecting his various devices. Steam was applied to his looms in 1807, and in 1828 he died, at the age of eighty-eight years. Five distinct actions are now performed in the power loom by steam: 1st. Raising and lowering alternately the two sets of warp threads. 2d. Throwing the shuttle. 3d. Driving up each weft thread after the shuttle is thrown. 4. Unwinding the warp from the beam. 5 Winding the cloth on the cloth roller. An arrangement is introduced for stopping the loom when a thread breaks, when the shuttle sticks in its passage, or when the yarn on the cop contained in the shuttle is run out.

Fig. 1.



Warping-Mill, Winding-Machine, and Power-Loom.

In Fig. 1 is shown the power loom with a warping and winding machine, designed for the manufacture of light and medium cotton goods. With this loom the cost at Manchester, England, of weaving a piece of cotton cloth, 25 inches wide, 29 yards long, and 11 picks per quarter inch, is estimated at 10¼ cents. One person can attend to two or three looms, and each loom produces 26 pieces of such cloth per day. On the old hand loom of 1800, one man would attend to one loom, and produce 4 pieces per day at a cost of 66 cents each. The adaptation of the

POWER LOOM FOR FANCY WEAVING

is shown in Fig. 2. The pattern chains, *d*, are mounted in a frame at the top of the loom; and in their movement, their pins act on vertical hooked wires or jacks, *c*, connected with a series of coupled levers, *e*, connected in turn with the harness frames, *f*. A rocking frame, *a*, at the top of the loom, provided at its opposite ends with cross or griff knives or bars, *b*, engages the hooked wires selected by the pins of the pattern chains, and raises the harness frames necessary to produce the pattern. Plain and fancy twills, spots, satin checks, etc., may thus be produced.

Fig. 2.

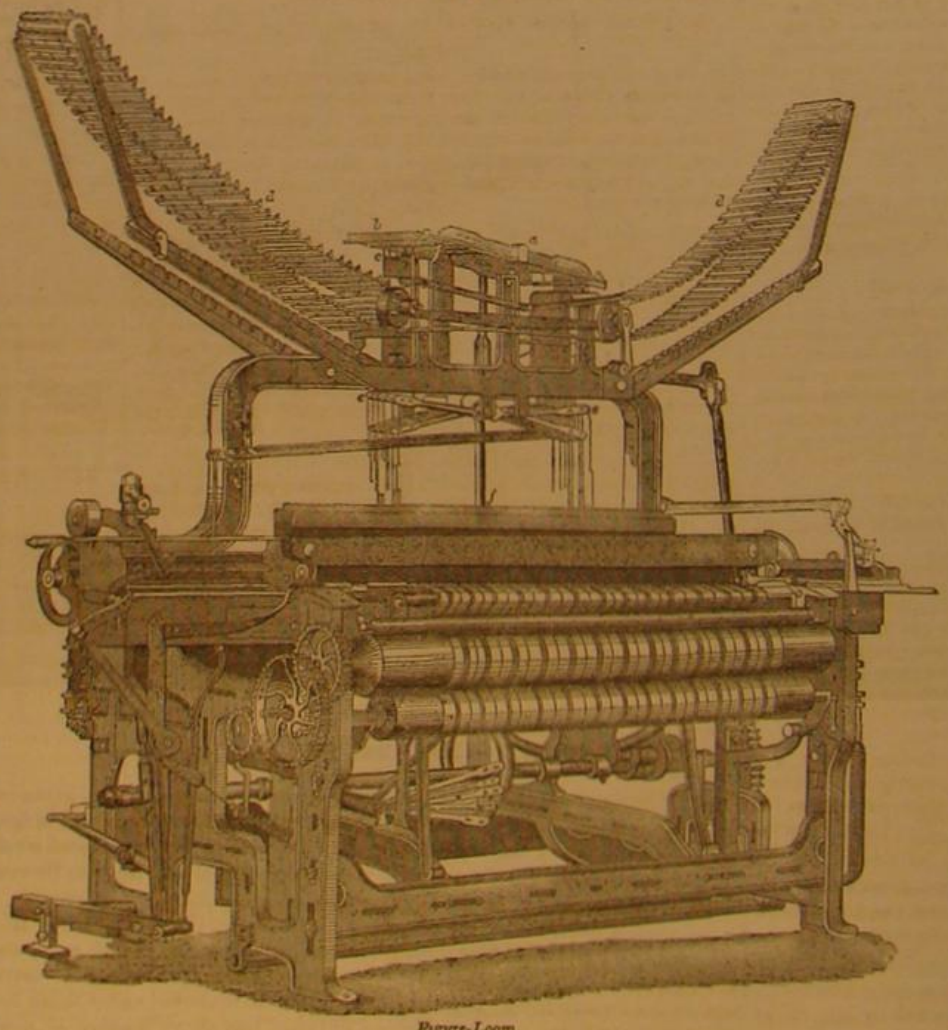


Figure-Loom.

* Published in numbers by Messrs. Hurd & Houghton, New York city.

Formation of Ultramarine during the Incineration of Bread.

"I do not find any note of the fact that, at a certain stage in the incineration (burning) of bread, the beautiful ultramarine blue is formed. This occurs under circumstances which I have not yet sufficiently studied to enable me to reproduce it with certainty; but if the heat be raised to very bright redness, or be prolonged after complete incineration of the bread, the blue passes into a beautiful turquoise color, then becomes green, then passes on into a rusty color, and finally comes out as a pale fawn-colored lining to the botrycidal mass of ash. This is not further affected, even by a prolonged white heat. The tints are so suggestive of the presence of copper that only by very careful examination did I satisfy myself of the absence of that metal; and I find that the colors occur in the purest and finest bread, as well as in inferior samples. I should be grateful if other analysts would favor me with any observations which they may have made upon this point, and I hope soon to be in a position to submit for myself some further account.

"It is curious that copper should appear in all the text books as one of the agents ordinarily used for adulterating bread, and the question arises whether the supposed use of copper may not sometimes have been erroneously inferred from the occurrence in bread ash of these beautiful colors."—*James Edmunds, M. D., in Chemical News.*

What is Life?

At the recent session of the American Dental Convention, in the course of some remarks upon microscopic investigation, Dr. Atkinson said: "We shall never know anything about life until we go to the bottom of the matter of function. There is a substratum denominated 'atom,' which is the least manifestation of life that we know of. Atoms are endowed with life—they can't be killed. We have been told that the molecular life of our food is killed. A statement like that is either a *lapsus linguæ*, or it shows an utter misapprehension of the subject. Atoms coalesce and manufacture molecules; plasma is an aggregation of molecules. Something must die that something else may live throughout the range of organic life. We have crystalline life, and below that granular life, molecular life, and atomic life. A crystal is regularly arranged granules that are regularly arranged molecules that are regularly arranged atoms.

"The doctrine of inorganic or azoic existence will not do in this day. If we wish to know the origin of life, we must define the territory we are speaking of; when the conscious life has left the body, we have organic, cellular, and molecular life left, and that is the food which we delight to suck from the beefsteak. It is simply a polarization and depolarization of atoms that constitutes molecular mass. We cannot disrupt molecules without reducing to ultimate atoms; there is no such thing as death. Matter means mother. Every one who has followed me knows I have given as complete an answer to the question we are discussing, as that two and two are four. When the blessed love of the Father of light comes in and illumines us, we are endowed with the capability to perceive. The doctrine that *omne vivum ex ovo* is pretty old, as old as Harvey. If the protoplastic mass is an egg, that is true; there are no bricks without mud, there is no loaf without dough. What do Bastian's investigations prove? Only that these points are so small as not to have been detected before; they do not prove that the germs are not essentially eggs. What is an atom? It is in size about the two hundred millionth of an inch. If one side of it is warm and the other cold, there is polarization and depolarization, and that brings it to a point where freezing begins, and that is crystallization. When we have investigated deep enough, we shall be prepared to understand the processes, and they will be as plain as the freezing of water."

A Brave and Modest Engineer.

Mr. George Walter Roche, naval engineer on the Saugus, writing from Pensacola Bay, Florida, under date of December 17, says: "Last night we had a thunder and lightning storm, and afterwards a heavy blow from the N. E. It rained for a while furiously. About a quarter of 1 o'clock I thought I would look out and see what sort of a night we were to have, and then retire. This, of course, was on board. As it was raining at the time, I walked under the lee of the smoke pipe, on the hurricane deck, when immediately I thought I heard, from the midst of the gloom, calls for help. To reassure myself, I called the man on watch to listen, when a man's voice could be heard, though not what he said. I immediately had a boat lowered, and with two firemen and two seamen, went in search of the poor fellow, following the direction of the sound of the voice. After about fifteen minutes' pull against wind and tide, I came up with two men in a skiff, who had been dumped overboard from a sloop that had capsized about four miles up the bay away from us. One of the men was in the greatest distress about his brother, who, at the time of the accident, was asleep in the cabin of the vessel. He and the man with him had returned in the skiff and called his brother, but got no answer, and they concluded to go away from the vessel and trust to the skiff to procure help. I took them aboard of the Saugus; but not feeling satisfied about the fate of the other brother, I went to the forward part of our deck and listened. To my great satisfaction, I heard the indistinct calls of some one in distress, and immediately got the men into the boat again and pulled for the voice. After three quarters of an hour, or perhaps more, we rescued him from the bottom of his sloop, which had turned turtle. He was very cold and wet. He was in the cabin when his brother called his name, but could not make him cognizant of the fact. When we started the last time, the brother I had taken on board asked as a favor to be allowed to go with us, and I told him to get into the boat. The meeting of these two poor fellows was truly affecting, each thinking that the other was dead. I took the party aboard the Saugus and had a fire made to dry their clothes and warm them; the men meanwhile provided them with dry working clothes. Now it seemed almost providential, for I was just going to turn in, but thought I would take a look around before doing so."

Occluded Hydrogen in Explosive Antimony.

When the officinal chloride of antimony, made according to the directions of the German pharmacopœia, is decomposed by a single cell of a Bunsen battery with a resistance of about 800 feet of copper wire (the positive electrode being formed of a massive piece of cast antimony, and the negative electrode of one or more fine platinum wires), in three or four days the platinum wires will be covered with a metallic film with a silver luster. The slightest scratch, or a spark from an induction machine, will cause it to explode with a loud noise and flash, and the evolution of a great quantity of white vapors. This was first observed by Gore, and it was supposed that the film consisted entirely of pure antimony in a peculiar allotropic state. Some years ago Professor Böttger proved experimentally that the apparently metallic film on the platinum wire did not, by any means, consist of pure antimony, but beside antimony there was in it no inconsiderable quantity of chloride of antimony, which could be proven by throwing a little distilled water on the disrupted mass while glowing; a copious white precipitate of basic chloride of antimony was formed, which could not occur if the said film consisted only of metallic antimony.

The most recent observation of Professor Böttger on this remarkable electrolytic product is the discovery therein of occluded hydrogen, possessed of the same reducing properties as that contained in Graham's alloy of palladium and hydrogenium. If a platinum wire, freshly coated with the so-called explosive antimony, is placed for ten or fifteen minutes in a very white aqueous solution of ferricyanide of potassium, the latter will be partially converted into ferrocyanide of potassium, a property which chemically pure antimony, free from arsenic, does not possess.

Since the *liquor stibii chloratis* consists, as we know, of a solution of chloride of antimony in hydrochloric acid, we should expect that, in addition to metallic antimony, gaseous hydrogen would be evolved at the cathode during electrolysis. This, however, is not the case, as not the slightest trace of liberated hydrogen can be detected at the negative platinum electrode. That the chlorine liberated in a nascent state at the positive electrode should unite with the metallic antimony acting as anode, dissolving it, shows nothing contrary to theory; but that the electro-negative chlorine should appear at the negative electrode at the same time that the metal is deposited, and unite with it without yielding a trace of hydrogen in gaseous form, is so very striking a phenomenon, opposed to all theory, that it seems desirable to see other metallic chlorides subjected to similar electrolytic tests in this direction.

EGG SPOONS get tarnished by the sulphur in the egg uniting with the silver. This tarnish is a sulphuret of silver, and may be removed by rubbing with wet salt or ammonia.

NEW BOOKS AND PUBLICATIONS.

THE INVENTION OF PRINTING. By T. L. De Vinne. Part I. To be Published in Five Parts, price $1 each. New York city: Francis Hart & Co., 14 College Place.

Here is a book which even the most advanced bibliomaniac can certainly find no fault with. It is really a curious and beautiful imitation of old style typography in every detail, this being the author's peculiar fancy, in order that the appearance of the book might be in harmony with its title and the quaint lore of its contents. We have a faint suspicion, too, that the volume has no typographical errors in it. The author by no means asserts that fact; but we have met with no printer's mistakes in the part of the work now before us. We have not the slightest doubt, however, but that some errors have escaped us, and would in fact baffle the scrutiny of the keenest eyes, for the reason that every known attempt which has hitherto been made to produce a perfect book has signally failed. Not that almost perfect books do not exist; in fact, we presume that some editions of the Bible, printed by the Universities or by the Queen's printers in England, are as near perfection as human work can arrive; but these have been corrected and recorrected, in edition after edition, for decades. We know of two instances where attempts were made to produce perfect specimens of book typography. The first was that of Dom. José Souza, a Portuguese nobleman, who literally lavished money in order to print an absolutely perfect edition of *Os Lusiadas*, by Camoens. Assisted by Didot, and by a large gathering of skilled talent, Souza had the pages read and re-read by different scholastic persons until he was assured beyond all doubt that everything was absolutely correct. But when the copies came from the press, after all an error was found—the letters in the word *Lusitano* had become misplaced. The type had, as is very commonly the case, been drawn out in the passage through the machine, and the pressman, with that sublime indifference to sense which is peculiar to his race, and which revels in returning dropped type upside down (as we know, to our weekly exasperation), had mixed the characters around to please his somewhat erratic fancy. The second case, and it was one in which even greater care was taken, was that of an edition of the classics publishe by the celebrated Foulises of Glasgow. Six experienced proof readers were employed, who devoted hours to the reading of each page. After each leaf was thought to be perfect, it was posted in the hall of the University, with a notification that a reward of fifty pounds would be paid to any person who could discover an error. Each page was suffered to remain two weeks in the place where it had been posted before the work was printed, and the printers thought that they had attained the object for which they had been striving. When the work was issued, it was discovered that several errors had been committed, one of which was in the first line of the first page. There are other instances, which a little research will quickly reveal, all showing that the "best laid plans of mice and men," as Burns sings, "gang aft agley." We remember now that Sir Sterndale Bennett, the celebrated English composer, not long since deceased, worked for years at the editing of Bach's Passion Music, and supposed his work perfect when it was published; and then he discovered to his dismay, an error in the second chord of the very first bar of the immortal composition. The title of the volume is the "Invention of Printing;" and it is a complete storehouse of curious lore regarding the rise of the "art preservative." The illustrations are copious and fine; and the author, Mr. T. L. De Vinne, of the firm of Francis Hart & Co., to whom the credit of the excellence of the typography is due, writes in a pleasant, readable way, sure to enlist popular interest.

MAGNETISM AND ELECTRICITY. By Frederick Guthrie, Professor of Physics at the Royal School of Mines, London, England. Price $1.50. New York city: G. P. Putnam's Sons, Fourth Avenue and 23d street.

The literature of electrical science certainly keeps pace with the discoveries; and as the practical applications of electricity become more and more numerous, the demand for books on the subject spreads with rapidity. Mr. Guthrie's claims to labor in this wide field are based upon experimental knowledge and aptitude for teaching; and he has now given the world a *resume* of some courses of lectures delivered by him at the institution of which he is a professor. The book gives a proper and, we may add, an unusual amount of attention to frictional electricity, a branch of the science which is not yet fully explored, having been eclipsed by the brilliancy of recent discoveries in the field of galvanism. We are able to award Mr. Guthrie the highest commendation for the clearness, accuracy, and practical value of his treatise, which is published in Messrs. Putnam's Advanced Science Series.

THE AMERICAN ARCHITECT AND BUILDING NEWS, a Weekly Journal of Constructive and Decorative Art. Subscription price, $5 a year, in advance. Boston, Mass.: James R. Osgood & Co., 131 Franklin street.

We are glad to see that a new architectural journal, edited and printed in a manner worthy of the subject, commenced on January 1 of this year. We abrogate nothing of its excellence in saying that it has much resemblance to the *Building News*, of London; and we are able to pay it the compliment of saying that, like that very successful journal, it is edited by men of thorough practical knowledge and high artistic tastes, united with a proper sense of the dignity and importance of their profession. It also has its illustrations, which are admirably executed, printed on separate sheets of paper, by the photo-lithographic process. We wish Messrs Osgood & Co. a continued success in their new enterprise.

THE AMERICAN STATE AND AMERICAN STATESMEN. By William Giles Dix. Price $1.50. Boston, Mass.: Estes & Lauriat, 301 Washington street.

This book is a valuable contribution to our political literature, which needs at once pruning and purifying. Although our pages are filled with matters which we and our readers consider more important than the intrigues and chicanery which make up the greater part of contemporary politics, we are glad to be able to commend a sincere, vigorous, and able champion of truth and justice, two abstract qualities which are perhaps in danger of becoming merely abstractions. A wide diffusion of the author's spirit and enthusiasm would do much to remedy many evils in our body politic, which are in danger of becoming insupportable.

THE PRINCIPLES OF COAL MINING. By J. H. Collins, F.G.S., Author of "Handbook to the Mineralogy of Cornwall and Devon," etc., and Honorary Secretary to the Miners' Association of Cornwall and Devon. With 139 Illustrations. Price 75 cents. New York city: G. P. Putnam's Sons, Fourth Avenue and 23d street.

This little book is an excellent treatise on a subject of which little is known except by those immediately connected with coal mines. The writing is at once concise and explanatory, and it is the work of an unquestionable authority. It forms one number of Messrs. Putnam's Elementary Science Series.

HOW TO BUILD SHIPS: an Essay upon the Weakness of Large Iron Steamships, with Recommendations for Making them Strong. By a Seaman. Price 75 cents. New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

This treatise is a collection of ideas as to the weak points of iron ships, many of which are new and original. It is free from technicality, and contains some interesting information. It is the work of Mr. S. P. Griffin.

THE METHODIST ALMANAC. Cincinnati, Ohio: Hitchcock & Walden, 150 West Fourth street.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From December 31 to January 6, 1876, inclusive.

AXLE BOX, ETC.—J. N. Smith, Jersey City, N. J.
CAR WHEEL.—S. N. Allen *et al*, Hudson, N. Y.
CIGAR-MAKING MACHINERY.—C. M. Mann, Chicago, Ill.
EYE CUP.—P. J. Stephens, New York city.
FLOCKING CLOTH.—H. N. Slater, Massachusetts.
HANGING DOORS, ETC.—T. Morton, New York city.
MIXING SOAP, ETC.—F. M. Weiler, New York city.
SCOURING HIDES, ETC.—C. Rose, New York city.
SEWING MACHINE, ETC.—S. W. Wardwell, Jr., St. Louis, Mo.
SEWING MACHINE.—J. Folk, Brooklyn, N. Y.
SEWING MACHINE.—J. Keith, Rhode Island.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED MITERING MACHINE.

Robert A. Williams, Galion, O.—In this device there is a square frame having guide flanges for supporting the moldings, said flanges being so located as to allow of placing the moldings on the frame for mitering. A diagonal piece connects the angles of the frame, and has a guide recess for the introduction of the mitering frame and frame-setting device, both of which last are adjustable so as to admit of the accurate mitering and setting of the moldings.

IMPROVED ROTARY ENGINE.

Thomas Swinburn, Charleston, W. Va.—In this rotary engine, the cylinder is provided with a concentric groove arranged obliquely in its end, and the piston works from a fixed center concentric with said groove. Drawings are necessary to convey a clear idea of the working parts; but the general arrangement is both novel and apparently practical.

IMPROVED CAR AXLE.

George W. Miltimore, Janesville, Wis.—This invention consists of a steel ring, which is placed on the stationary axle in front of the journal box of the revolving outer axle, and retained thereon by a stationary sleeve of the pedestal box. A double clamping ring, with spring-acted interior ring, revolves with the sleeve, by a connecting diaphragm secured on the sleeve. The diaphragm creates an oil chamber around the end of the journal box, and excludes impurities. The oil is supplied by grooves of the stationary sleeve and the steel ring from an annular oil reservoir of the pedestal box, which is again connected by an inclined channel with a cavity, into which the oil is filled through a top hole, closed by a conical spring plug, sliding on the vertical pin connecting the axle and pedestal box.

IMPROVED SEWING MACHINE.

Josiah Glines and Noel W. Stiles, Postville, Iowa.—This invention consists in devices for giving circular motion to the shuttle without twisting the thread. The face plate, against which the shuttle runs, is connected to the vertically-moving race, so as to move up to the position for guiding the shuttle properly, when the nose is to enter the loop, and it has a notch to mesh with a stationary needle-backing plate. The shuttle carrier has a point guard, projecting forward of the point of the shuttle, to prevent the thread from throwing over the latter when it reverses at the back part of its course, and the shuttle is contrived for the thread to pass out at the rear end for the same purpose.

IMPROVED CLOTH SHEARING MACHINE.

Isaac L. Holmes, Saco, Me.—This inventor now improves certain parts of a cloth-shearing machine for which a patent was granted to him March 16, 1875. An automatic contrivance is added whereby the revolving cutters are stopped by a seam when it approaches the cutters, and are again automatically set in motion after the seam has passed the cutters, to prevent the seam from being unduly cut. An elastic disk is also provided in the friction clutch, by which the rotary cutters are started and stopped.

IMPROVED HORSE POWER OR DERRICK FOR DRILLING WELLS.

George A. Newman, Crowder, Neb., assignor to himself and James L. Newman, Chicago, Ill.—This is an improved hollow revolving horse power or derrick for sinking wells. It combines four novel mechanical devices, so constructed as to operate the auger and raise it without stopping the horse or changing his direction, to operate and rotate a drill, and to guide the tube and hammer when sinking a drive well.

IMPROVED MACHINE FOR SHEARING BOILER PLATES.

Ebenezer Fisher, Kincardine, Canada.—This device consists of a stationary and a movable shear for clipping boiler plates. The stationary shear is arranged in a plane so inclined to the movable shear that the edge of the plate, being cut, is beveled suitably for calking, and at the same time the machine is so inclined that the plate lies flat or horizontally on the stationary cutter. The cam which works the lever of the movable cutter is contrived to allow the cutter to remain as long as possible when raised, to facilitate the adjusting of the plate.

IMPROVED TREADLE.

Carl Brandtner, Reading, Pa.—This is a centrally pivoted and laterally swinging treadle, that is connected by a rigidly attached rod and crank rod with the crank shaft of the fly wheel, the crank shaft imparting, by friction wheels, motion to the driving shaft. The inventor claims that rocking of the treadle on its pivots may be readily kept up without fatigue for any length of time, as it requires hardly any effort.

IMPROVED CAR REPLACER.

Jesse F. Bridge, Warwick, Mass., and Arthur R. Blakeslee, Birmingham, Conn.—This improved switch is so constructed as to enable a train, a part of a train, or a single car to be shunted, whenever desired, upon a temporary or permanent section of track, and again replaced upon the main track. It may be easily and quickly put down and taken up without disturbing the rails or interfering with the traffic of the road. It is an arrangement of forked and grooved blocks attached to the rails in connection with a bridge, the mode of adjustment depending upon the circumstances under which it is used.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED FISHING TACKLE.

Julio T. Buel, Whitehall, N. Y.—All fishermen are already under so large a debt of gratitude to Mr. Buel, that we hardly see how the same can be increased, even by such ingenious devices as those which form the subjects of the two new patents below described. Mr. Buel, than whom, we believe, no more ardent disciple of old Izaak Walton exists, is the original inventor of the trolling spoon—that ingenious substitute for bait which neither pickerel nor blue fish, nor any other water cannibal, is able to distinguish from the small fry which form its food. How many million fish have fallen victims to its glittering allurements, or how many unfortunate minnows have been spared the torture of impaling, it is impossible to estimate; but Mr. Buel is determined to show that he has not by any means exhausted all the capabilities of his invention, and therefore he now produces some new and ingenious applications of it, which will doubtless meet with general welcome. The first is a new device whereby two fish may be caught on the same line, and the hooks be so connected after fishing that the entangling is avoided and a smaller space taken up by the same. A V-shaped wire spring frame has snap hooks at the ends, to which separate hooks with spoons are applied. The latter act as separate baits when the legs of the spring frame are spread out, and the legs of the frame are locked by the snap hooks after fishing to take up less space. In the second patent we find a reliable adjustable device for attaching minnows or other bait of different size, and also for applying as many additional hooks as may be required for the size of the bait without the use of thread, gimp, or gut strings. It consists of a spring hook that is attached to a sliding wire ferrule, and adjusted along the connecting shank of the tackle to set bait thereon. A gang of two or more hooks, according to the size of the bait, is employed and connected by means of a central wire extension with snap hook engaging an eye at the shank of the next adjoining hook.

IMPROVED WATER TRAP SUPPLY AND VENTILATION.

John H. Morrell, New York city.—Mr. Morrell has recently patented a large number of useful inventions of the same general nature as the present one, with several of which our readers are familiar through the illustrated descriptions published in back issues of this journal. The object of the device now patented is to improve on one heretofore patented by Mr. Morrell (October 5, 1875), and to provide for ventilation during the downflow of water through the pipes; also, to provide for the water supply, and also the ventilation of the traps and their adjuncts when the orifice of the supply pipe mentioned in said patent is obstructed by ice, or even when water cannot be obtained from the roof or eaves of the building, or when from any cause it is desirable not to use such water. It consists in the combination, with the reservoir B (see engraving on page 335, volume XXXIII), of an additional water supply pipe; also, of a ventilating pipe within some portion of the water pipe, or extending through the interior of the whole length of the same, applied to said pipe.

NEW AGRICULTURAL INVENTIONS.

IMPROVED HAY LOADER.

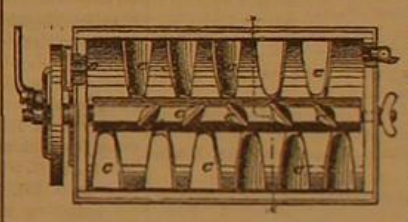
John A. Bower, Eureka, Kas.—This is an improved machine for collecting hay as it is spread upon the ground, and loading it upon a hay wagon. The wheels, turned by the advance of the machine, actuate an endless belt, teeth on which take the hay from the gathering rake. By means of the belt the hay is raised up and discharged in the wagon. Suitable devices are added to hold the teeth of the gathering rake out of action when required.

IMPROVED HAND CORN PLANTER.

Milton Pollock Noel, St. Cloud, Minn.—This improved corn planter is so constructed that the operator can operate it and plant the corn as rapidly as he can walk over the ground with a cane. The new feature consists in applying a loop to serve in conjunction with the handle to facilitate manipulation, and in a side handle that is used in connection with the jointed handle. An illustrated description of this device was published on page 86 of our current volume.

IMPROVED CHURN.

James L. Sprague, Hermon, N. Y.—This invention consists of spiral or propeller shaped paddles on a horizontal shaft, pitched so as to draw the cream from each end toward the center, in combination with an air inlet at each end and an outlet at the middle: whereby the paddles draw air in at each end and eject it at the center after acting on the cream, thus increasing the efficiency of the air, which is an element of considerable importance in the churning process. The operation is further facilitated by the insertion, in the churn box, of concave corner pieces, which are placed in the angles formed by the flat top and vertical sides; and these corner pieces prevent the clogging of the cream in those angles, a difficulty which is common in churns of this form. In the engraving, A is the horizontal cream box, having a round bottom and flat top. B is the paddle shaft, C C are the paddles, D D the air inlets, and E the outlet, F F being the corner pieces in the angles. The illustration clearly shows the construction and action of the apparatus, which seems to be thoroughly efficient for all the purposes above described. For further particulars, address the inventor as above.



IMPROVED COLTER.

Andrew Muir, Sparta, Ill.—The invention is an improvement in that class of rotary colters which are attached to plow beams by such devices as enable them to be adjusted and secured in any adjustment higher or lower, or at different points along the beam. The colter has its bearings in a plate which is provided with parallel vertical slots, whose opposite edges are notched to engage with the edges of bolts, which secure the said plate to the plow beam.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED BOLT FOR WINDOW FASTENING, ETC.

Herbert Seymour, Brooklyn, N. Y.—This is a simple bolt having a pin at right angles to its end. A slot in the keeper permits of the passage through of the pin, and when the bolt is turned, the pin, taking against the solid part of the keeper, prevents its slipping out.

IMPROVED SASH HOLDER AND FASTENER.

Joseph R Payson, Chicago, Ill.—The object of the first of these two inventions is to improve the construction of the sash supporter, patented to the same inventor November 5, 1867. The invention consists in forming upon the back of the friction plate a thin projection, inclined at an angle of 40° or thereabout, which enters an elongated slot in the box, where it bears upon and traverses a roller pivoted in the box, its single point of bearing upon the face of the roller being below the center of axis of the roller, by which means the movements of the sash are made smoother. The invention further consists in a bed box, having formed in its upper end an elongated slot, in which the roller is pivoted, the sides of which serve as a guide to the thin edge of inclined projection; and at its lower end a bed for the spring, with sides cut away, to decrease its width and weight. A thumb screw is inserted in the upper end of the box, with the point of the screw working upon the inclined surface of a recess formed in the friction plate, in order to force the friction plate against the window casing in an upward direction, and to force the edge of the inclined projection upward and outward upon the face of the roller, thus wedging the friction plate tightly. The same inventor has also patented a new fastener for the meeting rails of sashes, in which the operation of turning the arm in fastening the window will draw the lower sash up or the upper sash down, should they not be fully closed, without its being necessary to fully close said sashes with the hand before operating the lock.

IMPROVED MODE OF DRESSING ENAMELED MOLDINGS.

Albert C. White, Brooklyn, N. Y.—For the purpose of cutting off the moldings from their connecting wood base or backing in a rapid accurate, and very reliable manner by the use of a power planer and for dispensing with the hand planing and sandpapering, this invention passes the moldings through the planer by placing them in a bed piece with corresponding grooves and of equal length and width, and feeding them to the cutter set to the exact thickness of wood required to be cut.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

Alden Engine, 3 cyl. Com. Balance Piston, doubles power of Steam! Circulars free, Farrelly Alden, Pittsb'h.

"Wrinkles and Recipes" is the best practical Handbook for Mechanics and Engineers. Hundreds of valuable trade suggestions, prepared expressly by celebrated experts and by correspondents of the "Scientific American." 280 pages. Elegantly bound and illustrated. A splendid Christmas gift for workmen and apprentices. Mailed, post paid, for $1.50. Address H. N. Munn, Publisher, P. O. Box 772, New York city.

For Sale—A good manufacturing business, secured by Patent. Address H. R. Van Eps, Peoria, Ill.

Wanted—Tools, Patterns, &c., of small Machine Shop and Foundry. Must be in good condition, and cheap. Give particulars. Nevil Whitesides, Mt. Vernon, O.

Wanted—A Partner in a long established and profitable Machine Business, with from $5,000 to $8,000, to develope one of the most promising patents ever produced. Address Lock Box 2244, New Haven, Conn.

Our new catalogue of drawing materials will be sent on receipt of 10c. Add. Keuffel & Esser New York.

Wanted—Second hand Milling Machine, heavy. Send accurate description, with price, to Page & Lockwood, West Meriden, Conn.

Patent Rights for Sale—Small articles and cheap for entire Right. Address Key Box 9, Spartanburg, S. C.

I wish to correspond with Manufacturers of Gutta Percha Articles, with a view of having our Adding Card made of that material. Marshall M. Smith, Greentop, Schuyler Co., Missouri.

Latest and Best Books on Steam Engineering. Circulars free. F. Keppy, Bridgeport, Conn.

For Sale—Two Brick Machines, "Sargent" Patent—in use one year. Apply 27 So. Charles St., Balt., Md.

Wanted—Situations, by two Englishmen, Pattern Maker and Blacksmith, both competent workmen. Box 118, Clearfield, Pa.

Shafting, whole or clamp Pulleys, best style Hangers. 5 to 8 cts. per lb. S. E. Harthan, Worcester, Ms.

Small Steam Yachts, Yacht and Stationary Engines, Shafting, &c. S. E. Harthan, Worcester, Ms.

Wanted—For Cash, soon—2nd hand Flooring Machine. Must be modern, strong, large rolls, and cheap. Send full description and price to C. A. Walker, Kenton, Ohio.

For Sale—¼ or whole Interest my Laundry Polish Patent. Box 360, Ipswich, Mass.

Bound Vols., 3 to 14, Scientific American, First Series, 1 to 3, Second Series, 16 to 20, unbound, for sale by L. W. Rice, Greenfield, Mass.

Wanted—2,000 round Walnut Rods, 1¼ in. x 6 ft. Address Will F. Howe, Galveston, Texas.

Roth's Saw File Guide, illustrated in this paper Jan. 1, 1876, is manufactured by E. Roth & Bro., New Oxford, Pa. One, as sample, $2. Agents wanted.

For price of Steam Yacht Machinery, from a Row Boat to an Ocean-going Steamer, send to Clute Brothers & Co., Schenectady, N. Y.

Patent Office Reports for Sale—R. D. Cooke, 32 New Church St., New York.

Centennial Scroll Saw, $2 50. The best for amateurs. J. J. Green, Boonton, N. J.

Claimants wanted for Western land that has been sold for taxes. Land Patents procured. J. Vance Lewis, late of the Gov't Land Office, Attorney-at-Law, Washington, D. C.

Wanted—A Bone Crusher, suitable for crushing bones size of nut coal. A stamp mill preferred. P. O. Box 2369, Boston.

Wanted—Second hand Railroad Track Scales, 30 ft. platform, 20 tons draft. Address E. B Seeley, Bowling Green, Ky.

For Sale—37 in. x 15½ ft. Lathe, $300; 18 in. x 12 ft. Lathe, $250; 12 in. x 8 ft. Lathe, $125; 48 in. Chucking Lathe $195; 16 ft. Planer, $700; 6 ft. Planer, $275; 4 ft Planer, $175; 9 ft. Planer, $575. Shearman, 45 Cortlandt St., N. Y.

Wanted—One Heavy Drop, with 600 lb. Hammer, and one Facing Machine. Address P. O. Box 2258, New Haven, Conn.

½, 1, & 2 Horse Engines, $30, 60, & $100; Boilers for same, $75 & $100. T. B. Jeffery, 253 Canal St., Chicago.

Abbe Bolt Headers, the best—Prices reduced; 2 sizes made. Palmer Power Spring Hammers, 10 sizes. See machines, or write for information before buying. S. C. Forsaith & Co., Manchester, N. H.

Steel Castings, from one lb. to five thousand lbs. Invaluable where great strength and durability are required. Send for Circular. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Use Yocom's Split-Pulleys on all Shafting, same appearance, strength and price as finished Whole-Pulleys. Shafting Works, Drinker St., below 147 North Second St., Philadelphia, Pa.

Blake's Belt Studs are the best and cheapest fastening for Leather or Rubber Belts. Save ten times their cost. Greene, Tweed & Co., 18 Park Place, N. Y.

Linen Hose for Factories—1, 1½, 2 & 2½ inch. At lowest rates. Greene, Tweed & Co., 18 Park Place.

Manufacturers! Send for illustrated catalogue of Best Belt Pulleys made. A. B Cook & Co., Erie, Pa.

Fine Castings and Machinery, 96 John St., N. Y.

Shingles and Heading Sawing Machine. See advertisement of Trevor & Co., Lockport, N. Y.

Boult's Paneling, Moulding and Dovetailing Machine is a complete success. Send for pamphlet and sample of work. B. C. Mach'y Co., Battle Creek, Mich.

Small Engines. N. Twiss, New Haven, Conn.

The Original Skinner Portable Engine (Improved), 2 to 8 H.P. L. G. Skinner, Erie, Pa.

Walrus Leather & Polishing Materials—Greene, Tweed & Co., 18 Park Place, New York.

Patent Scroll and Band Saws, best and cheapest made. Cordesman, Egan & Co., Cincinnati, Ohio.

For best and cheapest Surface Planers and Universal Wood Workers, address Bentel, Margedant & Co., Hamilton, Ohio.

Solid Emery Vulcanite Wheels—The Original Solid 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, New York.

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. Frisbie & Co., New Haven, Ct.

Water, Gas and Steam Goods—Send eight stamps for Catalogue, containing over 400 illustrations, to Bailey, Farrell & Co. Pittsburgh, Pa.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Wrought-Iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., or lithograph &c.

Hotchkiss & Ball, Meriden, Conn., Foundrymen and workers of sheet metal. Fine Gray Iron Castings to order. Job work solicited.

Peck's Patent Drop Press. Still the best in use Address Milo Peck, New Haven, Conn.

All Fruit-can Tools, Ferracute W'k's, Bridgeton, N. J.

American Metaline Co., 61 Warren St., N. Y. City.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon, 470 Grand Street, New York.

Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass.

For best Bolt Cutter, at greatly reduced prices, address H. B. Brown & Co., New Haven Conn.

Diamond Tools—J. Dickinson, 64 Nassau St., N. Y.

Temples and Oilcans. Draper, Hopedale, Mass.

Notes & Queries

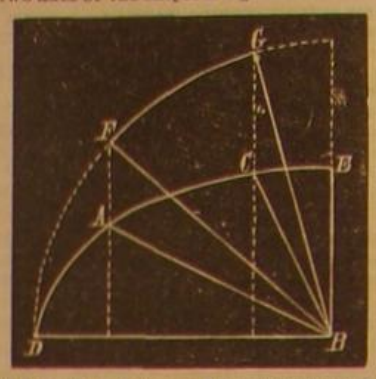
W. W. W.'s queries would, with the answers, occupy too much of our space. Consult a papermaker.—J. F. D. will find that the polishing material described on p. 57, vol. 34, will do well for cleaning silver.—H. J. P. will find an illustrated description of a freezing process on p. 82, vol. 33. We have never heard of one being used for condensing in a steam engine.—R. and others will find an illustrated description of Gramme's electric machine on p. 351, vol. 29.—M. L. H. will find directions for cleaning nickel-plated surfaces and brass on p. 57, vol. 34.—W. F. W. will find directions for tanning sheepskins with the wool on on p. 233, vol. 26.—J. H. can fasten metals to wood with the preparation described on p. 287, vol. 34. See answer to W. F. W., above, as to swan skins.—G. P. A. can calculate the speed of pulleys by the rule given on pp. 26, 73, vol. 25.—R. G. O. will find a recipe for liquid glue on p. 90, vol. 32.—L. J. C. is informed that his method of lacing belts is very old.—C. H. will find good directions for browning gun barrels on p. 11, vol. 32. Directions for casehardening gun work are given in this issue.—D. H. will find on p. 234, vol. 30, full directions for making fulminate for percussion caps.—H. W. will find a recipe for a cement for glass on p. 379, vol. 31.—G. P. will find a description of phosphor bronze on p. 315, vol. 30.—C. E. F. will find directions for annealing lamp chimneys on p. 42, vol. 26.—E. L. will find directions for making erasive soap on p. 181, vol. 31.—R. will find full information as to burning coal dust on p. 379, vol. 31.—E. C. W. will find directions for setting the eccentrics of a locomotive on p. 212, vol. 32.—P. T. N. will find directions for making vinegar on p. 68, vol. 29.—T. E. M. will find a good recipe for aquarium cement on p. 43, vol. 33.—C. W. J. will find directions for making patent leather on p. 122, vol. 27.—J. W. T. will find an answer to his query as to a ball dropping through the earth on pp. 158, 250, vol. 31.—C. B. will find directions for making phosphor bronze on p. 315, vol. 30.—H. E. B. will find directions for soldering cast iron on p. 251, vol. 28.—R. T. will find directions for polishing marble on p. 283, vol. 30.—H. B. Jr. will find a recipe for artificial meerschaum on p. 193, vol. 26.—H. F. W. will find directions for removing tattoo marks from the skin on p. 331, vol. 30.—J. E. M. will find an explanation of his difficulty as to the distance at which an object is visible on p. 20, vol. 34.—M. T. will find, on p. 119, vol. 30, a recipe for restoring rancid butter.—A. F. will find directions for polishing precious stones on p. 138, vol. 30.—E. B. A. will find directions for soldering of all kinds on p. 251, vol. 28.—R. J. will find a description of mica on p. 88, vol. 25.—J. C. W. will find a recipe for indelible ink on p. 112, vol. 27.—F. C. will find particulars of the New York State canal boat award on p. 81, vol. 30.—J. C. will find directions for washing flannel and other woolen fabrics on p. 267, vol. 30.—F. W. will find a recipe for harness blacking on p. 218, vol. 28.—R. J. C. will find a description of M. Coignet's artificial stone on p. 124, vol. 22.—R. T. can coat his pills with sugar by the process described on p. 59, vol. 32.—W. W. will find details of the manufacture of plaster of Paris on p. 399, vol. 29.—J. N. will find particulars as to the lifting power of hydrogen on p. 74, vol. 31.—F. O. can cement whalebone to wood with the preparation described on p. 90, vol. 30.—R. F. will find a formula for the proportions of a safety valve on p. 107, vol. 31.—W. T. will find directions for stuffing and mounting birds and other small animals on p. 350, vol. 30.—M. N. will find a recipe for preparing muriate of ammonia for inhalation on p. 315, vol. 31.—S. T. will find a description of the process for condensing milk on p. 343, vol. 30.—N. J. will find formulæ relating to the strength and thickness of boilers on p. 155, vol. 32.—N. K. R. will find directions for making an æolian harp on p. 330, vol. 26. Imitation meerschaum is described on p. 193, vol. 26.—M. B. T. and others are informed that the pretensions of the mineral rod men are humbug.

(1) W. S. asks: How can I gild white metal without a battery? A. Take 8 parts gold and 1 part mercury; make the gold into thin plates and put them in the mercury while the latter is boiling. Dissolve ½ oz. of this mixture in 1 oz. nitromuriatic acid. Add 2 ozs. alcohol, and apply the mixture, when the article is clean, with a soft brush. Rinse and dry in sawdust, and polish with chamois leather.

(2) F. H. D. asks: Why is it that a steel shod sled will draw harder on bare ground than a sled shod with iron? A. Some kinds of cast iron become, by friction and wear, casehardened to a high degree: and sled shoes made of it acquire smoother surfaces than those made of steel.

(3) H. M. asks: In plating small articles, does the current of electricity need to be strong enough to give a shock? A. No. A single cell is sufficient.

(4) L. M. asks: How can I find the area of a sector of an ellipse, namely, that part of an ellipse inclosed by the arc and two radius vectors, when the angle subtended by the two radii and the two axes of the ellipse are given? A. Let B D



and B E be the semi-axes of the ellipse, and B A C the sector. Draw an arc, D F G, with B D as a radius, and through A and C draw lines parallel to B E. Join the points, F and G, in which these lines cut the circular arc, with the center, B. Then

$$BD : BE :: \left\{\begin{array}{c}\text{area of}\\ \text{circular}\\ \text{sector B F G}\end{array}\right\} : \left\{\begin{array}{c}\text{area of}\\ \text{elliptical}\\ \text{sector B A C.}\end{array}\right\}$$

(5) W. E. P. asks: 1. Upon what does the stability of magnetism in a horseshoe magnet depend? A. The purity of the steel. 2. How should a magnet be tempered? A. As hard as possible. 3. Is the power of a compound magnet of 4 parts, each of equal magnetic strength when separate, equal to four times the power of one part? A. Yes.

(6) H. K. F. says: I am trying to heat a wire of about the size of Stubs' No. 70 by electricity, but so far have not succeeded. I have an ordinary Smee battery, but the zinc is not amalgamated, and so far I have only used copper wire. Will you be kind enough to tell me how to proceed? A. Use the large sized Bunsen battery.

(7) E. K. M. says: 1. Please give me directions for putting up an electric bell, to be operated by an ordinary eight day clock, that the bell may sound the hours to correspond with the striking of the clock. The bell is to be placed about 100 feet distant from the clock. Will the Meidinger battery answer my purpose? A. The Meidinger, Daniel, gravity, or Léclanché battery will answer. 2. Will a copper wire, wound closely with cotton yarn and then coated with beeswax, be an insulated wire suitable for the apparatus? A. No. 24 copper wire 100 feet long would answer. It is not necessary to cover it with beeswax. A covering of cotton thread is sufficient.

(8) G. C. H. says: I intend to put up a telegraph line of about one half mile in length, and would like to know how much battery (Daniell cells) it would take with one wire and a ground return. A. Twelve cells.

(9) C. F. S. says: I do not think I have a correct conception of the meaning of the expression "electromotive force." Is it the chemical energy at the surface of the negative metal, or is it the power of the battery to overcome resistance? Are the numbers used, in connection with it, proportional or comparative values; or can the force be definitely and independently expressed in ohms? A. The electromotive force of a galvanic element is the power it possesses of overcoming resistance. This force is proportional to the number of cells in a battery connected up in series $+-+-+-$, etc. The unit of electromotive force is called a volt, after Volta, while the unit of resistance is called an ohm after the German scientist Ohm. The electromotive force of a Daniell cell is about equal to a volt, and may be practically regarded as a unit of force.

(10) G. H. C. says: I have made a magnet, and put upon it 1,050 feet of cotton-covered magnet wire No. 32. I connected it with a battery that is used to run a telegraph with fewer coils and coarser wire than mine. My magnet will not lift a shingle nail. What is the cause? A. For lifting purposes, you should have used thick copper wire about 100 feet in length.

(11) J. W. C. asks: What are the lowest, mean, and greatest velocities of electricity through a suspended copper wire? What is the mean velocity of electricity through a buried wire, an overhead telegraph wire, and the Atlantic cable, respectively? A. Electricity has no defined velocity, but differs with the circumstances under which it travels, the size of the wire, length of the wire, and distance of the wire from the ground. The velocity of the current on the Western Union telegraph wires varies from 15,000 to 75,000 miles per second. On the Atlantic cable, for about two tenths of a second after contact is made with the battery, no effect is perceptible on the opposite side of the ocean. After four tenths of a second the received current is about 7 per cent of the maximum current. One second after contact the current will reach about half its final strength, and after about three seconds its full strength.

(12) E. T. D. asks: How many cells would it take to heat an iron wire of the size of common thread, hot enough to light a lamp? A. A dozen Grove cells would heat such a wire red hot. 2. How would I make an electric lamp lighter? A. You cannot light lamps with electricity unless the wick is surrounded with gas.

(13) E. W. P. says: 1. I wish to make a very small telegraph sounder to put into a watch case. The coils cannot be over an inch long nor more than ⅝ in diameter; with what size of wire shall I wind them? A. No. 28. 2. On an open circuit telegraph line, can an operator at one of the middle stations work all the instruments on the line, as in the closed circuit plan? A. Yes. 3. In running a small electro-motor, wound with coarse wire, which will work best, a quantity or intensity battery? A. A quantity battery. 4. What is the effect if the zinc plate in a Callaud battery becomes partly coated with a copper deposit? A. The current is weakened. 5. Is there any way that a house telegraph, having 5 or 6 instruments in the circuit, could be worked on the open circuit with one battery? A. Yes.

(14) A. S. G. asks: On p. 19 of your current volume is an extract from the *Journal of the Telegraph*, headed "The New Force." In the second paragraph occurs the following: "Upon an insulated table, place an ordinary Morse key and an electro-magnet, the coils of which are so wound that no magnetism is produced in its cores by the passage of an electric current." How an electro-magnet can be such without magnetism is beyond my comprehension, and how coils can be wound so as to neutralize each other I do not know. Can you explain? A. If the two helices are so joined that the current traverses one in an opposite direction from the other, no magnetism will be developed. 2. Is the cadmium armature attracted by the peculiar magnet, and what office does the armature fill in the experiment, as nothing more is said of it? A. The so-called etheric force accumulates upon the cadmium. A soft iron armature upon an ordinary sounder is as good as anything else to observe this extra current, or "etheric force," with.

(15) L. F. A. asks: What is the best method of constructing a meat cooler, large enough to put in two oxen in warm weather? A. Make a frame of 1½ by 4 inches uprights, set edgewise; cover it on the exterior with narrow tongued and grooved boards, and in the interior with narrow rough boards with the edges neatly fitted together; line the interior with sheet zinc, and fill in the frame with dry sawdust. A covered top is better than doors on the side; have the doors double in thickness and also filled in with sawdust. Have a slight opening for ventilation, protected with fine gauze wire cloth, and a small pipe for drainage If your meat box had been placed under your ice house, it would have been better.

(16) J. S. M. asks: What size of opening does it require to keep life in 100 men, supposing them to be shut up in a close room? A. Supposing the room to be large, a much greater opening would be required at the top than if placed at the bottom, as the carbonic acid gas, which would accumulate by being thrown from the lungs of the occupants of the room, is heavier than the atmosphere, and would rest upon the floor. The most favorable arrangement to ventilate the room would be that in which an opening would be provided at the floor and another at the ceiling, and in this case the size of the openings might be at the minimum, the fresh air entering at top and being discharged at the bottom, except where the temperature may be so much increased as to induce a current in the contrary direction. An authority says: "The proportion of oxygen gas in the atmosphere is about 22 per cent, but after it has visited the lungs it is reduced to 16 per cent." There is, therefore, a loss of about 30 per cent of the oxygen of the air at each respiration; and the opening should be large enough to renew about ⅓ of the air contained in the room in every 5 seconds. How large such an opening, or openings, should be will depend upon the velocity of the current entering, whether forced by mechanical power or not, and should be determined by experiment.

(17) E. B. G. asks: How much water should be evaporated in a room 14 feet square, to keep it in a healthy condition? A. It is not desirable that the air should be entirely saturated with water. Fevers are sometimes generated in consequence of a too humid state of the atmosphere. An English admiral once banished the yellow fever from his fleet on a West Indian station by keeping his lower decks dry with stoves in the summer season. A vessel holding about 2 gallons of water placed in the air chamber of the furnace would give you all the moisture you want for the whole house.

(18) A. B. asks: Is there any kind of acid or salts that I can put in a sulphate of copper telegraph battery to keep it from freezing? A. No, not without impairing it.

(19) T. W. C. asks: 1. For two engines 7 by 12 inches, and an upright boiler 8 feet high by 5 feet diameter, which you recommend for a boat 50 feet long by 18 feet wide by 3½ feet deep, what steam and water pipes do I require? The inspectors do not allow upright boilers on steamboats here, as the law forbids them. Will a boiler 3½ feet in diameter and 10 feet long, with return flue, do instead of the one you recommend? A. Make the steam pipe 2½ or 3 inches in diameter, and the feed pipe from 1¼ to 1½ inches. We think the boiler will answer. We would like to see the section of the law that forbids the use of vertical boilers. The only thing that we can find in the revised regulations, bearing on the subject, is the following paragraph: "Inspectors shall not hereafter allow the use of donkey boilers of the vertical tubular kind on steamers navigating the waters flowing into the Gulf of Mexico." It is possible that we may have overlooked some other paragraph in relation to the matter; and if so, we would be glad to have our attention directed to it.

(20) W. E. S. says: I have been trying an experiment in burning coal dust. The first week in October I carefully weighed all the coal burnt in 62 hours, when using only the natural draft. I used no steam whatever for heating purposes. The amount used was 3,118 lbs. of Lehigh nut coal, which, at $7 per tun, would cost about $9.75; steam averaged 45 lbs. to the inch. The second week in December I weighed the coal dust used, and then I used plenty of live steam for 26 hours out of 61 hours to heat 4 stories of the shop with 1,000 feet of 3 inch pipe. I used the exhaust all the time for heating. The amount of dust burned was 5,236 lbs. at $2 per tun. Steam pressure averaged 50 lbs.

to the inch. The boiler is horizontal, with 24 three inch iron tubes; and it is 10 feet in length by 3 feet in diameter, and well bricked up. Steam pipes, etc., are well covered with asbestos. When burning coal dust, I use a blower running about 3,000 revolutions per minute. About half an hour before shutting down (at 4 o'clock in the afternoon) I rake over my fire and get a good solid bed of fire on the grate: when I stop, I cover lightly with fresh dust, and shut all drafts, and at 6 o'clock the next morning I have from 30 to 40 lbs. steam; and then all I have to do is start the blower, and in half an hour I can have a good fire and plenty of steam. A. You make a very favorable showing. If you can contrive to measure the amount of water evaporated in a given time with each kind of fuel, you will be able to make an accurate comparison. If you do this, we would be glad to know the result.

(21) C. H. A. says: After reading Mr. Edison's experiments on the "etheric force," I tried his method of producing it with a printer: and found that, by forcing the press up against the type wheel (first cutting out the main battery) and breaking the circuit between the instrument and battery on the negative wire, it would cause a most beautiful and intense spark, and give a very heavy shock. I find that, on connecting it with the stove, as Mr. Edison did, it produces similar effects, giving off a spark when touched by a metallic substance. I am more interested in the phenomenon of the shock, as Mr. Edison says nothing about it. I am somewhat inclined to believe that, in this particular, it resembles inductive electricity; and it being somewhat new to me, I write to ask if this mode of producing electricity to give a shock is new to electricians? A. The so-called "etheric force" is nothing more than the extra or induced currents which are produced when the battery circuit is opened and closed: some facts connected with it, however, led to doubts on the subject at first. Electricians are well acquainted with this method of producing shocks.

(22) A. F. O. asks: What must I do with the fluid of the Grenet battery after it is played out? Can it by dilution, or by the addition of more of the salts, be restored, or must it be thrown away? A. Throw it away.

(23) R. asks: 1. I have a pair of polished skates, recently nickel plated, and I find on using them that the nickel begins to flake off. Can I prevent this in any way? Can I have the plating removed from the whole skate or any part of it? A. Yes; have the nickel removed and the skates replated with more care.

(24) C. H. N. says: You state that the earth received its motion during its formation, and you compared it to the velocity of a railroad train running half a mile after the steam is shut off. That being true, is it not the cause of the remarkable difference between the age of man in the days of the deluge and at the present time? The earth must in olden times have revolved faster and made the days and nights shorter. A. The period of 4,000 years is nothing when compared with the age of the earth. Millions upon millions of centuries ago, she obtained her motion; untold centuries went on during the different periods of change, as revealed by geological researches, until at last, some 150,000 or 200,000 years ago, man appeared. The oldest records of man go only back some 4,000 to 6,000 years; but we know that during this time the velocity of the earth's rotation has not changed an appreciable fraction of a second. In regard to the reported age of the patriarchs, we must consider that, at a time when people had no chronology nor almanacs, they did not count the years as correctly as we do, and could not know themselves how old they were. We may add to this the veneration in which the oldest people were held, which led every old man to boast of his great age, and so they probably made themselves out to be older than they really were.

(25) B. B. asks: Will it damage flax straw for manufacturing purposes to thrash it with a common spiked cylinder thrashing machine? A. Yes, it very nearly spoils it. Treading out the seed with animals is better, but the rollers are the best.

(26) A. D. says: It is generally conceded that the orbit of the earth is not necessarily a fixed pathway, and that the plane of the orbit, which has an obliquity of 23° 28′ to the plane of the sun's equator, probably at one period had a still greater obliquity, which would extend the warmer zones into higher latitudes. And again, the orbit of the earth will eventually become circular, and the earth will revolve on the plane of the sun's equator; and the intimation that the orbit of the earth is gradually assuming a circular form, if true, would be the best evidence that this change is now in progress. Then the poles of the earth will be perpendicular to the plane of the orbit, with the sun vertical over the equator only, and there would be no change of seasons. Are these suppositions probable? A. You confound the pathway of the earth in her yearly revolution with the inclination of her axis on the ecliptic; this inclination may change, while the pathway or plane in which she moves remains essentially the same. Some astronomers have supposed that, at some time in the far future, the inclination will become less and the intensity of the seasons diminish, and at last disappear. But this time is so remote that the earth will then have cooled, and the internal heat have become so dissipated that the interior of the earth's crust will no more possess heat appreciable on the surface, and the latter will be unfit for vegetation, and consequently also for animal life. The earth will then be as the moon is now—dead.

(27) W. H. S. says: You state that the moon rotates on its axis and in its orbit in the same time. What is that time? A. 27 days, 7 hours, 43 minutes, 42 seconds.

(28) T. P. M. asks: 1. Will zinc do instead of copper as a plate for a ground wire connection of a telegraph? A. Yes, but it will not last nearly so long. 2. What size of plate is necessary for a line one quarter of a mile long? A. For a line of that length you will get better results by using a return wire. Plates four or five feet square will answer if it is not desirable to run an additional wire.

(29) M. M. asks: How many feet of common illuminating gas made from coal can I compress in an iron tank or gas holder of 50 cubic feet capacity, carrying the compression to 100 lbs. to the inch? A. About 333 feet.

(30) R. K. asks: How can I tell how many lbs. weight are necessary to produce a given velocity, as described in Z. D.'s query as to the tension of a cord over a pulley? A. To calculate the weight required to produce this velocity, assume a time or distance in which it is to be attained, and make the proper substitutions in the formulas below. It will be easy for any one to see what assumption is necessary for the tension of 1,550 lbs., and the formulas also show how different values can be obtained, and yet be correct. Our readers will doubtless observe, further, that these formulas are the same that are employed for calculations connected with the use of Atwood's machine, and that the case proposed by Z. D. is similar to problems that are solved with the above apparatus. Let x=weight required to give the weight of 1,000 lbs. a velocity of 10 feet per second. S=distance in feet in which this velocity is acquired. t=time in seconds in which this velocity is acquired. g=acceleration due to gravity. f=acceleration due to the weight. Then $f=g\times\frac{x-1000}{x+1000}$; $S=\frac{50}{f}$; and $f\times t=10$. This also answers M. B.

(31) A. H. T. asks: 1. How is the heat calculated which is generated by compressing air? A. See p. 123 (14), vol. 33. 2. Why is it that there is such a great loss of power by compressing air to high densities? A. The principal source of loss, in general, is due to the fact that the power required to compress the air is not afterwards given out by allowing the air to expand as much as it was formerly compressed. 3. Do hyperbolic logarithms hold good in calculating the mean pressure in an air cylinder, or would it be correct to represent the initial and terminal pressures as a right-angled triangle, and calculate the area of it? A. The formula with hyperbolic logarithms is only applicable in case the temperature of the air in the cylinder is constant throughout the stroke.

(32) J. G. B. asks: At what rate is the water falling over Niagara Falls wearing the rock away yearly? A. The action is not uniform, the rock being detached in large masses from time to time. It is estimated, however, that, for long periods, the average wearing away has been about a foot a year.

(33) Z. D. says: In reply to my query as to tension of a cord over a pulley, you give the answer 1,550 lbs. A mathematician answers me that the tension of the cord is exactly the same, namely, 4,000 lbs., whether the weight is raised at the uniform velocity of 10 feet per second *or* whether it is motionless. He acknowledges that the tension is above 1,000 lbs. when the first pull is given, before the weight attains its uniform speed. Another gives as his answer a number somewhat over 1,300 lbs. By what method did you find that 1,550 lbs.? A. Our answer was possibly misleading, from the fact that all the data upon which it depended were not stated. Really, the tension of the cord, required to give the weight a velocity of 10 feet a second, can have an infinite number of values, subject to the following conditions: 1. It must be greater than 1,000 lbs. 2. The time and distance in which the weight attains the required velocity must be less and greater, respectively, than the time and distance in which a heavy body falling freely under the influence of gravity would acquire the same velocity. As soon as the weight acquires the given velocity, it will continue to move uniformly with that velocity, under a tension of 1,000 lbs., if there is no friction or other prejudicial resistance. See answer to R. K., on this page.

(34) G. B. K. says, in reply to T. D., who asks how to obtain the index of an engine lathe: If you will note what thread the lathe will cut when two given gears are in place, you can easily construct a table that will show you just what thread any two gears will cause the lathe to cut. Suppose that two 63's cause 12 threads to the inch. Then place 12 in the space, A, in the diagram below:

Stud.

Screw.	28	33	35	42	49	56	63	70	77	84	91	98	105	112
28														
33														
35														
42														
49					*b*									
56						*a* B	C A E	D *c*						
63														
70														
77									*d*					
84														
91														
98														
105														
112														

Now, 63 : 56 :: A : C } (direct proportion).
63 : 70 :: A : E }
Also, 56 : 63 :: A : B } (inverse proportion).
70 : 63 :: A : D }

The spaces may all be filled except a, b, c, d, etc., which it is useless to fill, as only your 63 gear is duplicated. A half day's time will be sufficient for a good mathematician to fill out the table.

(35) J. H. says, in reply to D. C. B.'s query as to his hydraulic ram difficulty: The air, becoming exhausted in the air chamber, prevents the water from entering the chamber, when the impetus valve closes, and the result of the working is only the dead beat of the valve in closing. All well regulated rams have inserted in the lower casting (a head of the opening to the air chamber) a small screw, called the sniffle. It is made taper, and a small groove is filed lengthwise in it; and it is so adjusted as, when put in, to allow of water escaping when the impetus valve closes. Upon the reaction of said valve, a portion of air is drawn in through the screw, which passes upward to the disk valve, opening to the air chamber; and at the next pulsation of the ram the air is passed to the chamber, thus keeping the chamber fully replenished with air, during which time the valve gives the lively click, which he describes, when working well. Care must be taken not to allow the water to back upon the sniffle, or the ram will again cease to work well.

(36) J. W. writes us from Switzerland that he has tried to produce electricity there by shuffling the feet over the carpet, but without success; he has often done it in this country, but it will not work there. He wants to learn the reason; also wants us to corroborate the fact that electrical sparks can be produced as mentioned, in this country. In reply we state that in this city, in winter, in well warmed, dry houses, strong electrical sparks may be produced by walking on or rubbing the feet on the carpet. Loud snaps are produced by touching another person with the finger: while a common home amusement for the young folks is to light the gas by electricity, by rubbing the feet on carpet and then touching the open gas burner with the finger. In Europe the climate is more moist, and hence probably the phenomenon is unknown there. Possibly in a well warmed house on a very cold day, upon a rug in front of a good coal fire, our correspondent could produce the electrical sparks in Switzerland.

(37) J. B. J. says, in answer to C. E. B.'s query as to a force on an inclined plane: Let W=weight (=112 lbs. in this case), A=angle between plane and horizon (=30°—), w=force with which W presses against the plane, L=force pressing in the direction of the plane. Then F=W *sin.* A=112×0·5=56 lbs. w=W cos. A=112×0·86602 =97 lbs.

(38) J. B. J. says, in answer to J. A. R., who desires to know the contents of a cylinder with hemispherical ends: l=length of cylindrical part, r=radius of hemispherical ends, h=hight or depth of liquid, x=area of immersed cross section of cylinder, C=contents of cylindrical part, and c=contents of hemisphere ends. π=3·1416. Then $C=x\times l=l\,x$. Then $c=\pi h^2\,(r-\frac{1}{3}h)$. C+$c$= content required. If the above dimensions are in feet, multiply the result by 7·4762, which will reduce it to gallons. Compute content for every foot (and fractional part) of depth, and arrange a table, when the contents will be seen at a glance. The comuntation may be made for half the tank or vessel, and doubled to find the whole contents.

(39) S. W. G. says, in reply to J. G. S.'s query for a remedy for cracked fingers: Into equal parts of glycerin and cologne spirits, put ten grains salicylic acid, shake until well mixed, and apply in the same manner as glycerin.

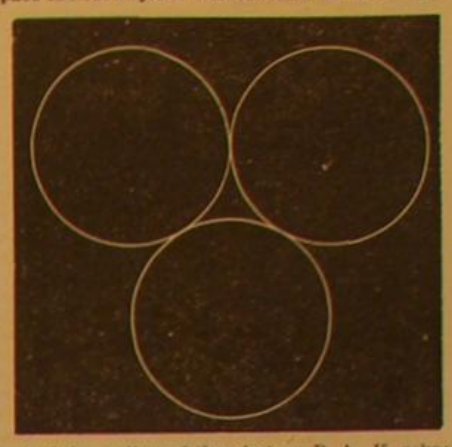
(40) C. C. says, in reply to W. T. W.'s query as to setting boilers: Take 6 or 8 inches of brick work away at sides and top, and 2 feet at back end, regardless of the water line. Do not let brick touch the boiler except at front and on dome. Excavate not less than four feet under the whole length, leaving the mud drum (if there be one) exposed to the heat. Set the grates 4 feet from the lowest part of the shells. Build a bridge wall 10 inches (just enough to hold the fuel) above the grates. With coal for fuel, you will sooner think of disposing of one boiler instead of adding to the three you now have. You can get all the steam you want without skillful firing, constant hard work, and waste of fuel, if you burn your fuel instead of sending it up chimney. The above described radical change in setting of steam boilers was made with excellent results. My boiler making and repair bills are beautifully less; and while I increased the production of the mills, the fuel bills are less than before.

(41) J. S. F. says, in reply to C. B. H.'s query as to how to give a locomotive her full speed: Unless she be drawing a heavy load or running with a very light pressure, she cannot attain her full speed with the throttle wide open and at full stroke, because of the contracted area of the exhaust nozzle and high state of expansion of the steam, which cause her to choke when more than a certain quantity of steam is admitted to the cylinder at each stroke of the piston. To prevent choking, the quantity of steam admitted to the cylinder should be regulated by the position of the reverse lever, or, to state it more properly, by the travel of the valve.

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

J. S. B.—It is granular quartz.—D. R. McM.—The thickness can be told by examination of the outcrop at suitable points. In some localities, the thickness of these sandstone strata is several thousand feet. Your chance of getting water is slight. No. 1 is iron pyrites. No. 2 is steatite. No. 3 is indigo carmine.—A. M.—You are correct in taking it to be a sandstone containing a hydrocarbon of an asphaltic nature. The bituminous schists made use of in France are somewhat different.—S. N. F.—It consists chiefly of lead, with a small percentage of alloy.—P. L. S.—It is lead.—W. M. N.—It is one of the alloys of tin and lead, the former being in preponderance.—G. F. P.—It is a piece of furnace slag.—J. A. H.—It contains no uranium.—R. P.—The base of the composition is hard rubber.—J. H. E.—It is iron pyrites.—C. T. A.—It contains no silver, but scales of mica.—The specimen in box marked "Washburn" is graphite in quartz rock.—H. M.—No. 1 is mica in quartz. No. 2 is serpentine. No. 3 is iron pyrites.—S. W. M.—The good specimen contains the substances mentioned in the recipe, and there is no reason why it should not act well. Try again.

W. C. S. says: The following is a geometrical nut for some of your readers to crack: The space enclosed by 3 circles contains an acre. Required the radius of the circles.—P. A. K. asks: Who invented the first railroad sleeping car, and put it into practical use?—J. D. says: I have a valuable mare, 8 years old, which has been but little worked. Last summer she had the thrush in her fore feet, but was soon cured, and her feet looked well and were free from contraction. I commenced driving her this winter; and her feet were at once inflamed, and quite sore for a day or two. She flinches when she puts her frog on anything hard. What can I do for her?



COMMUNICATIONS RECEIVED.

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

On Working Men at the Centennial. By M. M.
On Spiritualism. By J. A. C.
On Pulling and Pushing. By R. B. S.
On the Moon. By C. J. L. C.
On Safe Savings. By —.
On a Remarkable Machine. By C. E. F.
On Magnetic Attraction. By A. A. A.
On the Oldest Inhabitant. By N. V. C.
On the Universal Force. By J. E. H.
On Momentum. By J. A.
On the New Nebular Theory. By C. E. M.

Also inquiries and answers from the following:

I. H.—M. M.—P. S.—G. A. R.—T.—L. O.—W. T. Jr—H.—Y.—J. H. P.—G. P. B.—J. T. H.—R. S. M.—W. L.—C. H. P.—J. W. R.—S. T. W.—B. F. U.—D. B. K.—F. W. M.—A. D.—N. C. G.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who makes the best dynamometers? Where can three inch objectives for telescopes be obtained? Who makes electric belts for medical purposes? Where is there a firm that undertakes well-boring? Where are there any works where nickel ore can be smelted? Where can walrus leather be obtained? Who sells shoe peg machinery? Who sells machinery for making friction matches? Who sells alarm clocks? Who makes stocks, to secure the feet of restive horses, while being shod? Who makes diving apparatus?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

January 11, 1876.

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Air brake valve, G. Westinghouse, Jr.	172,064
Air, compressing, H. P. M. Birkinbine	171,977
Alarm, burglar, Bruen & Price	172,082
Alarm, etc., electric fire, W. B. Watkins	172,218
Alloys, imparting resonance to, B. Silliman	171,959
Anti-spasmodic remedy, Taylor & Boston	172,060
Bath, mud, H. J. Bang	172,079
Bed bottom, E. Stillwell	177,19
Bedstead, sofa, W. E. Buser	172,084
Bedstead, sofa, F. D. Kramer	171,940
Bee hives, entrance to, J. S. Harbison	172,019
Beer, device for drawing, T. J. Byrne	172,085
Billiard table cushion, A. Hand	172,018
Bird cage, H. C. Breck	171,980
Blasting with nitroleum, T. P. Shaffner (r)	6,854
Bodkin, adjustable, L. F. Thorne	172,207
Boiler, culinary, A. T. Doster	172,086
Boiler for stoves, W. McIlvain	172,143
Boiler injector, W. T. Messinger	171,946
Boilers, making wash, J. E. Wells	172,093

Bolt blanks, manufacture of, J. Browning..... 172,081
Bo't, self-acting door, E. Feige..... 172,106
Book holder, C. N. Brown..... 172,090
Boot heel support, M. D. Strait..... 172,209
Boot seams, rubbing, T. K. Keith..... 172,091
Bottles with aerated liquids, filling, J. Edwards. 172,101
Bow and arrow, J. B. Cleaveland..... 171,918
Brick machine, E. H. & W. E. Gard..... 172,111
Bridge, lift, S. Swartz 172,204
Broiler, I. De Haven..... 171,924
Buckle, E. Young..... 171,966
Burner, gas, W. C. Wren..... 172,065
Burner, lamp, J. Segondy 171,135
Burner, night, W. P. Newhall (r)..... 6,852
Burners, gas regulator for, C. G. & G. Curtis..... 172 000
Butter package, A. J. Bell..... 171,925
Butter package, V. A. Fenner..... 171,928
Butter worker, W. H. Lilly..... 172,153
Buttoner, shoe and glove, J. F. Adams..... 172,066
Can caps, etc., soldering, A. Barker (r)..... 6,848
Can nozzle, L. B. Foss..... 172,010
Can, oil, A. J. Bell..... 171,926
Car axle box, E. Sikes 172,186
Car brake, L. Griesser..... 171,933
Car coupling, P. C. Murray..... 172,151
Car, grain, J. E. White..... 172,228
Car, stock, J. A. Wood..... 172,238
Car ventilator, C. H. Winchell..... 172,227
Cars, door for grain, L. F. Frazee..... 172,0 2
Carouseter, Barbarin & Roberts..... 172,074
Carbureter, T. Meredith..... 172,144
Card, playing, J. H. Black..... 171,978
Carpet stretcher, O. D. Carlisle..... 172 087
Carriage, child's, Conant & Holman..... 172,091
Carriage dash frame foot ele, M. Seward..... 171,936
Cartridge-loading implement, C. J. Stoddard..... 172,201
Caster, furniture, C. Brinton..... 17 ,981
Casting, metals, machine for, J. B. McCune..... 172,044
Chair, J. H. Mabbett..... 172,126
Chair, spring tilting, A. B. Stevens..... 172,198
Chair, tilting, J. Lemman..... 172,040
Chandelier frie tion clutch, C. T. Bruen..... 172,093
Chimney holder, E. W. Briggs..... 172,478
Churn, J. L. Sprag e 172,194
Cider, etc., making, J. Matthews 172,139
Cigar machine, J. T. Hennaman..... 172,120
Clasp, N. H. Bruce..... 171,985
Clasp, E. S. Smith..... 171,961
Clevis, J. Schofield..... 172,180
Closet catch, W. E. Sparks..... 172,191
Clothes dryer, D. Masters 172,043
Coffins, metallic corner for, P. Brailly..... 172,077
Comb, J. T. O'Donoghue..... 172,156
Corkscrew, W. Engelsdorff..... 172,104
Corn sheller, A. Borneman (r)..... 6,847
Corn sheller, W. S. Reeder 172,171
Corset, L. C. Warner..... 172,214
Cotton gin rib, J. E. Carver..... 171,991
Crushing machine lifting cam, M. Cock..... 171,921
Curry comb, C. E. L. Holmes..... 172,021
Curtain fixture, S. Vreeland..... 172,211
Deflector, hot air, M. T. Forsyth, Sr. 172,108
Demijohn packing case, G. W. Banker..... 171,912
Dental anesthetic applicator, C. G. Von Bonhorst 172,209
Dental flask, A. J. Jordan..... 172,029
Depthing tool, A. Schwerter..... 172,183
Desk friction joint, H. H. Evarts..... 172,007
Digger, potato, P. M. Bawtinhimer..... 171,913
Disinfecting apparatus, W. H. Hutt..... 172,128
Distilling process, oil, E. Lane..... 172,131
Doors, sheave for sliding, C. H. White..... 172 226
Doubling machine, L. E. Leigh..... 171,943
Dredging machine, J. C. Osgood (r)..... 6,855
Drilling machine, metal, W. Sellers 172,056
Duster, wool, J. E. Overacker..... 172,160
Eaves trough hanger, F. M. Burdoin..... 171,915
Edger, gang, L. S. Hogeboom..... 172,121
Emery wheel, G. H. Peabody..... 172,162
Engine governor, Hall and Whittemore..... 172,116
Engine governor, steam, A. K. Kline..... 171,939
Engines, foot valve for, Sherman & Fe esch..... 172,057
Equalizer, horse power, O. Woodworth..... 172,237
Eyelet, L. C. Curran..... 172,094
Faucet, T. Bingham..... 172,075
Faucet, measuring, Blackerby & Noland..... 171,979
Fence, wire picket, J. A. Morris 172,149
Fifth wheel, T. F. Bryan..... 171,914
Fire arm, breech-loading, A. C. Falvre..... 172,008
Fire escape, J. C. Moore 172,147
Fire extinguisher and escape, Wood & Leonard.. 172,234
Flower pot bracket, J. G. Folsom..... 171,011
Food for p stry, etc., L. D. Gordon..... 172,114
Fork, carving, J. Gerard..... 171,931
Fruit drier, A. J. Reynolds..... 172,172
Furnace heating, S. Smith..... 172,188
Furnaces, supplying air to, A. J. Creigh..... 172,093
Furnaces, supplying air to, H. Heckel..... 172,119
Furniture legs, rubber tip, Stockedale *et al*..... 172,100
Galley supporter, W. S. B. King..... 172,033
Gas governor, D. B. Peebles..... 172,163
Gas, making, G. Olney..... 172,047
Gas purifier, centrifugal, P. Sweeney..... 171,963
Glass, engraving on, E. O'Neil..... 172,159
Glass, antique colored, J. Baker..... 171,971
Glove fastening, C. R. Ferguson..... 172,009
Gone pot, C. S. Comins..... 171,932
Grain bag, C. Lazarevitch..... 172,039
Grain, band for binding, D. Olmsted..... 171,950
Grain binder, W. R. Baker..... 171,972
Grain conveyer, H. L., P. F. & E. D. Chase..... 6,856
Grain conveyer flights, making, H. I. Chase *et al*. 172,089
Grain header, Myers & Irwin..... 172,152
Grinding disk, W. E. Brock..... 172,079
Harness, breast and neck strap, Murray *et al*..... 172,045
Harness bearing hook, etc., R. Spencer..... 172,059
Harrow, J. B. Okey..... 172,158
Harvester, P. Kline 172,034
Harvester, J. B. Mohler..... 172,145
Harvester, M. L. Parrett..... 172,050
Harvester, M. T. Eidout..... 172,173
Harvester rake, T. H. B con..... 172,070
Hat and coat hook, M. B. Coburn..... 171,920
Hay rack, J. Hall..... 172,017
Heater, E. E. Gold 172,014
Heater, flat iron, R. M. Merrill..... 171,945
Hook, snap, B. B. Bulwinkle..... 171,984
Horse power, C. Roberts..... 172,174
Horse power, C. Roberts..... 172,175
Horse power equalizer O. Woodworth..... 172,237
Horseshoe, T. W. Murphy 172,150
Horseshoe nails, finishing, E. W. Kelly..... 172,127
Hydrant, G. C. Bailey..... 172,071
Hydrant, J. P. Gallagher..... 172,110
Hydrant, G. Shelley..... 172,184
Hydrant and hydrant valve, H. E. Earle. 172,002
Index, B. F. Urban..... 172,061
Inkstand and paper weight, H. Lee (r)..... 6,850
Key for locks, folding, J. M. Spring..... 172,195
Kiln, brick, J. Blum..... 171,920
Knitting machines, wheels for, W. H. Abel..... 171,908
Labeling machine, C. I. Pittman..... 171,952
Ladder, E. J. Schneider..... 172,179
Lamp, J. E. Ambrose (r)..... 6,844
Lamp, A. French..... 171,929
Lamp black, P. Neff 172,046
Lamp extinguisher, C. G. Knapp..... 172,035
Lamps, attachment for, C. F. Martine 172,137
Lathe for wheels and axles, G. G. Lobdell..... 172,134
Leach, Wolfe & Henkel..... 172,233
Lime, receptacle for E. B. English..... 171,105
Locomotive spark arrester, W. W. Piper..... 171,951
Locomotive truck L. A. Roberts..... 172, 76
Loom, J. C. Duckworth 172,097
Loom shuttle box mechanism, A. B. Capron..... 171,919
Manger, H. Friedrich..... 171,930
Mattocks, swage for shaping, L. Gerber..... 172,112
Meat preserving, H. Stevens..... 172,196
Medical apparatus, electro, R. W. Hathaway..... 171,934
Metal plates, metal coating, Morewood *et al*..... 172,148
Metal shearing machine, rotary, New *et al*..... 171,949
Meter, fluid, J. Johnson..... 172,124
Milk, desiccating, J. B. Cole..... 172,090
Mill and press, cider, Schwanengel *et al*..... 172,055
Mills, etc., scouring case for smut, A. Vandegrift 172,062
Millstone dressing machine, W. B. Chase..... 171,992
Millstone exhaust, S. L. Bean 171,974
Millstone level and tram, J. T. Beckwith..... 171,974
Mining, hydraulic, J. O'Farrell..... 172 197
Miter-cutting machine, G. H. Gove..... 171,932
Mop, G. K. Harris..... 172,118
Necktie shield, J. B. Carter 171,990
Newel post, J. D. Kelly..... 172,126
Nut lock, F. B. Wigle..... 172,229
Oiler, G. W. Parsons..... 172,161
Ordnance, breech-loading, R. Punshon..... 171,168
Organ bellows and treadle, S. J. Crockett..... 171,923
Overalls, G. R. Ezger 172,100
Paper box, E. De F. Shelton..... 171,958
Paper collar, E. Brady..... 172,076
Paper-cutting machine, A. Hardy..... 172,020
Pavement, I. B. Potts..... 172,167
Piano keys, forming fulcra in, Webber *et al*..... 172,222
Piano keys, shaping, S. M. Comstock..... 171,995
Picks, dressing edges of, J. C. Klein 172,130
Pin book, J. G. Wetmore 172,225
Pipes, T coupling for, T. P. Hardy..... 172,117
Plane, edge, W. Osborne..... 172,048
Planing machine, W. C. Margedant (r)..... 6,851
Plate lifter, E. C. Luks..... 172,135
Plow p int, W. B. Ready 172,053
Plow, sulky, F. H. Isaacs..... 172,028
Pocket book fasteners, D. M. Read..... 172,169, 172,170
Pocket implement, I. C. Cowles..... 171,997
Polish, device for applying, I. M. Rose..... 172,177
Post hole digger, J. Lee..... 171,942
Power, treadle, A. H. Stevens..... 172,197
Press, baling, L. W. Liles..... 172,132
Press for stamping soap, W. H. King..... 172,032
Privy vaults, emptying, C. H. Voutè 172,210
Pump cylinder, S. A. Ellis..... 172,102
Pump, endless chain, W. McGrew..... 172,142
Pump, steam vacuum, A. Huffer..... 172,023
Radiator, steam, G. P. Jacobs..... 172,026
Radiator, steam, S. Smith..... 172,198
Railroad rail joint, O. B. Latham..... 172,037
Railroad tie, E. E. Lewis..... 172,041
Rake, horse, J. H. Thomas..... 172,206
Rake, horse hay, T. Penrose..... 172,165
Saddle cloth, R. Spencer..... 172,058
Sash balance, A. Smithers 171,960
Sash fastener, S. Vreeland..... 172,212
Sash holder, C. P. Babcock 172,069
Saw, band, P. H. Edge..... 172,003
Saw-filing machine, F. W. Benjamin..... 171,968
Saw-sharpening machine, W. L. Covel..... 172,092
Sawing machine, scroll, H. M. Quackenbush..... 172,032
Scales, spring, G. H. Chatillon..... 171,998
Scraper, chopper, etc., A. S. Spence..... 172,193
Separator, grain, M. Laufenburg..... 172 038
Sewing machine, J. S. Fletcher..... 172,107
Sewing machine, J. McCloskey..... 171,944
Sewing machine, A. Thayer..... 172,205
Sewing machine caster, T. B. Garretson..... 172,013
Sewing machine treadle, J. C. Mackey..... 172,042
Sheet iron, planished, W. D. Wood 172,235
Sheet metal molding machine, Clark *et al* 171,917
Sheet metal scroll cutter, Clark and Kittredge... 171,916
Shingle, G. W. Soule..... 172,190
Ships, etc, construction of, G. E. Gordon..... 172,113
Shirt bosom, M. A. Clifford..... 171,919
Shoe, wooden, A. G. Wilkins..... 172,230
Shoes, insole for, A. Burke..... 171,987
Sizing, J. W. Wattles..... 172,216
Skirt elevator and adjuster, P. G. Baker..... 172,072
Sled, S. W. Francis 172,109
Sled propeller, W. H. Shelton, Jr..... 172,185
Soap, making, B. T. Babbitt..... 172,068
Soldering bench, Kittredge and Clark..... 172,128
Soldering tool, E. M. Lang..... 171,941
Spark arrester, locomotive, W. W. Piper..... 171,951
Spike extractor, R. Newland..... 172,154
Spinning jack stop, Sinclair and Galvin..... 172,187
Sprinkler, lawn, R. Hug..... 172,034
Sprinkler, street, W. Westerfield..... 172,224
Square, A. Moore..... 171,947
Square, beam, Farnham and Leach..... 171,927
Starch, drying, E. E Duryea..... 172,099
Stave-jointing machine, J. W. Byther..... 172,086
Steam trap, J. Deakin..... 172,001
Stone-dressing machine, D. Narracong..... 172,153
Stove, H. C. Cassel..... 172 088
Stove damper, N. W. Graffane..... 172,115
Stove, magazine, W. W. Baldwin (r)..... 6,845
Stove pipe elbow, A. Syversen..... 171,964
Stoves, boiler for, W. McIlvain..... 172,143
Stoves, heat indicator for, A. J. Jourde..... 172,030
Street-sweeping machine, A. S Martin 172,138
Street-sweeping machine, W. Warren..... 172,215
Sulky, trotting, P. Jones..... 171,937
Suspenders, E. Parsons..... 172,049
Swing, H. J. Blakeslee 171,969
Table and portfolio combined, J. B. Bunyard.... 171,983
Table, folding, W. E. Allen..... 171,909
Table, ironing, F. A. Faul..... 172,051
Table ware, covered, C. A. Bailey..... 171,910
Tag fastener, W. R. Russell..... 172,054
Tag, machine for stringing, J. Emery..... 172,103
Telegraph, fire and burglar alarm, W. B. Watkins 172,221
Telegraph key and register, L. S. Crandall 171,998
Telegraph circuit closer, etc., W. B. Watkins.... 172,220
Telegraph electric circuit, W. B. Watkins..... 172,219
Thermometer, G. W. Schumacher..... 172,181
Tinner's fire pot, Kittredge and Clark..... 171,938
Tobacco stains, E. W. Dickerson..... 172,096
Tobacco sucker destroyer, Knaus and Harford.... 172,036
Tonic remedy, B. F. Rucker 171,954
Top, spinning, F. A. Philippi..... 172,166
Toy money box, J. Hall..... 172,016
Toy thaumatrope, G. Burdett..... 171,986
Trace carrier, J. Hudson..... 172,022
Track lifter, G. W. Shaffer..... 171,957
Trap, fly, D. E. Roe (r)..... 6,853
Trunk, H. Vogler (r)..... 6,849
Trunks, corner clamp for, W. L. Mowry..... 171,948
Tubes and cylinders, making, Z. S. Durfee 172,098
Tunnels, submarine, J. F. Jones..... 172,027, 172,028
Umbrella supporter, E. M. Arnold..... 171,907
Valve, air brake, G. Westinghouse, Jr..... 172,064
Valve for tubular wheels, J. T. Whipple..... 172,227
Vehicle, light road, W. S. Clark..... 171,994
Vehicle top prop block, A. Butterfield..... 171,988
Wagon, seed sower, N. A. Monroe..... 172,146
Wash bench, folding, C. H. Bangs..... 171,911
Washing machine, W. W. Hubbell..... 172,122
Washing machine, J. Thompson..... 171,965
Washing machine, J. D. Tower..... 172,208
Washing machine fire box, W. Klein..... 172,129
Watch escapement, M. Petersen..... 172,165
Watchman's detector, G. A. Schultz..... 172,182
Water, etc., compressing air for raising, J. Jonson 172,125
Water closets, ventilating, E. Estmond..... 171,926
Waterproof fabrics, etc., H. M. sawyer..... 172,178
Water wheels, turbine, McCormick *et al*.. 172,140, 172,141
Water wheel, turbine, H. Waters..... 172,217
Weather strip, G. A. Herrick..... 171,936
Well piping, etc., inserting, F. Spees..... 172,192
Wells, machine for boring and walling, C. Stough 172,202
Wheel, metallic, S. Vreeland..... 172,213
Whiffletree, E. Ely..... 172,006
Whitewashing machine, W. H. Alexander..... 172,067
Wind power, T. C. Guthery..... 172,015
Wind wheel, Stephens and Shay 171,962
Wind wheel, J. Weimer..... 172,223
Windmill, W. E. Dewey..... 171,925
Wire, pointing, H. A. Williams..... 172,231
Wood, kyanizing, D. W. Hunt (r)..... 6,848
Wood shaper safety guard, T. H. Wood..... 172,236
Wood-splitting machine, F. Raud..... 171,955
Wrench, E. T. Barlow..... 172,239
Wrench, W. Hawkins..... 171,935
Wrench, O. B. North 172,155
Wrenches, monkey, E. T. Barlow 172,240, 172,241
Wrench, pine, J. Browning 171,982
Wrench, pipe, W. Crumbie 171,999
Yoke, neck, A. G. Cook..... 171,996
Yokes, neck, E. Ely..... 172,004, 172,005

DESIGNS PATENTED.

8,889.—TYPE.—G. G. Bailey, Jr., *et al*., Boston, Mass.
8,890.—STAND LAMPS.—N. L. Bradley, West Meriden, Ct.
8,891, 8,892.—TYPE.—J. M. Conner, Greenville, N. J.
8,893.—TYPE.—J. M. Conner, Greenville, N. J.
8,894.—TYPE.—H. H. Delacroix, Philadelphia, Pa.
8,895.—NECKLACE.—F. Dimier, New York city.
8,896, 8,897.—TYPE.—H. Ihlenburg, Philadelphia, Pa.
8,898.—CANISTER.—S. Rosenblatt, New York city.
8,899.—CARPETS.—T. J. Stearns, Boston, Mass.
8,900.—HINGES.—C. B. Clark, Buffalo, N. Y.
8,901, 8,902.—EMBROIDERY.—E. Crisand, New Haven, Ct.
8,903.—BUCKLES.—H. Johnson, Newark, N. J.
8,904.—HEATERS.—J. A. Lawson, Troy, N. Y.

SCHEDULE OF PATENT FEES.

On each Caveat..... $10
On each Trade mark..... $25
On filing each application for a Patent (17 years)..... $15
On issuing each original Patent..... $20
On appeal to Examiners-in-Chief..... $10
On appeal to Commissioner of Patents..... $20
On application for Reissue..... $30
On filing a Disclaimer..... $10
On an application for Design (3½ years)..... $10
On application for Design (7 years)..... $15
On application or Design (14 years)..... $30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, January 10, 1873.

5,571.—P. Rodier, Detroit, Mich., U. S. Skate. Jan. 10, 1876.
5,572.—W. F. Lamb *et al*., Wilbraham, Mass., U. S. Book-keeping game board. Jan. 10, 1876.
5,573.—E. J. Duff *et al*., Pittsburgh, Pa., U. S. Wash board. Jan. 10, 1876.
5,574.—A. E. Edholm, Lake City, Minn., U. S. Safety extinguisher for lamps. Jan. 10, 1876.
5,575.—B. Silliman, New Haven, Conn., U. S., *et al*. Imparting resonance to metallic alloys. Jan. 10, 1876.
5,576.—H. W. Hutchins, Livermore Falls, Me., U. S. Box-making machine, etc. Jan. 10, 1876.
5,577.—J. R. McPherson, Jersey City, N. J., U. S. Stock car. Jan. 10, 1876.
5,578.—S. B. Morrell, Kenosha, Wis., U. S. Shirt bocom ironing board, etc. Jan. 10, 1876.
5,579.—W. E. Sawyer, New York city, U. S. Copying or autographic telegraph. Jan. 10, 1876.
5,580.—A. Payette, Montreal, P. Q. Axle box and axle. Jan. 10, 1876.
5,581.—D. Brennan, Elkhart, Ind., U. S. Pinch spike or claw bar. Jan. 10, 1876.
5,582.—J. B. Atwood, Wilbraham, Mass., U. S. Lock nut. Jan. 10, 1875.
5,583.—P. De La Neuville, Thompsonville, Conn., U. S. Water filter and purifier. Jan. 10, 1876.

Advertisements.

Back Page ------ $1.00 a line.
Inside Page ----- 75 cents 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 Friday morning to appear in next issue.

WANTED—PRACTICAL PAPER MANUFACTURER with some capital, can hear of a rare opening by addressing "SENTINEL," Clarksville, Mo., immediately.

STEEL NAME STAMPS—Post paid for 15c. per letter. STEEL STAMP WORKS, 213 Chapel St., New Haven, Ct.

A GOOD RECORD.

"The Gothic Furnace placed in my house gives excellent satisfaction in all respects."
REV HENRY B. SMITH, D. D., 108 East 25th St., N. Y.
To ALEX. M. LESLEY, 246 West 23d St., N. Y.
☞ Catalogues sent by request.

FOR THE BEST AMATEUR FOOT LATHE—Address STRANGE'S CYLINDER SAW AND MACHINE CO., Taunton, Mass., for Price List.

GLASS SHADES, ALL SIZES, FOR FLOWERS, &c., and True Blown Cylinders, any size. T. DEGNAN, 129 Milk St., Boston, Mass.

FINE TOOLS
For Machinists, Jewelers, Engravers, Watchmakers, Amateurs, and others. Also, a fine assortment of File and steel Wire Supplies, at FRASSE & CO.'S, 62 Chatham Street, New York.

Established in 1853.
LOVEJOY, SON & CO.,
ELECTROTYPERS and STEREOTYPERS,
15 Vandewater Street, New York.

RE-DUPLICATION OF LETTERS, ETC. A letter can be written and fifty copies taken in 15 minutes by EDISON'S DUPLICATING PRESS. Hundreds of Copies from a single writing.
CHAS. BATCHELOR, 41 Dey St., New York. P. O. Box 3207.

GLASS ROLLING PIN, PATENTED, No. 159,693. The State of Pennsylvania for Sale. Address C. P. HAYES, Elk Point, Dakotah.

BORAX.
We beg to offer to the trade our own brand of guaranteed strength and purity at the lowest market rate
CHAS. PFIZER & CO., 81 Maiden Lane, N. Y.

FOOT LATHES.
W. E. LEWIS, Cleveland, O. Catalogues Free.

A SLOW ROTARY MOTION CONVERTED into a rapid vibratory motion by James F. McCormick's Mechanical Movement, patented Dec. 21, 1875, by which Sewing Machines, Light Hammers, Mowing Machines, Jig Saws, &c., can be operated. Address J. F. McCORMICK, 1136 Poplar St., Philadelphia, Pa.

A WANT SUPPLIED.
AUSTIN'S PATENT RULER, MEASURE, PAPER CUTTER AND BLOTTER COMBINED. Sold by Agents, at the trifling cost of 25 cents, and free by mail on receipt of price by the "AUSTIN MFG CO.," No. 50 N. Fifth st., Phila. Agents wanted.

W. F. & JOHN BARNES,
Manufacturers of Barnes' Patent FOOT-POWER MACHINERY, SCROLL-SAWS, LATHES, ETC.
The only foot-power machinery without crank or dead centers. $1,500 to $2,000 per year made using these machines. Send for illustrated Catalogue.
Rockford, Winnebago Co., Ill.

PRICE REDUCED—Door Name Plate (Glass), Rubber Hand Stamps. Full instructions in manufacturing. Price 50c. each (no circular). J. W. PRATT, Box 191, Rondout, N. Y.

AS THE DUTY ON IMPORTATIONS OF MACHINERY will soon be abolished in Germany, a German house of long standing is prepared to accept the agency of an American Machine Manufactory, and to effect the sale of their Machinery.
No credit is wanted; the firm, on the contrary, being willing to buy exclusively for cash, and to carry on the business for their own account.
Machines for spinning, weaving, bleaching, dyeing, and finishing establishments and paper mills, will be accepted in preference; also small tool machines, and tools which are generally used in the repairing shops of the above named special branches.
The firm employs salesmen, travelling regularly for their account in Germany, Austria, Switzerland, Italy, Belgium, Holland, and Russia; they have extensive and valuable connections in these several countries, as well as in Denmark, Sweden, and Norway, and experienced workmen are engaged to put up the machines on arrival.
Address, stating terms, specialty of machines manufactured, etc., etc., H. 998, care of Messrs. Haasenstein & Vogler's Advertising Agency, Hamburg, Germany.



A Manufacturer wanted. An interest for sale.
Parallel Pliers, Clamps and Handvises. Very superior Tools for Machinists, Wire-workers, Jewelers, Glass-cutters, &c.
Address, I. C. & L. B. RUSSELL, Woodbury, New Jersey.

STAVE, SHINGLE, HANDLE AND CABINET Maker's Machinery, etc. etc. Address T. R. BAILEY & VAIL, Lockport, N. Y.

Best Mill Spindles and Steps, MILL GEARING, Shafting, Pulleys & Hangers.
Address T. B. WOOD & CO., Chambersburgh, Pa.

WHIPPLE'S Patent Door Knob.
Awarded a Bronze Medal at the American Institute Fair for 1874. The Judges say: "We consider this method of fastening DOOR KNOBS a great improvement over anything yet invented for the purpose, as it obviates the use of side screws and washers, and can be regulated to suit any thickness of Doors." Send for Circular.
THE PARKER & WHIPPLE COMPANY.
West Meriden, Conn., or 97 Chambers St., N. Y.

BIG PAY to sell our RUBBER PRINTING STAMPS. Terms free. TAYLOR & HARPER, Cleveland, O.

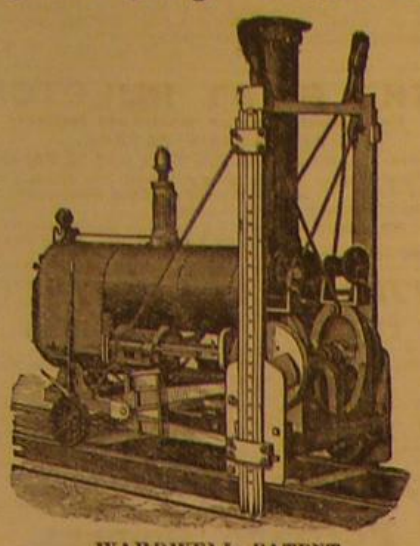
ON THE CAUSES OF KNOCKING IN HIGH PRESSURE ENGINES. By Joshua Rose. With Nine Engravings. A valuable practical treatise. Price 10 cents. Contained in Nos. 1 and 2 of "Scientific American Supplement," to be had at this office, and of all newsagents.

SCIENCE RECORD For 1876.



SCIENCE RECORD is a splendid book of 600 pages, published annually, about the 15th of January. Illustrated with many engravings. Price $2.50.
THE VOLUME for 1876 will be published about January 15th. Its contents will embrace the most interesting Facts and Discoveries in the various Arts and Sciences that have transpired during the preceding year, exhibiting in one view the General Progress of the World in the following departments:
CHEMISTRY AND METALLURGY,
MECHANICS AND ENGINEERING,
ELECTRICITY, LIGHT, HEAT, SOUND,
TECHNOLOGY, THE USEFUL ARTS,
BOTANY AND HORTICULTURE,
AGRICULTURE,
RURAL AND HOUSEHOLD ECONOMY,
MATERIA MEDICA, THERAPEUTICS, HYGIENE
NATURAL HISTORY AND ZOOLOGY,
METEOROLOGY, TERRESTRIAL PHYSICS,
GEOGRAPHY,
GEOLOGY AND MINERALOGY,
ASTRONOMY,
BIOGRAPHY AND NECROLOGY.
Every person who desires to be well informed concerning the Progress of the Arts and Sciences should have a copy of SCIENCE RECORD for 1876. It will be a most interesting and Valuable Book, and should have a place in every Household and Library.
800 pages Octavo. Handsomely Bound. Many Engravings. Price $2.50. Sent, post-paid, on receipt of price.
All the preceding volumes of SCIENCE RECORD may be had separately at $2.50 each, or $10 for the five volumes, 1872, 1873, 1874, 1875, and 1876.
MUNN & CO., PUBLISHERS,
37 Park Row, New York city

Stone Channeling OR *Quarrying Machine,*



WARDWELL PATENT,

FOR CUTTING STONE INTO VARIOUS SIZES AND DIMENSIONS IN ALL KINDS OF QUARRIES.

STEAM STONE CUTTER CO., RUTLAND, VT.

SOLE PROPRIETORS AND MANUFACTURERS.

FOREIGN PATENTS AND *THE CENTENNIAL.*

There is no doubt that our Centennial Exposition will attract to our shores multitudes of representative people from all parts of the world, and they will take home with them many of our best improvements to introduce into their own manufactures.

An unusual opportunity will be offered for selling to these people such foreign patents as have been secured on good American inventions in the respective countries from which these visitors come.

At the reduced prices for which patents are obtained abroad, our people will lose a chance not likely to occur again, if they do not avail themselves of the opportunity of securing their inventions in foreign countries at once, so as to have their patents ready to negotiate the coming summer.

For cost of patents in the different countries and the conditions on which they are granted, send for pamphlet containing full information.

Address MUNN & CO.,
37 Park Row, New York.

BRANCH OFFICE, cor. F and 7th Sts.,
Washington, D. C.

HOME-MADE TELESCOPES.—Directions for their construction, with engravings showing the proper arrangement of lenses and tubes. By Prof Van Der Weyde. Price 10 cts. Contained in No. 1 of SCIENTIFIC AMERICAN SUPPLEMENT, to be had at this office, and of all news agents.

RICHARDSON, MERIAM & CO.,
Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and Molding, Tenoning, Mortising, Boring, Shaping, Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-Off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty Street, New York.

OPIUM and Morphine habit absolutely and speedily cured. Painless; no publicity. Send stamp for particulars. Dr. Carleton, 187 Washington St., Chicago, Ill.

NOTICE.

The undersigned has assumed the Personal Property, including accounts, finished and unfinished Machinery, good will, &c., connected with the manufacture of MACHINIST'S TOOLS as conducted by Mr Lucius W. Pond since 1847, and will continue the said business at the old stand, cor. Union and Exchange Sts., Worcester, Mass., under the name of DAVID W. POND, Successor to Lucius W. Pond.

CARD.—Having assumed the business mentioned above, I solicit Inquiry and Patronage with guarantee that present standard of Workmanship, and quality of Machinery shall be maintained. A large quantity of NEW AND SECOND-HAND TOOLS, ALL STYLES AND SIZES, for Sale at Low Prices. Send for list of second hand tools. Store at 98 Liberty St., New York, will be discontinued from Feb 1, 1876, and all sales made from manufactory.

Respectfully, DAVID W. POND,
Successor to LUCIUS W. POND,



Made from pure long fiber Asbestos, Self-Lubricating, adapted for Locomotive and Stationary Engines, and, owing to its indestructibility, will save ten times its cost in the one item of repacking. See testimonials.

H. W. JOHNS, 87 Maiden Lane, N. Y.,

MANUFACTURER OF PATENT ASBESTOS ROOFING, STEAM PIPE, AND BOILER COVERINGS, PAINTS, FIREPROOF COATINGS, ETC. SEND FOR CIRCULARS, PRICES, ETC.

WANTED—Situation by a young man of good sober disposition, as Assistant Engineer or Surveyor; good references furnished. Address C. E., Box 73, Harveysburg, Warren Co., Ohio.

SCREW PROPELLERS, THEIR SHAFTS AND FITTINGS. By Hamilton W. Pendred, M.E. An able treatise, shewing the present practice, its advantages and defects. With 25 figures. Price 10 cents. Contained in No. 4 of SCIENTIFIC AMERICAN SUPPLEMENT. To be had at this office, and of all news agents.

10 **DECALCOMANIE,** or TRANSFER PICTURES, with book of 32 pp., giving full instructions in this new and beautiful art, sent post-paid for 10 cts, 100 assorted pictures, 50 cts. They are Heads, Landscapes, Animals, Birds, Insects, Flowers, Autumn Leaves, Comic Figures, &c. They can be easily transferred to any article so as to imitate the most beautiful painting. Also, 5 beautiful GEM CHROMOS for 10 cts.; 50 for 50 cts. Agents wanted.
Address J. L. PATTEN & CO., 102 William Street, New York.

CLARK & COMPANY'S PATENT SELF-COILING, REVOLVING STEEL SHUTTERS

Can be readily fitted to Store Fronts, Rear Windows or other openings, making them FIRE AND BURGLAR PROOF, and affording absolute protection; also, **WOOD SHUTTERS** in various kinds of wood, suitable for Store Fronts, Private Houses, Offices, and School Partitions. Clark's shutters are self-acting, require no machinery or balance weights, and cannot get out of order. They are handsome in appearance, and are the best and cheapest shutters in the world. Are fitted to the new *Tribune* Building, Delaware and Hudson Canal Building, Manhattan Building, Lenox Library Building. Have been for years in daily use in every principal city throughout Europe, and are endorsed by the leading architects of the world.

JAMES G. WILSON, Manager, 218 West 26th St., New York, and at London, Paris, Vienna, Berlin, Melbourne, &c., &c.

AGENTS WANTED.

The TOLL-GATE! Prize Picture sent free! An ingenious gem! 50 objects to find! Address with stamp, E. C. ABBEY, Buffalo, N. Y.



CENTENNIAL DRILL CHUCK—Warranted perfect and durable. Holds -64 to 1-2 in. Sent by mail on receipt of price, $1.25. Send for new reduced List of Chucks.
A. F. CUSHMAN, Hartford Conn.

WILLIAM HENRY KING—ALBUMEN MANUFACTURER, 78 & 80 St. Andrew Street, Liverpool, Eng.

Planing & Matching.

Moulding, Re-sawing and Tenoning Machines. Scroll Saws and General Wood-Working Machinery.
JOHN B. SCHENCK'S SONS { Matteawan, N. Y.
Send for Catalogue. { 118 Liberty St., N. Y. city.

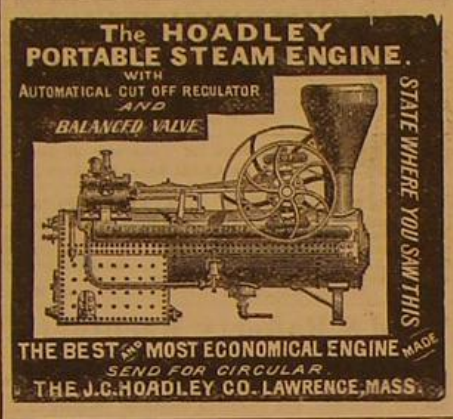
PATENT
Planing and Matching

and Molding Machines, Gray and Wood's Planers, Self-oiling Saw Arbors, and other wood-working machinery.
S. A. WOOD'S MACHINE CO., { 91 Liberty St., N. Y.
Send for Circulars, etc. { 67 Sudbury St., Boston.

OTIS' SAFETY HOISTING Machinery.

OTIS, BROS. & CO.,
No. 348 BROADWAY, NEW YORK.

THE CENTENNIAL INTERNATIONAL EXHIBITION OF 1876.—The full History and Progress of the Exhibition, maps of the grounds engravings of the buildings, news and accounts of all the most notable objects, are given weekly in the SCIENTIFIC AMERICAN SUPPLEMENT. Terms, $5 for the year; single copies 10 cts. To be had at this office, and of all news agents. All the back numbers, from the commencement on January 1, 1876, can be had. Those who desire to possess a complete and splendid Illustrated Record of the Centennial Exposition, should have the SCIENTIFIC AMERICAN SUPPLEMENT.



THE BASTET MAGNETIC ENGINE AND BATTERY, for running Sewing Machines, Dentists' and Jewelers' Lathes, Printing Presses, Pumps, Blowing Parlor and Church Organs or working any Machinery that can be moved by Hand or Foot. SIMPLE—DURABLE—ECONOMICAL. Local Agents wanted in every town and county. For circulars and price list address, with stamp, THE BASTET MAGNETIC ENGINE CO., 1113 Chestnut Street, Philadelphia, Pa.

PUNCHING AND DROP PRESSES. For the Best and Cheapest, address THE STILES & PARKER PRESS CO., MIDDLETOWN, CONN.



THE IMPROVED CELEBRATED ARMSTRONG HEATER AND LIME CATCHER removes and prevents Scales in the Boilers by supplying them with pure water. Will save its cost in fuel within one year. All parties using steam should have one.
For particulars and circulars, address BAUGHMAN, CURTIS & KNIGHT, MANUFACTURERS, Toledo, Ohio.
Machinists WANTED to act as Local Agents.

P. BLAISDELL & CO.,

Worcester, Mass.,
Manufacturers of the Blaisdell Patent Upright Drills and other first-class Machinists' Tools.

STEEL CASTINGS.

Solid and Homogeneous. Guaranteed tensile strength, 25 tons to square inch. An invaluable substitute for expensive forgings, or for Cast Iron requiring great strength. Send for circular and price list to CHESTER STEEL CASTING CO., Eveline St., Philadelphia, Pa.



NONPAREIL

FARM AND FEED MILLS.
Bone, Drug, and Spice Mills. 10 sizes for Hand or Power. Conical French Burr Stone Flouring and Corn Mills. Illust'd Pamphlet free. Address,
L. J. MILLER,
181 E. Front St., Cincinnati, O.

COMPRESSED AIR MOTIVE POWER.—For particulars of the most recent practice, send 20 cents for SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 1 and 2, containing 5 engravings of the "Compressed Air" Locomotives now in use at St. Gothard Tunnel Works, with dimensions, etc.

PATENT WOOD WORKING MACHINERY

PLANING & MATCHING,
MOULDING, MORTISING,
TENONING, RESAWING, SHAPING
BAND & SCROLL SAWS &c. &c.

J. A. FAY & CO.
CINCINNATI, O.

THE IMPROVED
NIAGARA STEAM PUMP,



93 to 97 Pearl St., Brooklyn, N. Y.
Agency at 40 John St., New York.
Hubbard & Aller,
SOLE MANUFACTURERS,
ENGINES AND BOILERS,
Pulleys, Shafting and Hangers a Specialty.

The Myers Portable Engine, 4, 5, 6, 8 h.p. Something new. Best for price. Circulars.
SECOND-HAND IRON AND WOOD WORKING MACHINERY.
CHAS. PLACE, 103 Reade Street, New York.

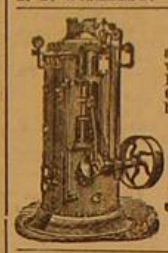
$12 a day at home. Agents wanted. Outfit and terms free. TRUE & CO., Augusta, Maine.



BLAKE'S PATENT
Stone and Ore Breaker

Crushes all hard and brittle substances to **any required size.** Also, any kind of STONE for ROADS and for CONCRETE, &c.
Address BLAKE CRUSHER CO., New Haven, Conn.

WITHERBY, RUGG & RICHARDSON, Manufacturers of 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, 26 Salisbury Street, Worcester, Mass. (Shop formerly occupied by R. BALL & CO.)
L. B. WITHERBY. G. J. RUGG. S. M. RICHARDSON



BOOKWALTER ENGINE

Compact, Substantial, Economical, and Easily Managed. Guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, &c., with shipping boxing, at the low price of

3 Horse Power.....$252 00
4½ " " 303 50

Put on Cars at Springfield, Ohio.
Address
JAS. LEFFEL & CO.,
Springfield, Ohio; or
109 Liberty St., New York City

VINEGAR HOW MADE IN 10 HOURS from Cider, Wine or Molasses, **without using drugs.** Address F. I. SAGE, Vinegar Maker, Springfield, Mass.

$77 A WEEK to Agents, Old & Young, Male & Female, in their locality. Terms & OUTFIT FREE. Address P. O. VICKERY & CO., Augusta, Me.



Excelsior Scroll Saw Latest Improvement. Double Treadle, including one doz. Saws, thirty inimitable Fret Sawing Patterns & Prepared Wood to the value of $1. A new device for tightening Saw, Power Drilling attachment, Wrench, Oil cup, and Screw driver. Speed 800 strokes per minute. Saws 1¼ in. thick. Price, complete, cased and delivered on board cars, or at Express office, $12. SMALL STEAM ENGINES, with copper Boiler, to drive light Lathes, Scroll Saws, &c. 100 Scroll Work Designs Free on receipt of stamp. GEO. PARR, Buffalo, N. Y.
Saw only, without Attachments, $9.00.

WOODWORTH SURFACE PLANERS $125. Planers and Matchers, $350. S.C. HILLS, 51 Courtland street, New York.



Bollinger's Patent Turbine WATER WHEELS AND Mill Machinery.

For Circulars, address
YORK MANUF'G CO., York, Pa.

ICE BOATS—THEIR CONSTRUCTION AND MANAGEMENT. For working drawings and full particulars, send 10 cents for SCIENTIFIC AMERICAN SUPPLEMENT, No. 1.

EAGLE FOOT LATHES,



With Scroll and Circular Saw Attachments, Slide Rest, Tools, &c.; also Small Engine Lathes, Metal Hand Planers, &c. Neatest designs, superior finish. **Low Prices.** Our new Catalogue describes these and every tool necessary for the Amateur or Artizan. Send for it.
WM. L. CHASE & CO., 65 & 67 Liberty St., New York.

Horse Shoe Nails.

The undersigned desire to improve their Machinery for the Manufacture of Horse Shoe Nails by use of a Pointing Machine, and to arrange with competent, reliable, and experienced machinists to take the works, when complete, and manufacture nails on a guarantee of quality and price. Undersigned will furnish Room, Power, Machinery, Iron and Coal, and take the product of the works. Proposition for machinery and the manufacture of the nails solicited. Parties proposing to manufacture will require sufficient capital to pay labor and incidental expenses. We also solicit correspondence with parties having patented articles pertaining to the Hardware Trade, and desiring them manufactured, on royalty or otherwise. For further information, address PRATT & CO., Buffalo, N. Y.

ELLIPTICAL GEARING. By Prof. C. W. MacCord, of the Stevens Institute of Technology. With Eight Engravings. A most clear and excellent exposition of the subject. Price 10 cents. Contained in "Scientific American Supplement," No. 2. To be had at this office, and of all news agents.

DO YOU WANT MONEY Male or female. Send your address and get something that will bring you in honorably over $150 a month sure. **Inventor's Union,** 173 Greenwich Street, New York.

Amateur Workers in FANCY WOODS

Can be supplied with the following HARD and RARE WOODS, planed ready for use: ¼, 3-16, ⅜, ½ inch and upward. Cash to accompany orders. Rosewood, Satinwood, Holly, Walnut, Mahogany, Ebony, Red and White Cedar, Bird's-eye Maple, &c.

Geo. W. Read & Co.,

186 to 200 Lewis St., foot of 5th & 6th Sts., E. R., N. Y.

Orders by mail will have prompt and careful attention. Inclose stamp for Catalogue and Price-List.

$250 A MONTH—Agents wanted everywhere. Business honorable and first class. Particulars sent free. Address J. WORTH & CO., St. Louis, Mo.

STEAM PUMPS.

FIRST PRIZES, VIENNA, PARIS, NEW YORK, BALTIMORE, BOSTON.
Send for circular of recent patented improvements.
THE NORWALK IRON WORKS, South Norwalk, Conn.

FRICTION CLUTCHES AND ELEVATORS.

VOLNEY W. MASON & CO. PROV. R. I.

LeCount's Patent MACHINIST'S TOOLS.

Reduced Prices.

Set Iron Dogs,	⅜ to 2 in.	$ 5.00
" " "	⅜ " 4 "	$12.00
" Steel "	⅜ " 2 "	$ 6.50
" " "	⅜ " 4 "	$13.00

Iron & Steel Clamps, Die Dogs, Clamp Dogs, Vice Clamps Expanding Mandrels, &c. Send for latest Price List to C. W. LE COUNT. South Norwalk, Conn.

A Good Agency Pays just now. Ours is simple, easy, very profitable and unusually respectable, has no canvassing. Publications and goods. Not a cent risked. Previous experience unnecessary. Send address (with references) for samples (free), terms, &c., to Publishers of ILLUSTRATED WEEKLY, 11 Dey St., New York.

Friction Pulleys.

For connecting shafting and gearing. BEAN'S PATENT CLUTCH is the most effective known, and is furnished for less than any other of merit. We make a specialty of FRICTION-CLUTCH COUNTER-SHAFTS. Our HOISTING ENGINES, with this clutch for Pile Driving, can strike three blows to one of engine using ordinary clutch. Hoisting machinery, upon application to
D. FRISBIE & CO., New Haven, Conn.

Machinery of Improved Styles for making
SHINGLES, HEADING AND STAVES.
Sole makers of the well known IMPROVED LAW'S PATENT SHINGLE AND HEADING SAWING MACHINE. For circulars, address TREVOR & CO., Lockport, N. Y.

PATENT DOUBLE ECCENTRIC CORNICE BRAKE. Manufactured by THOMAS & ROBINSON, Cincinnati, O. Send for Circulars.

MACHINERY.

IRON & WOOD WORKING MACHINERY OF EVERY DESCRIPTION.

Cold Rolled Shafting.

HANGERS, PULLEYS, COUPLINGS, BELTING, &c. Send for Illustrated Catalogue and Price List.
GEORGE PLACE,
121 Chambers & 103 Reade Sts. N. Y. City.

Machinists' Tools,

All sizes at low prices. E. GOULD. Newark, N. J.

Munn & Co's. Patent Offices.

Established 1846.

The Oldest Agency for Soliciting Patents in the United States.

TWENTY-NINE YEARS' EXPERIENCE.

MORE PATENTS have been secured through this agency, at home and abroad, than through any other in the world.

They employ as their assistants a corps of the most experienced men as examiners, specification writers and draftsmen that can be found, many of whom have been selected from the ranks of the Patent Office.

SIXTY THOUSAND inventors have availed themselves of Munn & Co.'s services in examining their inventions, and procuring their patents.

MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine inventions, confer with inventors, prepare drawings, specifications, and assignments, attend to filing applications in the Patent Office, paying the government fees, and watch each case step by step while pending before the examiner. This is done through their branch office, corner F and 7th streets, Washington. They also prepare and file caveats, procure design patents, trademarks, and reissues, attend to rejected cases (prepared by the inventor or other attorneys), procure copyrights, attend to interferences, give written opinions on matters of infringement, furnish copies of patents, and, in fact, attend to every branch of patent business both in this and in foreign countries.

A special notice is made in the SCIENTIFIC AMERICAN of all inventions patented through this Agency, with the name and residence of the patentee. Patents are often sold, in part or whole, to persons attracted to the invention by such notice.

Patents obtained in Canada, England, France, Belgium, Germany, Russia, Prussia, Spain, Portugal, the British Colonies, and all other countries where patents are granted at prices greatly reduced from former rates. Send for pamphlet pertaining specially to foreign patents which states the cost, time granted, and the requirement for each country.

Copies of Patents.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a 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 the laws and 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 handbook of reference for everybody. Price 25 cents, mailed free. Address

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

BRANCH OFFICE—Corner F and 7th Streets Washington D. C

Advertisements,

Back Page - - - - - - $1.00 a line.
Inside Page - - - - - - 75 cents 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 Friday morning to appear in next issue.

WILLIAMSON'S
TANNATE of SODA
Prevents Scale in Boilers. 25 lb. boxes, $6.25, C. O. D. D. D. WILLIAMSON, 268 West St., New York.



Upright
Stationary Engines,
Strong, Simple, Safe, and Serviceable!
4, 6, and 8 Horse Power.
GRIFFITH & WEDGE,
Zanesville, Ohio.

Diamond Solid Emery Wheels.
PRICES—4x¼, $1.25; 8x1, $2.25; 12x1½, $5.50; 16x2, $12.50; 18x2, $16.00; 30x2, 19.50; 34x3, $42. All other sizes at proportionate prices. Fast cutting, free from glazing, they are the best Solid Emery Wheels. Give diam. of holes in your order for wheels. Emery Grinders unequaled by any in the world. Address AMERICAN TWIST DRILL CO., Woonsocket, R. I.

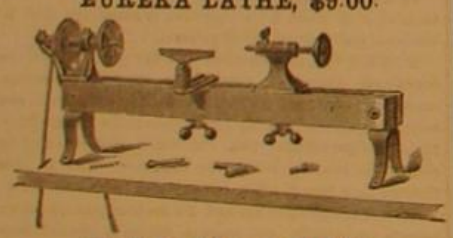
EMERY
WELLINGTON MILLS.
GEO. H. GRAY & DANFORTH, BOSTON, IMPORTERS

AMERICAN
Journal of Science,
DEVOTED TO
CHEMISTRY, PHYSICS, GEOLOGY, MINERALOGY, NATURAL HISTORY, ASTRONOMY, METEOROLOGY, ETC.
PUBLISHED MONTHLY, AND MAKING TWO VOLUMES A YEAR OF OVER 450 PAGES EACH.
Editors and Proprietors: J. D. DANA, B. SILLIMAN, and E. S. DANA.
Associate Editors: Professors GRAY and GIBBS, of Cambridge; NEWTON, JOHNSON, BRUSH and VERRILL, of Yale; PICKERING, of Boston.
☞ Subscription price $6.00 a year, with 12 cents for prepaid postage.
Address, DANA & SILLIMAN, New Haven, Ct.

IMPROVEMENT IN THE MANUFACTURE OF WHISKY.—A gentleman, who has just taken out a patent for the above in the United States, would be glad to meet with a party or company who would either put the invention before Distillers, with a view to its disposal, or buy up Patentee's rights. For copies of analysis and full particulars, apply, by letter or personally, to THOS. B. O'SULLIVAN, Mechanicville, Saratoga Co., N.Y.

Diamonds and Carbon
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., New York.

EUREKA LATHE, $9.00.



With Foot Power, $15.00.
We have also a SCROLL SAW ATTACHMENT for $5.00. Send for circular to the manufacturers, EUREKA MANUFACTURING COMPANY, 111 Devonshire St., Boston, Mass.

WROUGHT IRON BEAMS & GIRDERS
THE UNION IRON MILLS, Pittsburgh, Pa.—The attention of Engineers and Architects is called to our improved Wrought-Iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided. We are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph, address Carnegie Brothers & Co., Union Iron Mills, Pittsburgh, Pa.

FOR CHARLIE'S PRESENT
Get the TOM THUMB TELEGRAPH, put up in neat little boxes containing working sounder, telegraph apparatus, battery, key, wires, and chemicals, complete, ready for operation. Price $5.50, with full directions. Can be seen in practical operation at the "Scientific American" office, 37 Park Row; at Packard's Business College, 805 Broadway; and many other places. Besides telegraphing, many beautiful experiments can be made, such as the magnetic curves, electric light, lifting weights, making compasses, magnetizing knives, electro-plating, &c. F. C. BEACH & CO., makers, 246 Canal St., near Center St., New York.

PERFECT
NEWSPAPER FILE.
The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription, "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address MUNN & CO.,
Publishers "SCIENTIFIC AMERICAN."

$5 to $20 per day at home. Samples worth $1 free. STINSON & Co., Portland, Me.

An Unprecedented Success.
THOUSANDS ALREADY SOLD.
Wrinkles and Recipes
Pronounced, by the best Scientific and Mechanical Authorities, the most valuable Handbook ever compiled for Engineers and Mechanics of every class.
Contains the CREAM of the Practical Mechanism Series by Joshua Rose, which has appeared during the past year in the SCIENTIFIC AMERICAN—Useful new papers on mechanical operations by distinguished experts—Hundreds of knotty points in Mechanics and Engineering fully explained in terms that every one can understand. No high mathematics or intricate formulæ. Recipes of all kinds for industrial processes, for cements, for making simple instruments, etc. Hints for farmers and for housekeepers. The whole is a collection of the very best practical hints and suggestions which, for several years, have been sent to the SCIENTIFIC AMERICAN by its correspondents and contributors, together with an immense variety of new material.
☞ Price $1.50, post paid. Handsomely bound; 250 pages. Large pocket-book size.
Wrinkles and Recipes and Scientific American for one year $4.30.
Address R. N. MUNN, Publisher,
P. O. Box 772. 37 Park Row, New York.

PATENT COLD ROLLED SHAFTING.
The fact that this shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS,
Try Street, 2nd and 3rd Avenues, Pittsburgh, Pa.
190 S. Canal Street, Chicago, Ill.
☞ Stocks of this Shafting in store and for sale by
FULLER, DANA, & FITZ, Boston, Mass.
GEO. PLACE & CO., 121 Chambers St., N.Y.
PIERCE & WHALING, Milwaukee, Wis.

THE
Manufacturer and Builder.
The best and cheapest mechanical and scientific journal in the world. Edited by Prof. P. H. Vander Weyde. Each number contains treasures of information on all practical and scientific subjects. Subscription price $2.00 per year. Postage one cent a month extra. Ten thousand (10,000) applications wanted for specimen copies, which will be furnished. **Free. Liberal commissions to agents.** Address AUSTIN BLACK, Pub'r,
P. O. Box 4379. 37 Park Row, New York.



"Lowest Priced and BEST."
Do Your Own Printing!
$3 Press for cards, labels, envelopes, etc. Larger sizes for larger work.
Business Men do their printing and advertising, save money and increase trade. Pleasure and profit in Amateur Printing. The Girls or Boys have great fun and make money fast at printing. Send two stamps for full catalogue of presses, type, etc., to the Manufacturers,
KELSEY & CO., Meriden, Conn.

$42 A WEEK.—Agents wanted everywhere. Business permanent and first-class. For further particulars, address
J. KENNEDY & CO., Richmond, Ind.

ROGERS' TANNATE OF SODA BOILER SCALE PREVENTIVE. JOS. G. ROGERS & CO., Madison, Ind.
☞ Send for book on Boiler Incrustation.

The NILES ENGINE.
The LATEST and the BEST. Engine independent from boiler on the same base. 2, 4, 6, 8, and 10 Horse Power. Warranted the best Semi-Portable Engine in the United States.
Send for Illustrated Price List.
Niles Tool Works,
Hamilton, Ohio.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.
HARTFORD, CONN.

Schlenker's Stationary AND Revolving-Die Bolt Cutters,
MANUFACTURED BY THE
HOWARD IRON WORKS,
BUFFALO, N.Y.
☞ Send for Circular.



Niagara Steam Pump Works
ESTABLISHED 1862.
CHARLES B. HARDICK,
No. 23 Adams Street,
BROOKLYN, N.Y.

IRON PLANERS,
ENGINE LATHES, DRILLS, &c. Send for Price List.
NEW HAVEN MANUFACTURING CO.,
New Haven, Conn.

TOULMIN'S ELLIPSOGRAPH—Draws ellipses in ink from 6-10 to 8 inches. See Scientific American, Oct. 9, 1875. Boxed, with lock and key, for $12.50. Larger sizes to order. TOULMIN & CO.,
Lock Box 152, Washington, D. C.

BUILDERS Send for Catalogue of books. BICKNELL & CO., 27 Warren, N.Y.

HASKELL'S THREE CYLINDER PUMP—Hand or Power. Cheaper than a Steam Pump. Will outwear a Rotary Pump—do more work, with less power, than any other pump. Not liable to get out of order. Any blacksmith can repair it. Adapted to any kind of hard work. Send for Circular.
CHASE MACHINE COMPANY, Boston, Mass.

Todd & Rafferty Machine Co.
MANUFACTURERS OF
The celebrated Greene Variable Cut-Off Engine; Lowe's Patent Tubular and Flue Boilers; Plain Slide Valve Stationary, Hoisting, and Portable Engines. Boilers of all kinds. Steam Pumps, Mill Gearing, Shafting, &c., Silk Tow Oakum, Bagging, Rope, Flax, and Hemp Machinery. Agents for the New Haven Manufacturing Co.'s Machinist's Tools; for Judson's Governors and Stop-Valves; Sturtevant Blowers; and Differential Pulley-Blocks. WAREROOMS, 10 BARCLAY STREET, NEW YORK. WORKS PATERSON, NEW JERSEY.

DAMPER REGULATORS **BEST** AND LEVER GAGE COCKS.
MURRILL & KEIZER, 44 Holliday St., Balt.

THE
Scientific American SUPPLEMENT. 1876

$5 a year by mail, post-paid. Send 10 cents for Specimen Copy.

TO ILLUSTRATE AND DESCRIBE the many interesting themes and objects presented in the GREAT CENTENNIAL INTERNATIONAL EXPOSITION OF 1876, and also to meet the wants of that large class of readers who desire an increased supply of Scientific Information, particularly of the more Technical and Detailed character, we shall issue a SPECIAL PUBLICATION, entitled the SCIENTIFIC AMERICAN SUPPLEMENT, to be printed weekly during the Centennial year of 1876, and, perhaps, permanently thereafter. Each number will have sixteen large quarto pages, issued weekly, printed in the best style, uniform with the SCIENTIFIC AMERICAN, but separately paged.

The SCIENTIFIC AMERICAN SUPPLEMENT, in addition to the special matter pertaining to the International Exposition, will embrace a very wide range of contents, covering the most recent and valuable papers by eminent writers in ALL THE PRINCIPAL DEPARTMENTS OF SCIENCE AND USEFUL KNOWLEDGE, to wit:

1.—**Chemistry and Metallurgy.**—Embracing New Chemical Discoveries, Improvements, and Processes, with engravings. New Processes of Working Iron, Steel, Lead, Copper, Gold, Silver, and the Various Metals, with engravings of New Apparatus, New Information, etc.

2.—**Mechanics and Engineering.**—The latest and best papers upon Steam Engineering, Railway Engineering, Mining, and Civil Engineering, Mill Work, Textile Industry, with engravings and working drawings.

3.—**Electricity, Light, Heat, Sound.**—Latest Improvements in Telegraphy, Telegraph Engineering; Improvements in Galvanic Batteries, Electric Engines, New and Useful applications of Electricity in the Arts, with engravings.

4.—**Architecture.**—Examples of the best New Structures, with details and drawings.

5.—**Technology.**—New and Useful Invention and Discoveries relating to THE ARTS: Improvements in Photography, Printing, New Implements, New Machinery, New Processes, New Recipes, Improvements pertaining to Textile Industry, Weaving, Dyeing, Coloring, New Industrial Products, Animal, Vegetable, and Mineral—with engravings.

6.—**Agriculture, Botany, and Horticulture.**—New and Useful Information in all branches of Agriculture, Descriptions of New Plants, Trees, Shrubs, and Flowers, New, Useful, and Interesting Facts in relation to Cultivation, Propagation—with engravings.

7.—**Rural and Household Economy.**—The Latest Information concerning Building Materials, New and Valuable Recipes, and a great variety of Miscellaneous Information pertaining to Rural and Household affairs—with engravings.

8.—**Materia Medica, Therapeutics, Hygiene.**—Exhibiting the progress of Medical Science in various branches; New Medicinal preparations, New Health Appliances, and much Interesting Information.

9.—**Natural History and Zoology.**—The Latest Investigations, Discoveries, and most Interesting Information in this department of Science.

10 & 11.—**Meteorology, Terrestrial Physics, Geography.**—Accounts of Interesting Atmospheric and Terrestrial Phenomena, Travels, Explorations and Discoveries, etc.

12.—**Geology and Mineralogy.**—The Latest and most Interesting Geological Investigations and Reports, and New Discoveries.

13.—**Astronomy.**—Recent Interesting Discoveries and Information, with Reports of Astronomical Phenomena, Progress, New Instruments, etc.

TERMS:—Scientific American Supplement, One year, post-paid, $5.00; half year, $2.50 three months, $1.25. Three copies, one year, $13.50; five copies, $20.00; ten copies, $38.00. One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year post-paid, $7.00.

Address MUNN & CO., Publishers, 37 Park Row, New York.

☞ T. V. Carpenter, Advertising Agent. Address Box 773, New York city.

NOYE'S
Mill Furnishing Works
are the largest in the United States. They make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys and Gearing, specially adapted to flour mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N.Y.

THE BEST INJECTOR
For Locomotive and Stationary Boilers.
FRIEDMANN'S PATENT.
Over 15,000 Now in Use Here and in Europe
Throws more and hotter water, with less steam, than any others. It has two Waterways, fixed Nozzles, and no movable parts to get out of order.
NATHAN & DREYFUS, Sole Manufacturers,
108 Liberty St., New York.
☞ Send for Catalogue.

THE HEALD & SISCO
Patent Centrifugal Pumps,
VERTICAL & HORIZONTAL.
First Premiums at New Orleans, Cincinnati, and New York. "*Medal of Special Award*," American Institute, 1872.
Perfect satisfaction guaranteed. The cheapest, simplest, strongest, most efficient and popular Pump in use, for emptying Dry-docks, Coffer-dams, etc., and for use in Paper Mills, Tanneries, and Factories. STEAM PUMPS very low, for Wrecking, Dredging, Irrigating, etc. Illustrated pamphlet, free. Nearly 1,000 references to actual customers. 31 pages first class testimony. Address
HEALD, SISCO & CO. Baldwinsville, N.Y.

Portland Cement,
From the best London Manufacturers. For sale by JAMES BRAND, 55 Cliff St., N.Y.
A Practical Treatise on Cement furnished for 25 cents.

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 Imbaeuser & Co., of New York, was decided in my favor, June 10, 1874. Proceedings have been commenced against Imbaeuser & Co. for selling, contrary to the order of the Court, and especially the clock with a series of springs in the cover, and marked Pat'd Oct. 20, '74. Persons using these, or any other clocks infringing on my Patent, will be dealt with according to law.

THE NATIONAL
Steel Tube Cleaner.
For Cleaning Boiler Tubes.



PATENTED JULY 28 1874.
Adopted by U. S. Navy. For sale by dealers. Send for Circular.

NON-COMBUSTIBLE STEAM BOILER & PIPE
COVERING
WITH "AIR SPACE" IMPROVEMENT.
Saves 10 to 20 per cent. CHALMERS SPENCE CO., foot E. 9th St., N.Y.; 1202 N. 2nd St., St. Louis, Mo.

THE
SCIENTIFIC AMERICAN
For 1876.
The Most Popular Scientific Paper in the World.
THIRTY-FIRST YEAR.
Only $3.20 a year including Postage.
☞ Send 10 cents for Specimen copy.

THE SCIENTIFIC AMERICAN, now in its 31st year, enjoys the widest circulation of any weekly newspaper of the kind in the world. A new volume commenced January 1, 1876. Published weekly. Now is the time to subscribe and to form clubs.

THE CONTENTS OF THE SCIENTIFIC AMERICAN embrace the latest and most interesting information pertaining to the Industrial, Mechanical, and Scientific progress of the world; Descriptions, with beautiful Engravings, of New Inventions, New Implements, New Processes, and Improved Industries of all kinds; Useful Notes, Recipes, Suggestions and Advice, by Practical Writers, for Workingmen and Employers, in all the various arts.

EVERY NUMBER contains sixteen large quarto pages, elegantly printed and illustrated with many engravings. The year's issue contains 832 large pages, equal to *four thousand* book pages, at a cost, including postage, of only $3.20 a year to the subscriber.

Engineers, Mechanics, Telegraphers, Inventors, Manufacturers, Chemists, Photographers, Physicians, Lawyers, Clergymen, Teachers, and People of all Professions, will find the SCIENTIFIC AMERICAN most useful and valuable. Its pages teem with interesting subjects for thought, study, and conversation, and are an unfailing source of new and instructive information. As an Instructor and Educator, the SCIENTIFIC AMERICAN has no equal. It is promotive of knowledge and progress in every community where it circulates. It should have a prominent place in every Household, Reading-Room, and Library.

☞ *Specimen copies sent, prepaid, on receipt of 10 cents.*

TERMS OF SUBSCRIPTIONS.—POSTAGE PAID BY US.

One copy Scientific American, one year	$3.20
One copy Scientific American, six months	1.60
One copy Scientific American, three months	1.00
One copy Scientific American and one copy Scientific American Supplement, both for one year, post-paid	7.00
One copy Scientific American, one year, and one copy Science Record	5.20

☞ We make a liberal discount and give advantageous premiums to those who form Clubs or procure Subscriptions. A beautifully illuminated Subscription List, also Prospectus and Rates, *sent free.* Address

MUNN & CO.
37 PARK ROW, NEW YORK.

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

SCIENTIFIC AMERICAN

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

Vol. XXXIV.—No. 8. [NEW SERIES.] NEW YORK, FEBRUARY 19, 1876. [$3.20 per Annum. (POSTAGE PREPAID.)

IMPROVED DUMPING CART.

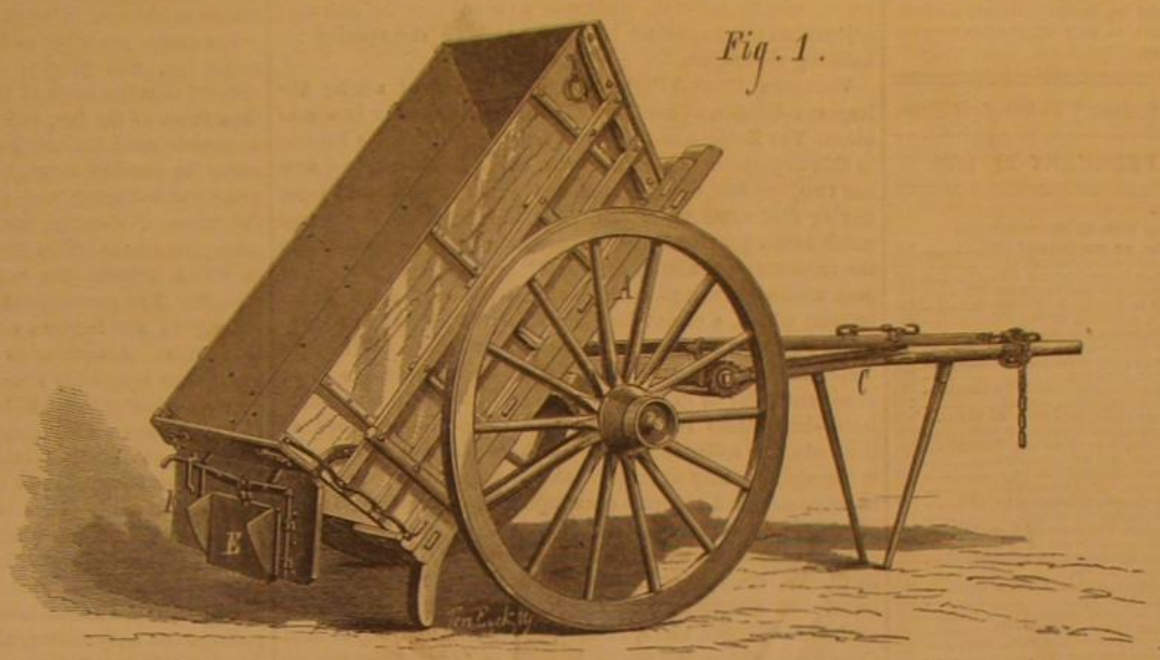
In the annexed engravings is illustrated a novel form of dumping wagon, which is so constructed that its load may be dumped by tilting the body of the vehicle rearward in the ordinary manner, or the load may be shot down an inclined chute attached to the rear of the body, the front portion of the latter being raised to facilitate the escape. The advantage of the chute attachment, for coal carts more especially, is obvious, since it admits of the load being delivered directly into the coal hole without being partially dumped into the street and gutter, or of being conducted at once to coal holes situated some distance back from the curb, thus saving considerable shoveling or transportation of the fuel in baskets.

A is an extra frame, which is jointed to the rear part of the shaft frame and rests on a pillow block on the axle, tilting thereon to dump in the ordinary way, as shown in Fig. 1. The front end of said frame is fastened to the shaft frame by hooks and staples. The rear end has hinged to it the bed frame of the box, so that the latter may be caused to rise at its front portion when the toggle bar, B, is elevated by means of a chain leading to the ratchet lever and shaft, C In this position, Fig. 2, the wagon is ready to deliver its contents to the chute, D, through the small gate, E. This gate has sides which form a portion of the chute, and is fitted in the main gate, F, Fig. 1, which last opens upward on hinges and is fastened by slide bolts and staples, the same devices combined with a compound lever serving to fasten both gates. The suspending rods, G, are connected to the chute by long staples, which allow the chute to be shifted along the rod to adjust it on the axle under the cart body for transportation.

The toggle bar, B, is jointed to the box frame so as to swing back. It can be adjusted over the chute when the latter rests on the axle; and by tightening its chain, the chute will be securely held in place. The end frame is provided with striking pieces, to drop on the ground and sustain the shocks when dumping in the ordinary way.

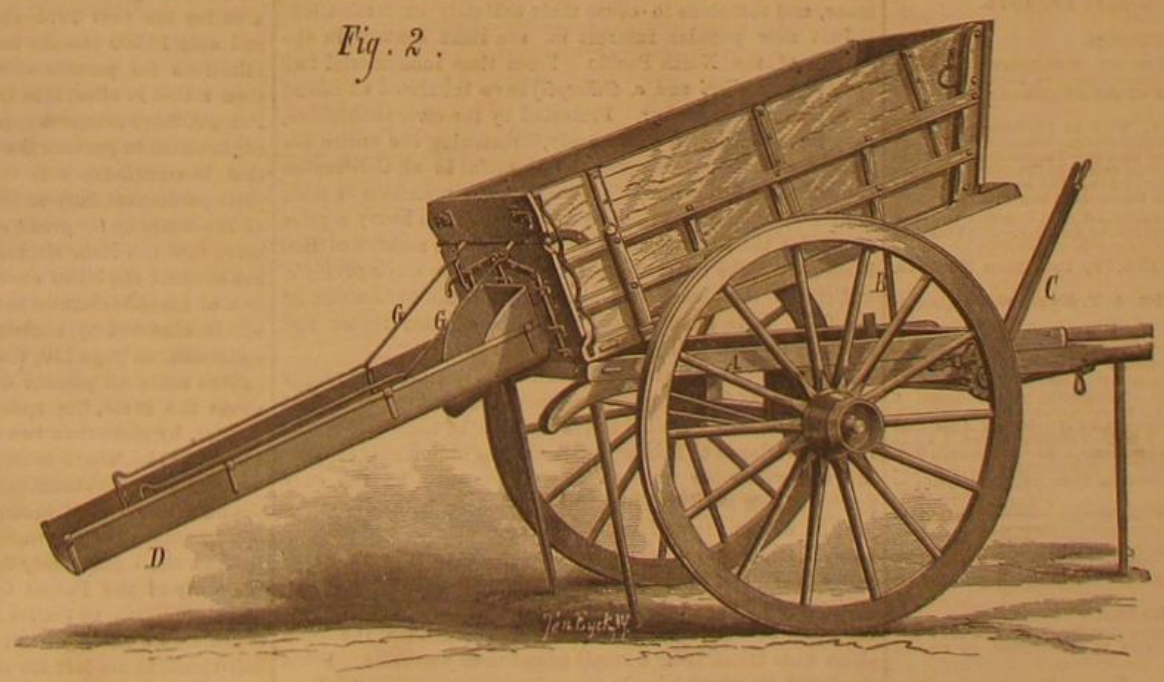
Patented through the Scientific American Patent Agency, November 30, 1875. For further information address the inventor, Mr. George B. Wiestling, engineer and superintendent, Mont Alto Railroad Company, Mont Alto, Pa.

Fig. 1.



WIESTLING'S DUMPING CART.

Fig. 2.



WIESTLING'S DUMPING CART.

The Death of the Captive Gorilla.

The only captive gorilla in existence recently died in the Zoölogical Gardens, in Dresden. The animal, a female, was long supposed to be a chimpanzee, and it was only lately that, to the surprise of all naturalists, her gorilla characteristics were recognized. The story of the death scene of this almost human monkey is a remarkable one, since it goes to show that the animal was the possessor of feelings hitherto deemed absent among the brutes. Says a writer in the London *Echo*: "As Director Schopf (the director of the gardens) leaned over his favorite, the ape drew him toward her, placed her arm around the neck of her kind friend, and looked at him for some time with clear and tranquil eyes; she then kissed him three times, with short intervals between each salute, motioned to be laid upon her couch, gave her hand to Schopf—as though bidding farewell to a companion of many happy years—and slept never to wake again."

A VEIN of galena twenty-seven feet thick has recently been struck in the Yosemite mine, Bingham cañon, Utah.

Photographing Sound.

Professor Vogel, in a letter to the *Photographer*, Philadelphia, Pa., says that König, at Paris, has constructed an apparatus, consisting of a little drum, over which is stretched a very elastic skin. A stream of gas let through this drum will burn as usual; but as soon as a tune (by singing) strikes the skin stretched over the drum, the gas light commences to shake in a wonderful manner; and if we look at it in a rotating mirror, we observe peculiar figures, which change according to the different notes; and by using a burning gas producing a light of great chemical effect, we can photograph these peculiar figures. What kind of gas will answer for this purpose is still an undecided question, but this much is certain, there are in this respect great problems yet to be solved; we may succeed, perhaps, in photographing speeches instead of stenographing them as usual.

Ten Millions of Gold in One Pile.

A San Francisco correspondent of the Philadelphia *Press* says that a well authenticated rumor is prevalent in San Francisco that the great bonanza kings, Messrs. Flood, O'Brien, Mackay, and Fair, are going to send one hundred and fifty tuns of the gold and silver bullion from their Consolidated Virginia Mine to the Centennial, and pile up the glittering bars in some conspicuous spot, so that all the world can see what one mine produces in five months! The value of the bars will be ten millions of dollars in United States gold coin! "If the idea is carried out, it will be the grandest sight among a million of grand sights, and I venture to say more people will visit this mountain of wealth than any other single thing in the buildings. Five millions of the bullion is now boxed up for shipment, and the balance will be ready in due season. Few people ever saw such a vast sum as ten millions of dollars in gold and silver, all in one or several piles; and I think the proposition of Messrs. Flood & Co., if carried through, will add much to the charm, the wonder, the *éclat*, and the success of the Exposition."

Torture by Electricity.

The punishment inflicted on garotters and on criminals who perpetrate brutal crimes on old people or on women, in England, is a whipping well laid on, and the effect is said to surpass any other means of preventing such crimes hitherto devised. A recent English writer thinks that our suggestion relative to killing murderers by the electric shock might be modified to suit the cases abovementioned; and he wants the legislature to authorize the substitution of the battery for the lash, so as "to produce absolutely indescribable torture (unaccompanied by wound or even bruise), thrilling through every fiber of such miscreants." No doubt a strong current, properly applied, would give infinitely more pain than a sound thrashing; but unfortunately, unlike the latter, its after effects might be serious. The lash does no permanent physical injury; but a too powerful current might shatter the nervous system and leave the possessor possibly paralyzed, thus condemning the sufferer to a penalty even worse than immediate death.

American Meat in England.

The London *Farmer* bears testimony to the remarkable success which has been met with in transporting American beef to England, from New York city. Our contemporary says: "As the quarters were stripped of their canvas wrappers and hooked up, the people gathered about, looked, and handled, and had to admit that, in quality and in clean marketable condition, the meat was equal to anything else on sale." Four carcasses were sent over in one recent lot, the average weight of which was 1,200 lbs. The whole weight of the consignment was 50 tuns, and it met with a quick sale at 14 cents a pound. In the same refrigerating room the carcasses of 20 pigs were brought over in excellent condition, and fetched 12 cents a pound. We have already explained the means of cooling the storage compartment, the principle being simple, the maintenance of a dry, cold atmosphere. The "Roast Beef of Old England," we fear, will find a dangerous rival before long in the "Roast Beef of Young America;" for the facilities for accommodating cattle here in New York, have been greatly increased of late, and further enlargements of considerable magnitude are contemplated, so that, if this refrigerator system, thus far tested in a small way, continues to prove so efficacious, and its results remunerative, our enterprising stock dealers will soon begin to ship whole steamer loads of beef and pork to transatlantic markets, where beef has become scarce owing to the cattle disease.

Novel Well Boring.

In various parts of Scandinavia the boring of artesian wells is done by means of a jet of water. A description of the process is given in Dingler's *Polytechnisches Journal*. The stones, in the diluvial ground, which are a hindrance to such operations, are thrust to the one side if small; if large, they are shattered with dynamite, and the boring is thereafter proceeded with. In Kiel 22 artesian wells were thus bored during the past six months

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

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

TERMS.

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

Club Rates.

Ten copies, one year, each $2 70, postage included.....$27 00
Over ten copies, same rate each, postage included..... 2 70

☞By the new law, postage is payable in advance by the publishers, and the subscriber then receives the paper free of charge.

NOTE.—Persons subscribing will please to give their full names, and Post Office and State address, plainly written, and also state at which time they wish their subscriptions to commence, otherwise the paper will be sent from the receipt of the order. When requested, the numbers can be supplied from January 1st, when the volume commenced. In case of changing residence, state former address, as well as give the new one. No changes can be made unless the former address is given.

If any of our readers fail to receive their numbers regularly; if the direction is not plainly written; if premiums are not received; or if there is fault of any sort at this office, we will thank our friends to send us postal card complaints, and repeat the same, if need be, until the remedy is effected. *Do not hesitate to complain.* We desire to keep all matters between ourselves and patrons right and satisfactory.

VOLUME XXXIV., No. 8. [NEW SERIES.] *Thirty-first Year.*

NEW YORK, SATURDAY, FEBRUARY 19, 1876.

Contents.

(Illustrated articles are marked with an asterisk.)

Aniline green, dissolving (1)..... 122
Answers to correspondents*..... 122
Aristocracy of all, the..... 113
Bacteria in perspiration..... 118
Beware of him..... 117
Blowpipe, a new*..... 115
Boiler for steam heater (49)..... 123
Brush binder*..... 118
Business and personal..... 122
Business prospects of 1876..... 117
Butter in Denmark, artificial..... 114
Cane, bending wild (22)..... 122
Carpet rag looper*..... 118
Cement, revivifying (34)..... 123
Cistern, a walled* (35)..... 123
City, an ancient..... 118
Coinage, an international..... 115
Combustion of coal, spontaneous. 115
Compasses on iron ships (7)..... 122
Countersink for boring tools*..... 119
Cow, the..... 112
Drying house for lumber (30)..... 123
Drying houses (43)..... 122
Dumping cart*..... 111
Earth's motion, the..(13) 122, (46) 123
Electricity applied to organs*..... 117
Electricity, torture by..... 111
Electro-magnets (2)..... 122
Electro-motors, organic..... 118
Engine and boiler, running an (26) 123
Engine for sawmill (20)..... 122
Engines for boats (44)..... 123
Engines, packing (25)..... 123
Engine valves, etc. (24)..... 122
Etheric phenomenon, the*..... 116
Eyes, fatigue of the (50)..... 123
Filling for pine knots (31)..... 123
Fruit and ice house (5)..... 122
Gates*..... 119
Glycerin soap (4)..... 122
Gold ore, pyrites in (12)..... 122
Gold, ten millions of..... 111
Gorilla, death of a..... 111
Heater drip cocks (45)..... 123
Heating rooms by steam (32)..... 123
Hinges*..... 119
Household devices, etc.*..... 119
India, the population of..... 114
Iron, coloring (51)..... 123
Iron mold stains..... 114
Itching from frost bites..... 116
Ivory, repairing cracked (11)..... 122
Lamp burner, a safe..... 114
Lathe, proportions of (27)..... 123
Lenses, curvature of (3)..... 122
Lenses for telescope (36)..... 123
Lodestones and magnets (9)..... 122
Meat in England, American..... 111
Nails, splitting of the (52)..... 123
Navy, entering the (10)..... 122
New books and publications..... 120
Oil city, the original..... 116
Opium dangers..... 113
Organ, improvements in the..... 113
Patent decisions, recent..... 120
Patent office, progress of the..... 112
Patent office report for 1875..... 120
Patents, American and foreign... 121
Patents, list of Canadian..... 124
Patents, official list of..... 123
Patterns, thickening (47)..... 123
Pendulums, difference in (28)..... 123
Photographing sound..... 111
Pleiades, the stars of the (15)..... 122
Potatoes, desiccated (54)..... 123
Power outdoors, conveying (38).. 123
Recipes, useful..... 117
Reservoir, siphon from a (17)..... 122
Roofs, tin (19)..... 122
Sash fastener, improved*..... 118
Sawing chair rockers (37)..... 123
Sawing, power for, etc., (39)..... 123
Sawmill gearing (29)..... 123
Scientific apparatus exhibition... 116
Screw-threading tools*..... 115
Sea lions..... 112
Sewer gas trap, improved*..... 118
Smoke stack, underground (33)..... 123
Sprinkler for extinguishing fires*. 114
Square, describing a* (48)..... 123
Steel, drilling hardened (18)..... 122
Sulphur in the United States (14). 122
Sulphur mines (8)..... 122
Telegraphic value of language ... 114
Telescope, astronomical (40)..... 123
Telescope, making a (41)..... 123
Tidal wave, the (15)..... 122
Toothache, carbonate of soda for 115
Vinegar, to make (6)..... 122
War ship, a remarkable..... 117
Water, rain, to settle (53)..... 123
Weather prophets, Kentucky..... 113
Well boring, novel..... 111
Woodworking machinery*..... 114
Zoölogical laboratory, new..... 114

THE SCIENTIFIC AMERICAN SUPPLEMENT.

No. 8.

For the Week ending February 19, 1876.

TABLE OF CONTENTS.

I. THE INTERNATIONAL EXHIBITION OF 1876. With 2 engravings.—The Judges' Pavilion.—The Women's Pavilion.—What New York will show.—Brazil at the Exhibition.—British View of the Exhibition.—Thirty Exhibition Notes.

II. MECHANICS AND ENGINEERING. With 27 illustrations.—Snow Plows of Central Pacific Railroad, with engraving.—Dredging Machinery for Lake Fucino, with 18 engravings and figures.—Tunnel under English Channel, 2 engravings.—Resistance of Slag Bricks to Crushing.—Theory of Stream Lines, by PROFESSOR FROUDE, 7 figs.—The Inflexible and her Armament, 3 engravings.—Raising the Vanguard, 1 engraving.

III. CHEMISTRY, ETC.—Reagent for Uranium.—Use of Cuprous Oxide.—Constitution of the Phosphates.—Extraction of Sulphur.—Hot Blast Pig for Iron.

IV. LESSONS IN MECHANICAL DRAWING. By PROFESSOR MACCORD, with 16 illustrations.

V. MEDICAL. New Sphygmograph, by DR. A. T. KEYT, with 6 illustrations.

VI. PROCEEDINGS OF SOCIETIES. Entomological Society of London.—Royal Geographical Society. African Exploration.—Royal Society.—Honor to DR. HOFFMAN.—French Academy. Award of Prizes.

VII. TECHNOLOGY. With 18 illustrations.—Use of Raw Materials.—Cement for Fastening Rubber to Metal.—Registering Thermometer. 2 figs.—Coal Dust and Petroleum Furnace, 1 fig.—Improvement in Bridges, by Captain Eads, 1 fig.—Hydrocarbon Furnace, 2 figs.—Drying Apparatus for Tobacco, 1 fig.—Swinging Berths, 2 figs.—Velocipede Sled, 1 fig.—Fast Ice Velocipede, 1 fig.—Aquatic Velocipede, 1 fig.—Edinburgh Tricycle, 1 fig.—Bicycle Riding.—New Hayrick Apparatus, 2 figs.—A Mechanical Deer.—Uses of Diamonds.—Modern Uses of Goose Quills.—Chinese Acrobats.

VIII. MISCELLANEOUS.—Stenographic Exhibition.—Mid-Ocean Telegraph Stations.

The SCIENTIFIC AMERICAN SUPPLEMENT is uniform in size with the 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 SCIENTIFIC AMERICAN SUPPLEMENT will be sent together for one year, postage free to subscribers, on receipt of $7.00.

Remit by postal order. Address

MUNN & CO., PUBLISHERS,
37 Park Row, New York.

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

The Cow.

If civilized people were ever to lapse into the worship of animals, the cow would certainly be their chief goddess. What a fountain of blessing is a cow! She is the mother of beef, the source of butter, the original cause of cheese, to say nothing of shoe horns, hair combs, and upper leather. A gentle, amiable, ever yielding creature, who has no joy in her family affairs which she does not share with man. We rob her of her children, that we may rob her of her milk, and we only care for her that the robbery may be perpetuated.—*Household Words.*

SEA LIONS.

The crowds that hang around the sea lions' enclosure at Central Park are a standing proof of popular interest in these remarkable animals. The whole houseful of land lions, tigers, and other carnivora, near by, commands a smaller audience; and even the monkeys are neglected for the yelping pack of semi-aquatic performers without. That the exclamations of the onlookers should often betray the haziest possible notion of the real character of sea lions and their place in the animal kingdom is not surprising; even professed naturalists admit a plentiful lack of knowledge with regard to them, as their natural history has been studied, for the most part, only in a limited and fragmentary way, scarcely a single species having been fully investigated. Millions have been slaughtered for their skins, but those engaged in the murderous traffic care nothing for the scientific interests of their victims. Naturalists of exploring expeditions have made isolated observations and brought home a few skins and skeletons. But for connected and expended studies of these commercially valuable and scientifically interesting creatures, we are indebted mainly to the report of Mr. Elliott, who was sent out by our government to investigate the sealing and other resources of our lately purchased islands in the North Pacific, and to the observations of Captain Musgrave, who beguiled the tedium of a twenty months' enforced sojourn on the Auckland Isles by watching the species inhabiting that region.

Visitors at Central Park have the privilege of seeing the largest collection of sea lions ever brought together in a museum. The Zoölogical Society of London, which leads Europe in this department, has had only three live ones, and now has two, the first one (also the first ever seen alive in Europe) having died some years ago. Nor are European museums much better provided with dead specimens. But thanks to the exceeding popularity of "seal" fur, a lively interest has been aroused in regard to the animals which furnish it: an interest which, a recent English writer hopes, will be fruitful in putting a stop to the hideous and needless barbarities which threaten the speedy extinction of this valuable class of sea animals: or at least, if they must submit to immutable laws—immutable lawlessness, rather—and be gathered to the dodo, the solitaire, and the northern manitee of two centuries ago, we may at least be able to point to ample remains in museums, and accurate drawings and descriptions in scientific and popular treatises.

According to the naturalist just referred to, Mr. John Willis Clarke, there are nine well authenticated species of sea lions, thus distributed: in the North Pacific three, *ottaria ursina*, *o. Gillespii*, and *o. Stelleri;* in the South Pacific, around Cape Horn, and in the South Atlantic as far north as Rio de la Plata, two species, *o. jubata* and *o. Falklandica*; around the Cape of Good Hope and the adjacent islands, one, *o. pucilla* or *antarctica*; around Australia and New Zealand, two, *o. Hookeri* and *o. labata*; and around Kerguelen's Land, one, *o. gazella.*

Curiously, sea lions are unknown in the Atlantic except in the extreme south, though the Atlantic abounds in true seals, from which the sea lions differ in several particulars. The more obvious difference is the possession of external ears, which seals lack. They have besides a long, mobile, flexible neck, whereas in seals the neck is short and scarcely perceptible. Then their limbs are still available for locomotion on land, while those of seals have lost all power of supporting the body out of water. Lastly, they possess the fatal gift of under fur, which gives them their commercial importance, and threatens to cause their untimely extermination.

Just now popular interest in sea lions centers in the species of the North Pacific. From time immemorial two species (*o. stelleri* and *o. Gillespii*) have inhabited an island in San Francisco harbor. Protected by the civic authorities, they have multiplied enormously, threatening the entire destruction of the salmon once so plentiful in all Californian rivers. The fish commissioners demand a reduction of their numbers, urging that the loss of salmon is too heavy a price to pay for the entertainment of the pleasure seekers of San Francisco. The latter deny the guilt of the city's *protégés*, and charge the obnoxious Chinaman with the destruction of the fish. It is pleasure and prejudice against reason and economy: which will win, it is hard to say.

The second claim of the North Pacific sea lions to public interest arises from the circumstance that eighty per cent of the seal fur now supplied to the markets of the world comes from the islands of Behring's Sea, and the indications are that in a few years our Alaskan possessions will be the only source of this beautiful fur. Everywhere else the slaughter goes on without regard to system, age, or sex, and already many islands which used to furnish thousands of skins every year have been entirely depopulated. Not less than a million skins were taken from the island of Masafuera, off the coast of Chili. In two years four hundred thousand skins were taken from a small island near Australia. From the South Shetland islands, three hundred and twenty thousand were taken in 1820 and 1831, males and females being slaughtered indiscriminately, and the young left to die. It is hardly necessary to add that, in a few years, this horrid and wasteful process wrought its own destruction.

The resorts of the sea lions of the north were discovered in 1786, and a Russian fur company was at once established. For thirty years from eighty to ninety thousand skins a year were brought away, the killing being done without regard to sex or system. About 1817 it was observed that the animals had diminished in numbers. For twenty years more the wasteful slaughter went on, until but a tithe of the original number appeared. Then the slaughter was regulated, the number of skins restricted, and the females left undisturbed. When the islands came into the possession of the United States, the system was substantially continued, with the result of giving them almost a monopoly of the entire seal fur trade. According to Mr. Elliott's calculation, as many as three million breeding seals annually congregate on the two islands, St. Paul and St. George, to which they resort; the yearlings and males under six years of age he sets down at two millions, making a population of upwards of five millions. Only young males are allowed to be killed, and the number is limited to one hundred thousand. Females are not allowed to be molested, and no killing is permitted within several miles of the "rookeries," as the resting places of the females and their cubs are called.

When the time for killing arrives, usually in June, the killers select some "hauling ground" of the young males—for the old bulls do not allow them to associate with the females—and, armed with clubs, get between them and the sea. The animals, startled by the sight of them and frightened by their shouts, scramble rapidly landwards, and are leisurely driven to the killing grounds. In favorable weather they can travel at the rate of half a mile an hour, the most effective implement for driving being an umbrella. At the killing ground they are allowed to rest awhile, after which the fittest are selected and killed with clubs, a single blow on the head being sufficient for each. The rest are allowed to return to the sea. The skins are shipped in salt.

For many years the stiff coarse hair, which conceals the under fur, was plucked out by hand. It was finally discovered that the roots of the hair were more deeply seated than those of the fur, and that, by shaving the skin from the underside until the hair roots were cut away, the hair could easily be brushed away, leaving the under fur intact, thus greatly simplifying and cheapening the work of preparing the skins. Naturally, the fur is curly and of a light brown color; but as the ladies prefer a darker shade, the fur is dyed, in which process the curls untwist and the fur becomes smooth. The government rents the islands for $50,000 dollars a year, and imposes a revenue tax of two dollars on each skin taken. According to late accounts, the population of the islands is steadily increasing, and it is proposed that the number allowed to be killed might safely be increased also. In view of the probable early extermination of the fur-bearing seals, so called, of other regions, however—at least, so great a reduction of their numbers as to make the taking of them unprofitable—it is to be hoped that no risks will be run in the only place where they have any chance of perpetuation. Better under kill than over kill, even if the demands of the ladies should be scantily gratified. Properly managed, our Alaskan islands will remain for ever a source, perhaps the only source, of this beautiful and valuable fur. Overhunted, or left to the shortsighted selfishness of professional sealers, there is danger that it may soon be said of them, as an Australian naturalist has said of another once productive region—"I should as soon expect to meet a sea lion on London bridge, as on any one of the islands in Bass's Strait!"

PROGRESS OF THE PATENT OFFICE.

Sixteen thousand two hundred and eighty-eight patents for new inventions were issued last year, ending December 31, 1875. This is by far the largest number ever granted in one year, and is indicative of a growing spirit of liberality on the part of the Patent Office people towards the inventors of our country, which we hope will not only be maintained but increased in the future.

Last year we had occasion to call public attention to the extraordinary number of applications not granted, the figures for the year 1874 showing 21,602 applications made, and only 13,599 patents issued, leaving *eight thousand* applications for patents either rejected or undecided. We then stated in effect that in view of the statistics for 1874, the Patent Office examiners appeared to consider it to be their highest function to prevent the issue of patents; but we showed that, in accordance with the spirit of the Constitution, it was their paramount duty to seek reasons for the encouragement of inventors *by the grant of patents.* It is gratifying to observe that the Hon. Mr. Duell, new Commissioner of Patents, has adopted the latter view, and has sought to reduce the action of his subordinates to the same liberal line of policy. It will be observed by a glance at the Commissioner's tabular statement, on page 120, that, although the number of applications made for patents during the year 1874 and 1875 is about the same, the number of patents issued in 1875 is greater, by more than two thousand six hundred, than the issues of 1874. There is room for further improvement, and we trust that the Commissioner will continue to insist upon the observance of a prompt, liberal, generous treatment of applicants for patents until all complaints in respect to rejections shall practically cease. The patent law makes it the duty of the Patent Office promptly to issue a patent to every applicant, no matter how small the invention, provided it contains a grain of novelty and utility. All questions of infringement are left for settlement by the courts; the Patent Office has nothing to do with them.

But there is one serious, fruitful source of trouble, continually going on at the Patent Office, which consumes much valuable time of officers, and occasions great expense and dissatisfaction to applicants. We allude to the litigation pertaining to Interference cases. We are inclined to believe that these cases should be removed from the Patent Office and settled by the Courts. We should be glad if something practical in this respect could be enacted by Congress.

A NEW ENGLISH RIVAL OF AMERICAN PETROLEUM.

A new process of utilizing the gas of shale oil works has recently been devised in England, which, if we may trust the statements of the London *Grocer*, is to bring better times to the British manufacturers of mineral oil, who now

are unable to make much headway against the large petroleum exports from the United States. An immense quantity of such gas is wasted in the production of paraffin. Every tun of carbonaceous shale destructively distilled yields from 2,500 to 3,000 feet of the gas, in addition to other products, and our contemporary places the amount of shale thus treated in England and Scotland at 600,000 tuns.

In some large works, this gas is directly collected and used for illuminating purposes in the vicinity; and at one time it was proposed to illuminate the city of Edinburgh by conveying the vapor from the Addiewell Works near by. The new invention, it is now said, provides a way of bottling this gas —that is, converting it into a highly volatile liquid, a gasoline, which may be found a staple and valuable article of commerce. The inventor is Mr. J. J. Coleman, F. C. S., and his machine is based on the well known principle used in such ice-making apparatus as that of Windhausen and Mignot, namely, that air, when compressed and then allowed to expand, produces cold, especially when, in the act of expanding, it is made to perform work, such as driving a piston in a cylinder. The shale gas, it appears, is first compressed; then, after removing from the machine the collected liquid, the inventor causes the compressed gas to work an engine which delivers the exhaust gas at a temperature below the freezing point. The most ingenious feature of the invention is that the power which is first employed in compressing the gas is in great part recovered by the expansion of the gas in the act of producing cold: and owing to this result, when the machine is in full action, the steam may be, in a great measure, turned off. The gas thus works as it were in a circle; but of course it is constantly diminishing in quantity, and at the same time the loss is being made up from the condensers, which, in their turn, are attached to the retorts.

Very brilliant illumination has lately been obtained in Paris by saturating coal gas with gasoline and then burning it with oxygen. With Mr. Coleman's liquid, it is believed, a similar saturation can easily be effected; and Messrs. Laidlaw & Sons, of Glasgow, well known gas engineers, have undertaken the manufacture of the necessary machinery for treating a quarter of a million cubic feet of gas per day as an extended experiment. It is believed that about 2,000 gallons of the gasoline may be weekly obtained from this plant. Some of the material yielded will probably be naphtha; but the average specific gravity, it is stated, will range about 0·684. It is expected that there will be a large demand for the product at one shilling sterling (24 cents) per gallon.

KENTUCKY WEATHER PROPHETS.

The weather prophet of Kentucky farmers, according to the Louisville *Commercial*, is the breast bone of a goose, a yearling goose; and on the strength of the prognostications of such a bone, that paper predicts that the coldest weather of the present season will come after the middle of February.

The *rationale* of the augury is extremely simple. The breast bone of a young goose is translucent, with cloud-like spots in places, which white spots denote cold weather. It is to be inferred that all the geese of any year have precisely the same cloudings on their breast bones, though this important circumstance is not specially noted. Nor is any information given with regard to the geographical area covered by the goose-bone prediction in any case. We beg the *Commercial* to investigate this matter more thoroughly, for the benefit of the Congressional economists who want to abolish the Signal Service Bureau and all the sinecures incident thereto. Probably the family in Woodford county—who have so carefully preserved the little prophets for fifty years, and declare that not one of them has been wrong in its predictions—would be able to clear up all doubts and difficulties on this score, and demonstrate the utter wastefulness of telegraphic "probabilities" when prophetic certainties are so easily procurable.

In this connection we may properly mention the proposition of another Kentucky gentleman, who has been telling the Cincinnati Christian Association how to impose a wintry climate on the poor naked denizens of the South Sea Islands, and transfer their balmy climate to our own shores. For a man rejoicing in the title Reverend, and a company styling themselves Christian, this project, we may be permitted to say, is about the coolest we have ever heard of. But it is the scientific, not the moral, aspect of the proposition that we have to do with here.

At first thought, no undertaking would seem to be of more difficult accomplishment than the shifting of the climate of any hemisphere, massing all the cold in one part and all the warmth in another; but our reverend lecturer shows how it can be done with the utmost certainty and ease. Everybody knows that the south wind brings the warmth of sunnier climes, while the north wind brings arctic cold, provided, of course, that they blow long enough and far enough upon the earth's surface. And nothing is simpler than to suppose that if a south wind could be kept constantly blowing over our country, we should enjoy a summer temperature all winter. To most meteorologists the *if* in the case is a portentously large one, but not to the Rev. L. B. Woolfolk, of Lexington, Kentucky. He knows that the south wind is always on the surface of the earth, except during storms, and even then the north wind never has but one track at once. Consequently if we make a track for the north wind and keep it there, we shall have, everywhere else, a prevailing south wind and a genial climate. It is just as clear as that two and two make twenty-two. Now storms are always the result of a conflict between north wind and south wind. It is well known that heavy cannonading always raises a storm by breaking a path for the north wind. Therefore keep up a deuce of a racket where you want the north wind to blow, and you'll certainly have the balmiest of south winds for ever blowing right and left.

The learned lecturer proposes—and very wisely, seeing that the South Sea islanders are not able to resent the imposition—proposes, we repeat, to make the Pacific Ocean the track of the boreal winds, by a perpetual *feu de joie* on the Aleutian Islands. We are told by the Cincinnati *Gazette* that he was eloquent in depicting the results of such an easy and beautiful re-adjustment of the winds. The deserts of Asia and America would be visited with seasonable rains; warm weather would blow up the Atlantic (not like dynamite, we trust) into the Arctic Ocean, bearing before it tropical waters, until the arctic coasts, swept with tropical winds, would become habitable; and the arctic seas, flooded with tropical air and tropical water, would become the highway of commerce, and vessels would sail through open water at the pole, and every goosebone would become immaculately translucent, except in the South Sea islands; and as the people there do not keep geese, the change would signify nothing to them.

A word of admonition here. This is the Centennial year. We know how it began, and can faintly estimate what terrific reverberations will arise from time to time toward the culminating day of the year. Now that Mr. Woolfolk has spoken, we know what a terrible succession of arctic waves we are liable to bring down upon ourselves, blasting our crops and making the derided Ulster a Centennial necessity, while the shiftless Sandwich Islanders and the rest will bask in endless south winds, needing not so much as a pocket handkerchief for protection from the weather. With the earnestness of conviction, we say: Don't! For heaven's sake, keep still. If the yelling must be done and the powder burnt, let them be transported to the Aleutian Islands and discharged there. It will be hard for the Aleuts; but they are few and feeble, and know nothing of Centennial joys and fears. And as for the people south of them, let them —no: that involves a question of morals which is without our sphere.

OPIUM DANGERS.

It is a curiously suggestive fact that very few of the weekly journals, especially of literary nature, which go directly into families, can nowadays be examined but that somewhere in their advertising columns are found announcements offering radical cures for the opium habit. We have found these advertisements abundant in fashion magazines; and indeed so widely spread are they, and so persistently are they kept before the public, that a stranger might seriously ask himself whether the mania for the drug be not as strong in this civilized country as in China. Two or three cases, of those who have become addicted to the use of opium through its employment as a medicine during acute illness, have lately been brought to our knowledge; and some further inquiry leads us to believe that the large majority of opium eaters thus acquire their baneful taste. Dr. J. B. Mattison, in an article in the *Medical Record*, strongly advocates this view, and re-inforces his conclusions with a timely caution to physicians regarding the careless prescribing of the drug. It appears that, while alcoholic intoxication is decreasing throughout the United States, opium drunkenness is increasing, and the dealers in crude opium and the manufacturers of its alkaloids assert that the importation of the one and the productions of the other are rising rapidly year by year: so much so regarding morphia, that at one of our largest manufacturing centers the supply is said to be insufficient for the demand.

Dr. Mattison adduces a most interesting array of instances in proof of his views. Cases are mentioned of persons (who previously took opium to gain relief from the pain of sciatica, or neuralgia, or similar acute maladies) becoming confirmed inebriates, utterly unable to disenthral themselves, and swallowing their daily potion not as a means of gratification but as a physical necessity. Legislative enactments prohibiting the refilling of an opiate prescription, or the dispensing of opium in any form, unless in pursuance of a prescription from the attending physician, would, Dr. Mattison considers accomplish an immense amount of good. It would not wholly check the vice, but would greatly mitigate the same. "In carrying out the reform," he adds, "it should be the aim of every practitioner, when called upon to prescribe this most valuable medicine, to see to it that he exercises a discriminating care in so doing, by careful inquiry as to the neurotic status of his patient from the standpoint of hereditary tendency, and, if necessity demands a somewhat prolonged administration, to watch most warily and guard most strenuously against the earliest indications of an appetite that, thoroughly established, will scarcely be denied, and which entails upon its unhappy possessor a darkness so dense, a horror so indescribable, that death, at times, seems preferable."

THE ARISTOCRACY OF ALL.

"Yes"—we hear it said, even in this Centennial year of the Republic—"the theory of democracy is well enough; but after all the real progress is the result of class distinctions and privileges. Culture implies spare time and abundant means: in other words, an aristocracy of some sort, which must be supported by the labors of others. Only by the exemption of some from the drudgery of self-support is it possible for civilization to exist, much less to advance."

The assumption—it cannot be called an argument—is plausible, but it will not bear examination. However much the civilization of the past may have rested upon systems of privileged classes, the civilization of today rests upon and is carried forward by the working masses: not slavish toilers, kept down by class restrictions as of old, but freemen, who use their brains as well as their hands, and know that all things are possible to intelligence and thrift. It is by those who personally earn the right to leisure time, very frequently in the process of earning it, that the great steps of human progress are taken. As Higginson cleverly remarks, history is not written by the privileges of the rich, nor, we would add, by the privileges of the high born, but by the progress of the many. "Privilege traveled in its carriage with all clumsiness twenty miles a day; but when the people wished to go, steeds swifter than the wind were harnessed, and long lines of steel stretched far away that they may go in speed and safety. Privilege could only send its messages by fires on hilltops, and thus communicate slowly joy or grief; but for the messages of the people, the flames were condensed in one spark, and sent across continents and under oceans. Everywhere we find the failure of privilege the success of the whole. An aristocracy of all I want, where the humblest child may come from his cradle into a grand and glorious career."

This is the ideal that was aimed at by those whose actions we commemorate in this Centennial year. Its practical achievement may be celebrated a hundred years from now. The aristocracy of birth—hereditary rank, we mean, not inherited virtue, intelligence, and personal power—is done with. Its place has been usurped by what Higginson styles the aristocracy of the dollar. In the struggle for position, wealth leads, for it has the advantage of power.

To acquire wealth requires in the main the possession of force, albeit rude and pushing. To keep wealth requires, even more imperatively, personal ability. "So the aristocracy of the dollar is as foam on the waves of progress, bright, evanescent, changeable as the wave itself. It represents actual power, not past possessions like hereditary aristocracy."

But ability to hold is not a common inheritance. Nature is averse to hereditary rank, and titled families soon run out unless sustained by plebeian blood; and still more heavily weighted in the race for life is hereditary wealth. The aristocracy of birth is of the past. The aristocracy of wealth rules to-day. But it too is doomed. There is but one stable aristocracy possible, and that is the aristocracy of all, based on common freedom, common virtue, universal intelligence, and universal labor. The doers shall inherit the earth.

IMPROVEMENTS IN THE ORGAN.

In another portion of this issue will be found an illustrated description of some new and remarkably ingenious applications of electricity to organs, by means of which an instrument in one part of a hall is played from a keyboard located in another and distant portion. The invention is one which easily suggests the possibility of the distance between the keyboard and organ being increased, and thus, perhaps, may be a precursor of those possible electric devices to which we have, in the past, alluded, and by which we may be able to lay music in every house in New York city with as little difficulty as now is found in putting in the gas.

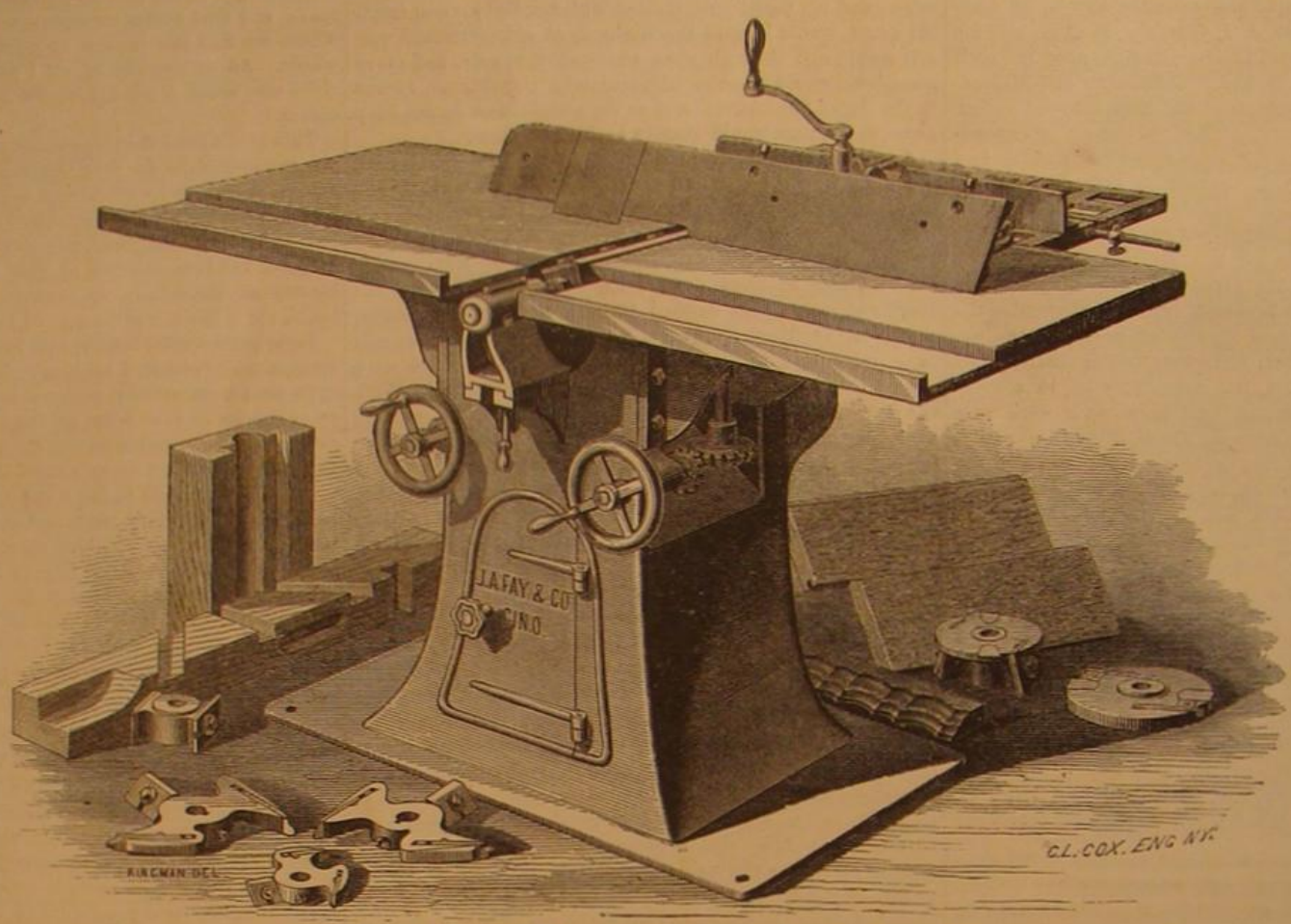
While this idea may be called an advantage of electric music yet to be realized, the immediate value of the use of electricity in the instrument rests on a different basis. That value is the vastly increased facility in handling the keys offered to the player. There is a large church organ now in this city in which a force of 5 lbs. is required to push down each key. It is easy to calculate the amount of power which the organist must actually develop to play at all. For instance, in the well known air o "Old Hundred" there are 34 notes. Supposing each note to represent a chord to be played by each hand, and each chord to average three notes, there are 204 notes to be pushed down a distance of, say, $\frac{1}{4}$ inch each for every verse or repitition of the tune. The time occupied in singing the air is slightly over 1 minute. Therefore 5 x 204 or 1,020 lbs. are moved through a space of $\frac{1}{4}$ inch in the above period by the fingers and elbows alone, equal to about 21$\frac{1}{4}$ lbs. raised 1 foot high in a minute, or $\frac{1}{1500}$ horse power, approximately. The labor an organist has to perform in carrying through a long mass or choral service is considerable. With the electrical organ this labor is entirely obviated; the touch is lighter than that of a pianoforte.

The builder of this new organ has succeeded in reproducing the *timbre* and quality of the human voice by machinery in a manner which is certainly wonderful. The echo organ is located in the garret, at a point where three angles of the roof meet, and the sound issuing from the open top of its case is reflected down upon the ceiling. The effect is such that every sound heard in the auditorium, though faint, is perfectly clear. By drawing the *vox humana* stop—a close copy of the similar arrangement in the celebrated Freiburg organ—and also the *tremolo*, the performer is enabled to produce not merely a sound of the quality of the voice, but also one having the voice's natural defect—the *vibrato* or shakiness of tone. Under the circumstance of the illusion, aided by the fact that the sound comes from an opposite quarter to that in which the performer is located, it is exceedingly difficult to convince one's senses that they are deceived. The effect is substantially that of an actual choir. The famous talking machine which was exhibited in this country several years ago, by means of rubber vocal arrangements, articulated words with great clearness, infinitely better, in fact, than the average vocalist in singing. The difficulty was, however, the dismal monotone, and this the genius of the inventor could not overcome. We therefore suggest a combination of the talking machine and organ; both are played from key boards, and therefore the machine could be arranged to connect with the organ manual by a simple stop. Send the tones of the *vox humana* echo through the mechanical larynx, and there is a singing machine. Perhaps the time is not far distant when a congregation will be provided with a mechanical choir.

NEW WOODWORKING MACHINERY.

In the manufacture of doors, sash, furniture, and patterns, as well as in agricultural implement, wagon, and carriage shops, etc., a large number of different operations, performed upon the same material, require separate machines, which occupy much space and consume much capital.

The present invention, recently introduced by Messrs. J. A. Fay & Co., Cincinnati, Ohio, is an apparatus which combines the capabilities of several such machines, while embracing the essentials of convenience of adjustment, ease of operation, and rapid production. It is adapted for planing out of wind, making glue joints, surfacing straight, tapering, and beveling work, rabbeting, gaining, grooving, plowing, working circular moldings, panel raising, squaring up bedposts, balusters, and newels, ripping, cross-cutting, etc., the only practical limit being the capacity of the operator for methods of manipulation. It is constructed on a strong substantial column of convenient hight, and can be belted either from above or below; and the iron tables are supported on the column in planed gibbed ways. These tables have vertical adjustment by means of hand wheels and bevel gears, for regulating the depth of the cut, and lateral adjustment to make a larger or smaller opening between the tables, according to the size of the head or cutter being used. The tables have an arrangement by which the distance from the periphery of the cutter is maintained as they are raised or lowered. They are also arranged for receiving the slides of the gaining frame and other attachments, and for making a continuous table for sawing.



J. A FAY & CO'S. No. 3 VARIETY WOOD WORKER.

The bearings of the arbor are supported on the column, one of them being cast solidly to it, while the other is movable, being planed in a seat, the hight of which, to the center of the arbor, is equal to one half the diameter of the largest head to be used. This movable bearing is held in place by a bolt which has a handle for convenience in loosening it, giving great facility in removing and replacing the different heads required for different kinds of work. The outside movable bearing is a very important feature in the machine, giving greater stability to the arbor, and obviating its liability to spring when dependent only on inside bearings, and thus rendering the machine capable of performing a heavier range of work.

The adjustable fence and bevel rest is fixed to and moves with the forward table, has adjustment for angles to 45°, and is arranged to receive stud springs, for holding down lumber, and the panel raising attachments.

When desired a boring and routing table is affixed to the rear end of the column, and this table has all necessary adjustments, gages, etc., to adapt it to a full line of that class of work. The belt for driving the machine is put on at such an angle as to leave the table level clear of obstruction.

This machine is the result of long experience in this line, assisted by practical tests, and is secured by letters patent. At the last Cincinnati Industrial Exposition, it attracted attention for its novelty, superior character, and variety of the work produced.

We have on our table a piece of hard wood about 14 inches long and 2½ inches wide, showing some eight or nine different kinds of work, all performed on this one machine, embracing planing out of wind, squaring up, rabbeting, cornering, chamfering, straight and angular gaining, beading, routing, boring, etc. This sample of work is in itself quite a curiosity. Two sizes of the machines are made, regarding which further information may be obtained by addressing the manufacturers.

The Telegraphic Value of Language.

A larger number and greater variety of ideas can be conveyed, with more exactness, in a given number of words in the English language than in almost any other. This is strikingly shown in the matter of telegraphy. It has been demonstrated that, for all telegraphic purposes, the English language is from 25 to 33 per cent cheaper than the French, German, or any other language.

A Safe Lamp Burner.

J. H. P. says: "Many lamp burners for use without chimneys have been invented, but none that I have seen is safe. The chief defect of all such burners is the shortness of the tube. There being no chimney to create a draft, so as to carry off the heat, the atter is conducted down the tube and the surrounding brass network to the top of the lamp, thereby heating the oil and causing it to take fire or to explode.

"The tube of a no-chimney burner should be not less than 4 inches long, instead of 1¼ inches, the ordinary length; and the fixture which surrounds the flame should be so made as to leave the cap exposed, so that any cinders or fragments of the wick falling down may be seen and removed. These cinders, falling upon the cap of the lamp, become saturated with oil, and frequently take fire and burn unseen, till the oil is heated to the flashing point, and the lamp is filled with explosive vapor. I have constructed a burner for my own use, which I regard as free from danger. The tube is 4 or 5 inches in length; and the fixture which regulates the flame is attached to the upper end of the tube, and has no connection with the cap, but is 3 inches above it. When in use, the lower end of the tube is nearly as cold as any part of the lamp. It is to be hoped that the numerous inventors of burners will furnish us something of this kind, which we can use without fear of losing our lives."

AUTOMATIC SPRINKLER FOR EXTINGUISHING FIRES.

Mr. Hezekiah Conant, of Pawtucket, R. I., has lately (November 2, 1875) patented an improved fire extinguisher, which consists in a sprinkling pipe to which water is admitted as soon as a tightly stretched skein of cotton or other fibrous material is touched by the flame.

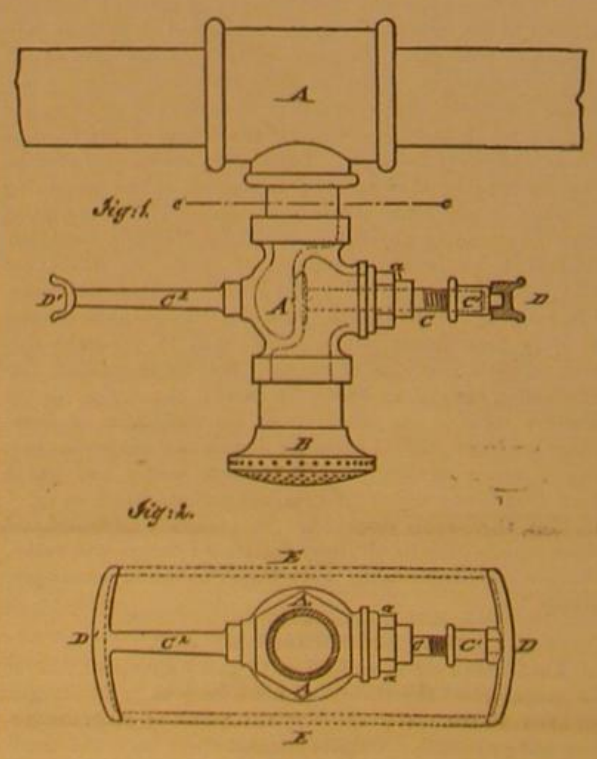


Fig. 1 represents a side elevation of the apparatus, and Fig. 2 a bottom view of the same. A represents the water supply pipe at the top or ceiling, which is provided, at suitable points and distances, with downwardly extending discharge pipes, A', according to the dimensions of the rooms. Each pipe, A', is provided with a suitable valve, whose stem, C, is extended in horizontal direction, and guided in a tightly sealing side bearing, *a*, of the discharge pipe. The lower part of the discharge pipe is arranged with a sprinkler, B, that distributes the water in different directions. The outer end of the horizontally sliding valve stem is provided with a slightly curved and grooved T bearing, D, over which and a similar bearing, D', in diametrically opposite direction from the former, a skein, E, of cotton is wound, of such thickness that the valve is firmly retained on its seat. The bearing or support, D', is applied to a stationary arm, C', of discharge pipe, A', and the cotton or other suitable inflammatory material stretched tightly on the supports by means of a screw sleeve, C', that turns on a thread of the valve stem, and in a socket recess of bearing, D, so as to act on the same and secure the perfect closing of the valve. As soon as the flames reach the valve holding cotton skein, so as to burn the same, the valve is forced open by the pressure of the water thereon, and the water is discharged in all directions on the fire. The sprinkler may be tested at any moment by simply cutting the cotton skein, and instantly be readjusted by winding a new skein around the bearing, and adjusting the stretching screw nut.

A Grand Zoological Laboratory.

A magnificent zoölogical laboratory is to be founded in Naples, Italy, under the control of M. Dohru. It will consist principally of a large general aquarium, in which will be collected all the marine *fauna* peculiar to European waters, together with eighteen special aquaria for the preservation of specimens under natural conditions, for the convenience of those who may be prosecuting original investigations into the habits of the fish. A large library and anatomical collection will be added, and provision will be made for a number of separate private laboratories, to be rented to universities or to governments. The subscription price is $360 a year. Italy and Russia have each secured two places, Saxony one, and the Universities of Cambridge and Oxford each one. Other applications are rapidly being received, and it is believed that eventually the institution will be one of the largest and finest of its class in the world.

The Population of India.

Here are the results of the first census of the population of India, taken from the English documents, compiled by *L'Union Médicale*. India, with the vassal states of England and all their dependants, contains 238,830,958 souls, which is equal to the entire population of Europe. To every square English mile, there are, on an average, 211 persons. The largest city is Calcutta, and it possesses a population of 895,000 inhabitants. Bombay has 644,000; Madras, 398,000; Lucknow, 285,000. Their religious, in round numbers, amount to 140,500,000 Hindoos; 40,750,000 Mahomedans; 9,500,000 Buddhusts, Jews, and Parsees; the Christians amount to 900,000, of which 250,000 are European, the other 650,000 are native. There are 23 different languages spoken in India; in the Western Provinces there are 300 different castes; in Bengal about 1,000 exist. There are employed by government 1,236,000 persons (the natives included); 629,000 (of which 819 are missionaries) are supported by religion; there are 30,000 religious medicants; 10,000 astrologers; 5 sorcerers; 465 exorcists; 518 poets; 1 orator; 33,000 jurists; 75,000 physicians: 218,000 artists, among whom are acrobats, serpent charmers, and monkey showers; there are 137,000 agriculturists; 950,000 elephant and camel drivers and shepherds; 22 professional gamblers; 5 pigeon trainers; 49 spies; 361 professional thieves; 30 highway robbers; 103,000 mendicant vegabonds.

Artificial Butter in Copenhagen.

It seems that our friends in Northern Europe are not to be outdone in the butter market by the French nor ourselves; and one of them, named Diderichsen, has devised a new method of making suet butter, which differs in some of its details from that employed in this city some two years since. The suet is first washed in cold water, and cut up in fine pieces, then it is placed in wooden vessels and melted by aid of steam heat. About 1 per cent of soda, dissolved in some water, is added to the melted fat, which is cooked for a few hours. Fresh soda is added, and the boiling repeated, after which the mass is washed with boiling water and pressed through flannel. To this mass, while still warm, but not above 140° Fah., 3 per cent of olive oil is added, and 3 or 4 per cent of sour milk, and the whole is then churned.

SALT of lemon is the best material for removing stains of iron mold, but it should be used very sparingly, as any excess will destroy the fabric.

IMPROVED TOOLS FOR THREADING BOLTS AND NUTS.

The accompanying engravings represent improved machinery and tools for bolt-cutting and nut-tapping, manufactured by the Pratt and Whitney Company, of Hartford, Conn. The series of new machines lately introduced by this firm comprehends power and hand bolt cutters, die stocks, adjustable tap wrenches, and taps, adapted to the use of jewelers, machinists, bridge builders, mill owners, steam and gas pipe fitters, manufacturers of agricultural machines, sewing machine makers, gun makers, carriage builders, and all others requiring bolt-cutting and tapping implements.

The large engraving, Fig. 1, represents what is designated as the No. 3 bolt cutter, driven by power, and having a range for bolts from $\frac{5}{16}$ of an inch to 1 inch diameter, and of nuts of corresponding sizes. The head spindle is hollow, and is furnished at the front end with a chuck for securing the bolt to be cut, or for holding a tap. The spindle is driven by a three-graded cone, the arbor of which connects with the spindle by gears. The chasers forming the dies are held in collets (Fig. 2), four in each, and secured in radial slots in the collets by screws, permitting their accurate adjustment. These collets are seated in holes for their reception on a revolving cylinder, mounted on a sliding carriage, that is moved on the ways of the bed of the machine by hand wheel, rack, and pinion, as may be seen by reference to the engraving. The cylinder holds on its periphery nine of these collets, and a plate with different sized perforated recesses for holding square and other nuts for tapping. This plate is shown as presented to the chuck. One plate may be slipped out and replaced by another, with different recesses, instantly. By removing a collet opposite the one that is at work, a bolt may be threaded to any distance desired. The cylinder containing the collets and the nut vise is instantly brought to the bolt, or the tap, by means of the hand wheel, and the cylinder is held in position on its center by a simple

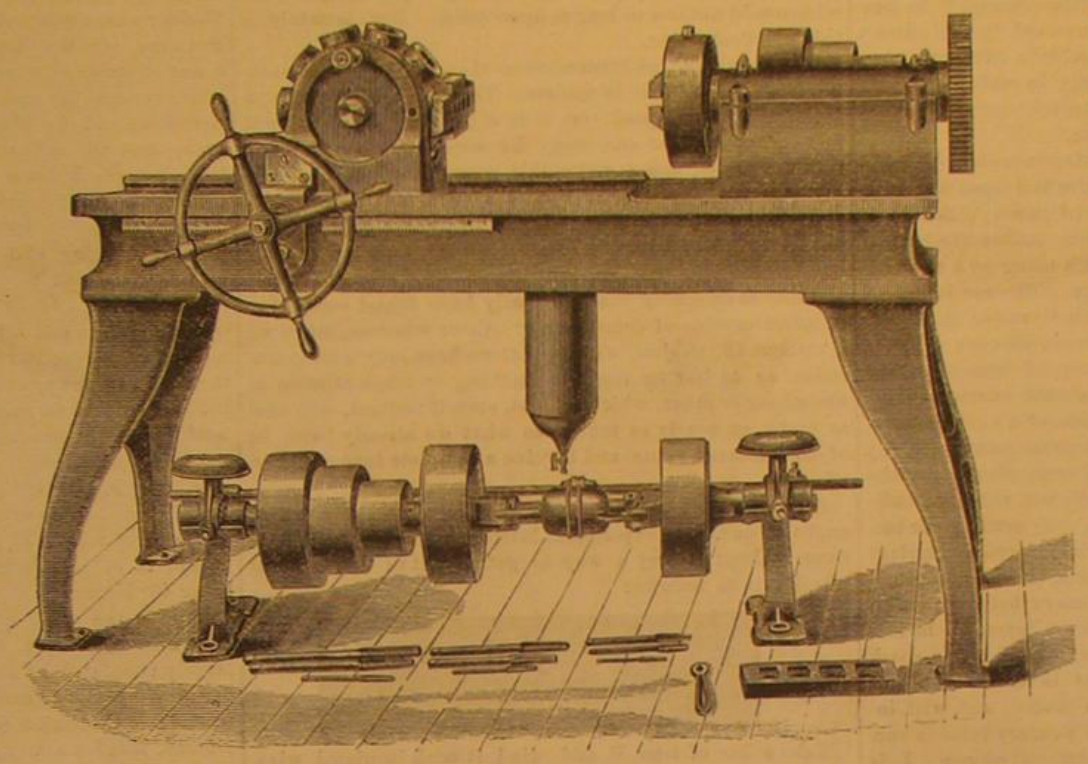
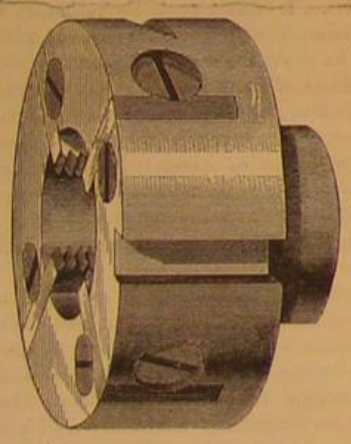


Fig. 1.—THE PRATT AND WHITNEY COMPANY'S BOLT CUTTER.

Fig. 2.



spring bolt. The threading of the bolt or the tapping of the nut is completed at one operation, the die or the tap cutting a perfectly full thread (without raising or squeezing), fully equal, it is claimed, to that produced on a screw-cutting lathe. The collets may be instantly removed, and may be replaced by hollow mills for pointing the end, turning the body, or squaring under the head of the bolt; and the bolt may then be threaded without removing it from the chuck. The hollow spindle allows bolts of any length to be threaded, and the geared head and three-graded cone give great power and a sufficient range of speeds. The chasers or cutters in the collets are sharpened, when dulled, simply by grinding on an ordinary grindstone; and any one of them may be duplicated, when broken, without the necessity of replacing the entire set. The machine is economical in the use of oil, as all the chips and oil are received into the hollow bed, and the oil drains through a strainer into a receiver, from which it may be drawn to be again used. The countershaft is furnished with F. A. Pratt's patent reversing clutch, which works with ease and certainty, and without jar or strain; and this, with the nut-tapping apparatus and case-hardened wrenches, is sent as a part of the machine.

A larger machine, similar in construction and operation, has a range for threading bolts from $\frac{1}{2}$ inch to $1\frac{1}{4}$ inches in diameter. This is known as the No. 4 bolt cutter. Two others are built, intended for hand work, known as No. 1 and No. 2, having respectively a range of $\frac{1}{4}$ to $\frac{1}{2}$ of an inch and $\frac{1}{2}$ to 1 inch diameters of bolts and taps. The company also build an open die machine, having a capacity of $\frac{1}{2}$ to 1 inch bolts, the dies of which are instantly opened, either by hand or automatically, to allow the bolt, when threaded, to be at once withdrawn, thus saving the time spent in running the bolt back through the die. The dies may be instantly interchanged for the different sizes of bolts without absorbing any time in adjustment.

The other engravings show a die stock, Fig. 3, with the collet, and an adjustable tap wrench, Fig. 4. The die stocks are made of five sizes, capable of cutting from $\frac{1}{16}$ to $1\frac{1}{4}$ inches diameter, and Nos. 2, 3, and 4 may be fitted with dies for threading gas pipe of all the sizes up to and including $1\frac{1}{4}$ inch pipe. These die stocks are drop-forged, in a single piece, from the toughest wrought iron, finished, and then case-hardened. The collets are held in place in the stock by spring bolts, which, when thrown back by the thumbs, permit the collet to drop out, to be replaced by another for a different size of bolt. The chasers, as may be seen by reference to the engraving, are seated in radial recesses in the collets, and are held and adjusted by screws.

The tap wrench, Fig. 3, is also drop forged, of the best iron, finished, and carefully case-hardened. It is made of four sizes, to fit the shanks of taps up to $1\frac{1}{4}$ inches. There are two jaws seated in the body of the wrench, which are opened and closed by the thumb moving a cam disk, and held in position by a spring pawl. They hold the tap securely, preventing the danger of cramping and breaking the tap in using.

The threads of the taps and dies are cut to the United States standard, as promulgated by the Frankl inInstitute; but the Whitworth thread, or special sizes, will be furnished as may be ordered. The taps are threaded and fluted before being relieved, the only way, it is claimed, in which they can be, with certainty, finished accurately to gage. In replacing one tap for another, or in duplicating a chaser, a perfect *facsimile* is assured, as the gages by which each piece is finished are themselves duplicated, one set being kept on hand, to be used only for verifying the accuracy of the working gage. The manufacturers have the reputation of using the best quality of steel in the taps and chasers, which are hardened and tempered in the most careful manner. Every piece is thoroughly inspected, and none with visible imperfections are allowed to leave the works. The workmanship on these tools, the company affirm, is of the best, and they intend to insure entire accuracy in the sizes of the taps and dies, and the grades of the threads; so that the purchaser may be certain of obtaining these tools, at all times, of the best material and workmanship, and without variation from standard sizes.

The pipe taps are constructed on the same principle as the dies—that of interchangeability—the cutting portions being

Fig. 3.



Fig. 4.



THE PRATT AND WHITNEY COMPANY'S DIE STOCK AND TAP WRENCH.

inserted in longitudinal slots on the body of the tap, so that any one of the slips, or cutters, may be removed, if injured, and replaced by a duplicate, fitting in its proper and relative place, thus avoiding the rejection of the entire tap, and saving unnecessary expense.

These tools are manufactured under letters patent issued to J. J. Grant, assignor to the Pratt and Whitney Company, Hartford, Conn., who may be addressed for further information.

The Spontaneous Combustion of Coal.

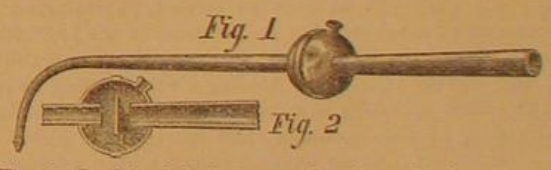
The *Revue Industrielle* says that, out of all the ships laden with cargoes of coal exceeding 500 tuns, which sailed from England for regions south of the equator during the first nine months of 1873, and during the similar period in 1874, 23 were destroyed by spontaneous combustion of the coal in the first year, and 50 in the second. These figures indicate 2 per cent of all the vessels in one case and 4 per cent in the other. It appears that the casualties are not imputable to any one class of coal, but to all classes without distinction. The theory which attributes spontaneous combustion to the presence of pyrites in the coal may explain, up to a certain limit, the increasing number of accidents; because, before the augmented demand of late years existed, it was customary to free the coal more carefully from this impurity than is at present done. On the other hand, Richter has shown that, for various coals experimented upon, those which contained the most pyrites were not the most exposed to spontaneous combustion. According to him, air is rapidly absorbed by the coal, and the oxygen of the air then combines with the organic components to produce carbonic acid, with a development of heat. According to all probabilities, however, the heat which determined the spontaneous combustion is due both to the oxidation of the iron and to that of the carbonized matters. This, confined in badly ventilated holds, speedily reaches a temperature sufficiently high to produce combustion.

An International Coinage.

Senator Sherman, of Ohio, recently presented to the Senate a resolution proposing a common unit of money for the United States and Great Britain and Ireland. The proposition is to make the gold dollar the common unit, slightly reducing the value of the dollar so that five dollars shall equal the British pound. It was referred to the committee on finance.

A NEW BLOWPIPE.

Mr. Charles Rumley, of Helena, Montana Territory, has lately patented (November 23, 1875) a novel form of blowpipe, engravings of which are herewith given. The idea is to afford an easy means of expelling the moisture which collects on instruments of this description, when supplied with air from the mouth; and to this end, the pipe is divided, and the two portions enter a hollow globe, as shown in section



in Fig. 2. In this globe is a central strip or diaphragm plate, against which the entering air impinges and which arrests the moisture and prevents its being carried along into the outer portion of the pipe. The globe has also a small exit opening, which, when the blowpipe is in use, is closed by a plug. In order to remove the condensed moisture, it is merely necessary to remove the plug, and turn the globe so that the opening comes beneath. Blowing into the mouthpiece then drives out the water. This device, which is shown complete in Fig. 1, offers a simple means of keeping blowpipes clean without detaching any removable parts.

Bicarbonate of Soda a Toothache Remedy.

Dr. Duckworth, of St. Bartholomew's Hospital, London, has recently successfully used bicarbonate of soda as a remedy for severe toothache, when applications of chloroform, either externally to the cheek or to the ear, or, placed on cotton in the decayed tooth, failed; and when carbolic acid, applied as last mentioned, also proved inoperative. Pledgets of cotton, soaked in a solution of 30 grains of bicarbonate of soda in one fluid ounce of water gave almost instant relief. Dr. Duckworth considers that very frequently the pain is due to the contact of acid saliva with the decayed tooth; and therefore it is important, in cases of odontalgia, first to determine whether the saliva has an acid reaction. If this be the case, then a simple alkaline application, as above stated, is the most efficacious means of cure.

Cases of toothache are such common accompaniments to disordered stomach that there seems every reason for the truth of the above author's conjecture. Doubtless on the same ground is due the efficacy of ammonia, so frequently recommended, but which, if applied carelessly, is liable to produce more pain by burning the gum than already exists in the tooth.

Bicarbonate of soda is found in every kitchen, and hence no more handy remedy could be devised, while it is destitute of any painful effects; and the *rationale* of its operation and its simplicity make us wonder why it has not been thought of before

Correspondence.

The "Etheric" Phenomenon.

To the Editor of the Scientific American:

Permit me in a few hurried words to return to the as yet unexpired subject of Mr. Edison's "etheric" force. Had I time, I would prefer to make my part of the discussion more exhaustive in point of enumerated contra-experiments; but enough remains, without, to expose the *fallacies* of the speculation. The only way in which I can account for the mystifications of several writers and experimenters on "the new force" is that they have become so involved in the pursuit of an idea that they absolutely are unable to extricate themselves from a position in which a thing, in reality perfectly ordinary *per se*, seems perfectly extraordinary simply because beheld under ultra-ordinary conditions.

The idea of J. P. H., who sees nothing inexplicable in obtaining a spark from an uninsulated wire laid upon wet earth and connected to an insulated source of power, although it has been endeavored to controvert him, strikes the bottom of the whole thing. There is no such thing as a non-conductor of electricity; there is merely a difference in degree of conductivity, an assertion of which dynamic electricity furnishes the proof. The only difference between dynamic and galvanic electricity is the difference of intensity. We use simply a battery to produce the galvanic current. This furnishes us with an atomic vibration of a certain force, which, unless the battery consist of a great many cells, say 2,000, so that the force of the first cell is augmented by the separate forces of the 1,999 other cells, will not give sufficient intensity to disrupt or discharge. By sending the battery current through a helix, over which is placed a secondary helix of a great number of convolutions, the atomic vibrations of the battery current in the primary helix are multiplied as many squares of times as there are layers of the secondary wire around it, and the result is disruption or a spark from the secondary wire, many inches in length. It is as though we were to project a ball from a cannon, and, with inconceivable rapidity, supplement the primary force in succession with the force of a million additional cannon. It is not difficult to calculate the increase of impact in which intensity exists. For instance, if the primary helix shall consist of 6 layers of 100 coils of wire, we shall, in the primary helix alone, have increased the battery impact 36 times. Taking the atomic vibrations of the battery at 1,000,000,000 per second, we have here alone 36,000,000,000 impacts per second. The secondary helix will consist of 500 coils, making the increased impact five times 36,000,000,000, or 180,000,000,000 per second. The secondary helix will consist of 100 layers, and the impact by induction will be increased 100 times 100 times, or 10,000 times, giving an atomic impact of [illegible] 1,800,000,000,000,000 per second as the result. Is it at all remarkable that this impact, or "kick," results in disruption, or forcing the electricity through what to the direct battery is practically a non-conductor? Or is it remarkable that, if the polarity of the impact is so instantly reversed that it is practically destroyed as soon as created, physiological or mechanical effects should not be produced in the 1,800,000,000,000,000th part of a second? I have let a person stand on the most perfect insulation, holding a wire leading to one end of such a secondary wire, the other end of the secondary wire resting upon an insulator, and sparks have passed in rapid succession from my finger, I standing upon a carpet, to the insulated person, often an inch or therabouts in length; yet the only circuit for the current was from the free end of the coil (through the insulator, table, dry carpet, thirty feet of wooden floor, carpet, and myself) to the person holding the other end of the coil. Supposing the free end of the coil had passed through 10 or 50 or 100 miles of wet earth, entirely uninsulated, and finally the end were laid upon the table, what would have been the difference in the spark passing from my hand to the person? I answer, and any competent electrician will understand and acknowledge it, none whatever

I might have expressed myself in much stronger terms than in my communication on page 36, but several considerations prevented my doing so. I do not, therefore, characterize the speculation as a deception, for the reason that the advocates of the etheric force may sincerely believe in it; but I do not hesitate to pronounce the whole thing, both as concerns the public and in a scientific point of view, as one of the flimsiest of illusions.

As stated in the article by Dr. Vander Weyde, on page 89, the conclusions of Dr. Beard are tinged with some disregard of the laws of static (or dynamic) electricity; and while Dr. Vander Weyde cannot technically agree with my views, I do not see but that he does so practically. He explicitly asserts his belief, precisely my own, as set forth in my communication, that the observed phenomena are due to induction, induced electricity of alternating polarities; and excepting on some minor points, I do not see that Dr. Vander Weyde is not an essential advocate—originative of my own position, however much he may differ from me in respect of the theory of atomic vibrations, which is by no means a part of this discussion.

But assuming that the etheric force is something, the question of its practical value is narrowed down to its utility as a telegraph; hence

1. To be of any real value it must be as direct and simple in its operation as the Morse telegraph; or

2. It must enable the construction of telegraph wires on an extremely economical scale; and this must cover the capabilities of the force in respect of a single wire as regards the capabilities of the Morse telegraph in respect of a single wire.

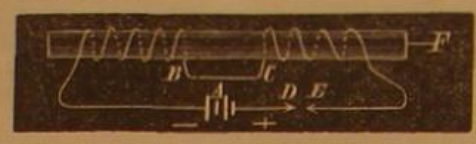
It clearly does not and cannot meet the first requirement. Therefore it must do a great deal in respect of the second; and how *does* it meet the second requirement?

The ordinary telegraph can be constructed, poles and all, for $150 per mile; each additional wire on same poles for $60 per mile. As the etheric force is assumed not to require insulation, if we place its wire upon poles we shall save merely 40 insulators at 12 cents a piece to the mile, or $4.80. This certainly is not practical value.

If, on the other hand, we place our wire underground, it will cost us, naked, at the very least $150 per mile, and the wire would not last so long as upon poles. Nor, certainly, is this practical value.

A higher speed of transmission than 500 words per minute over a single line is useless. The automatic telegraph yields a greater speed, yet it is a practical failure, for it does not and never can meet the requirements of a business telegraph, and I make this assertion while I am the inventor and possessor of such a system, obtained by considerable study and an expense of many thousand dollars. Taken in all or any one of its bearings, I contend that I have proved the practical inutility of the "etheric" force, and this is assuming that we really have found something or other capable of *something or other*: whereas, when we scrutinize the subject, we find that we have only wild speculation as to having found something or other capable of something or other, which, at best, even if realized, will cost as much, or nearly as much, as what we already have, be of no increased value and involve a complete innovation in affairs.

After all that has been made public, almost any person ought to be able to experiment intelligently with the etheric force. About as easy a way to get a sight of this ethereal etherity is as follows:



Take a bar of iron, F, and wind it with insulated wire, starting from the — pole of the battery, A, and passing in one direction round to B; then to C, and from C winding in the opposite direction around the bar, terminating at the contact point, E. From the + pole of the battery connect with contact point, D. Be careful to make the helix from battery to B and from E to C identical as to resistance in ohms and number of convolutions. There should be at least 10 layers of wire, the bar being about 7 inches long. The bar should be bent to form a horseshoe; when the contact points, D and E, are brought together, an armature is not attracted, as both ends of the bar are of the same polarity. Now separate the points D and E and [illegible] and you will get a bright spark, in which the polar effect of one portion of the coil is instantly neutralized by the polar effect of the other portion.

In order to bring the subject of the "etheric" force to a focus, I pronounce as utterly absurd, and challenge a demonstration to the contrary before competent and unprejudiced witnesses:

1. The statement that the etheric force can be transmitted, say from New York to Philadelphia, over a really uninsulated single wire: that is to say, the wire, if an ordinary wire, shall have such ground connections at different intervening points that a galvanic battery current will be completely short-circuited and unable to pass from New York to Philadelphia.

2. The intimation that the etheric force can be transmitted any distance, say one half mile, through the gas pipes of a city: provided there shall be no return wire, but simply an earth plate at the distant terminal, and that the area of the earth plate shall be the same as that of the ordinary earth plate at telegraph stations, and that the earth plate shall be imbedded in earth no more moist than that through which the gas pipe passes.

As I am prejudiced, I cannot, of course, witness the interesting proceedings I propose. W. E. SAWYER.

New York city.

The Original Oil City.

The readers of the SCIENTIFIC AMERICAN, or at least as many of them as are interested in the subject of the petroleum products, have a general notion of the machinery used for boring for oil, and for pumping, refining, storing, and transporting it. To such readers, as well as to those who are acquainted with the details of oil apparatus, an account of how they do these things in Asia will not be unacceptable.

The peninsula of Apsheron, at the southwest corner of the Caspian Sea, abounds in naphtha springs. The oil wells, fifteen years ago, yielded an annual product of about 4,000 tuns, which is now probably much increased. The wells find oil at an average depth of about 150 feet. These wells are about 1 foot in diameter, and the pumping apparatus is among the most simple. A tube, 9 feet long by 9 inches in diameter, furnished with a valve which opens when it touches bottom, is lowered and raised by a steam engine. This machinery lifts in a day about 500,000 lbs. weight of crude petroleum. The tube is lifted clear of the ground, and then (by hand) emptied into a conductor, whence it runs to a reservoir, rudely dug in the ground. From this reservoir, the oil is dipped in buckets and transferred to leather sacks or barrels, for removal. The price of the crude article at the reservoir is about 10 cents for 100 lbs., or five times cheaper than the usual price of crude petroleum in the Pennsylvanian oil regions.

The steam machinery is driven with petroleum for fuel. At the mouth of the firebox, a small stream of petroleum trickles from a tap, and a steam blast blows it, in continuous jets of spray, into the fire. The same description of apparatus is used on the steamboats which navigate the Caspian Sea. The port of the district is Baku, having about 5,000 inhabitants and an antiquity which is shown by the fact that remains of ancient buildings are found in the earth at a depth of 18 feet. Baku will soon be united to the Black Sea by a railroad, now in process of construction, over a distance of about 200 miles. On this road, petroleum steam engines will drive the locomotives, and the Euxine or Black Sea and the Mediterranean will probably be traversed by petroleum-driven steamers. On the Caspian Sea, the boats burn petroleum at a cost of about $1 (one and a half Russian roubles) per hour, while for coal the cost is twelve times greater. In the Mediterranean and the Black Sea, the disparity would not be so great; but the difference in cost would probably leave a large margin in favor of petroleum. At Baku and on the peninsula, both petroleum and the gas which issues from the ground are used in distilling and refining. They are applied in lime burning, and for various other purposes, cooking included, it is to be presumed. It is curious that, while for unnumbered ages petroleum has been so readily accessible at this and other points in the old world, its commercial value was left to be ascertained in the new; and that twenty-five years practical knowledge of the article in America has sufficed to make kerosene a leading article in the world's consumption and commerce. But the Asiatics—or to speak more correctly, the Russians—appear to have been good pupils, and are, in some respects, in advance of us. Their steam machinery may be rude; but they are before us in the practical use of petroleum as fuel. The Baku article is said to be less inflammable than ours, its flashing point being 40° higher.

Baku is the chief city of a province of the same name, now held by Russia, formerly a part of Persia, and still largely populated by Persians. It is only within the memory of the present generation that the Russians reduced the formidable Circassian chieftains to obedience. That accomplished, Russian activity is now turned, as in other places, to the development of the resources of this country. On the peninsula where the oil is found is the "Field of the Eternal Fires," where the Guebers or Parsees (fire worshippers) of old had altars and temples; and the burning gas made the spot holy ground, the point of pilgrimage for thousands of worshippers. Now there are no pilgrims, or next to none; the Persian inhabitants of the spot are more bent upon utilizing the sacred fire than adoring it. Few altars remain, and their few priests come from a distance to mortify the flesh, as the spirit is mortified by the desecration of the eternal fires: the ancient cultus is burning out in lamps, furnaces, and steam engines. *Tempora mutantur.* Times are changed, when the wandering correspondent of the London *Telegraph* (from whom we draw the recent facts in the above statement) could hire a despondent priest of the ancient superstition, by a couple of roubles, to perform his incantations.

Exhibition of Scientific Apparatus.

The Science and Art Department of the British Government, South Kensington Museum, is about to open a Loan Exhibition of Scientific Apparatus on April 1, 1876, to remain open until the end of September.

It will consist of instruments and apparatus employed for research and other scientific purposes, and for teaching. It will also include apparatus illustrative of the progress of Science and its application to the arts, as well as such as may possess special interest on account of the persons by whom, or the investigations in which, it had been employed. Models, drawings, and photographs will also be admissible, when the originals cannot be sent. The apparatus may, in certain cases, be arranged in train as used for typical investigations: and arrangements will be made, as far as it may be found practicable, for systematically explaining and illustrating the use of the apparatus.

Persons desirous of exhibiting should send to the Director of the South Kensington Museum, London, S. W., for further information. Briefly, it may be said that the apparatus for teaching arithmetic, including calculating machines of every description, and for teaching geometry, with the instruments used for geometrical drawing, in copying, in making graphic representations, with models of all descriptions, head the list. Measurement, kinematics, statics, dynamics, molecular physics, sound, light, heat, magnetism, electricity, astronomy, applied mechanics, chemistry, meteorology, geography, geology and mining, mineralogy, crystallography, etc., and biology, are all to be represented, with such fulness of detail as may serve to illustrate in a most striking manner the means and materials of scientific research and advanced education. The Exhibition is favored by the savants of the continent as well as Great Britain. There is a vast amount of similar material in the United States, some of it, such as the great collection in the Stevens Institution of Technology, of much historic interest, and no pains should be spared at the approaching Exposition to bring it together, and present it in a similar manner.

To cure the intolerable itching that always follows frost-bitten toes, it is necessary to exclude the air from the affected part. If it is not accompanied with swelling, gum shellac dissolved in alcohol, applied so as to form a complete coat, is the easiest remedy we know of. It dries soon, does not adhere to the stockings, and generally lasts until they are well. If the flesh becomes swollen and painful, plasters of good sticking salve are of great service; but if highly inflamed, use any mild poultice that will exclude the air from the diseased part, and keep it moist, doing the rest.

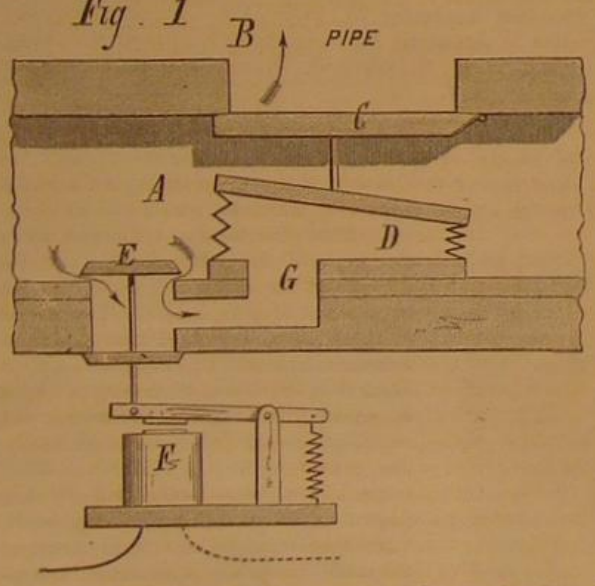
NEW APPLICATIONS OF ELECTRICITY TO ORGAN BUILDING.

A concert organ has recently been erected in Chickering Hall, corner of Eighteenth street and Fifth avenue, in this city, which is remarkable for the numerous entirely novel and ingenious electrical and pneumatic inventions which enter into its construction. The instrument is one of considerable magnitude, having three manuals, a compass of 58 notes, 29 pedal notes, 33 stops, and the necessary couplers and mechanical accessories. So far as the location of its parts is concerned, it is really three organs in one; that is to say, a portion of the pipes are on one side of the stage, a portion are some 60 feet away on the other side, while a complete though small organ, used for echo effects, is placed on the roof of the hall and about 175 feet distant from the single set of keyboards at which the entire apparatus is manipulated.

The portion of the instrument which is directly in rear of the keyboards is provided with pneumatic levers, so that the pressure on a key, instead of acting directly upon the valve of the pipe to be sounded, opens a valve which admits air into a small bellows. The latter, in its movements, actuates the pipe valve, and thus performs the heavy work, so that the merest touch is sufficient to move the key. With the exception of this ingenious pneumatic device, all the rest is directly mechanical, and, since it does not differ from the usual church organ arrangements, needs no further reference. In the other two organs, however, are found the curious electro-pneumatic inventions which have seemingly revolutionized the art of organ building, for by their aid not only can new effects be produced, but one or a dozen organs can be played at once, and all their stops perfectly controlled, and this irrespective of whether they are located within ten feet or ten miles, or in fact any distance, from the player.

We propose to explain, by the aid of the annexed diagrams, first, how the pipes are sounded through pressing the keys, and, second, how the stops are manipulated. For the benefit of those unfamiliar with organs, it may be stated in advance that, by means of stops, air is admitted from the main bellows into any desired set or sets of pipes. Each set of pipes gives a different quality of tone, and thus the performer may select just such sounds (flute-like, trumpet-like, etc.) as best suit the character of the music. Having regulated his instrument by adjusting the stops, his fingers, by pressing the proper keys, open the valves leading to the individual pipes, and thus the instrument is played. In order to apply electricity to the object first mentioned above, it will be obvious that the keys must act exactly as do the keys of an ordinary telegraph instrument, that is, on being pressed down, they must establish a current which, passing over a connecting wire, actuates mechanism at a distance. This is precisely the case, so that the organist has no power to exert beyond the very light pressure necessary to so move the keys. Each key controls its own circuit; and as the mechanism is the same for each, a description of one will suffice for all.

Fig. 1

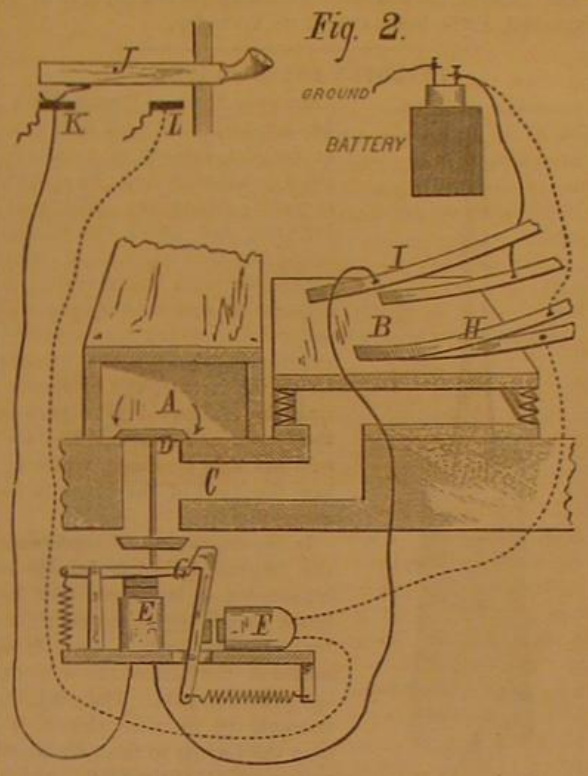


In the diagram, Fig. 1, A is a part of the air chamber, in which air, led by an air trunk from the air bellows, is kept compressed. B is the pipe corresponding to the key whose operation we are considering. There is an opening between the air chamber and pipe, closed as shown by the valve, C. Attached to this valve is a small bellows, D. Through the bottom of the air chamber is another orifice in which plays the double valve, E, the stem of which is continued downward and is attached to the pivoted armature of the electro-magnet, F. Said armature is provided with a spiral spring, the effect of which is to hold it away from the magnet and so to shut the lower part of valve, E, while holding the upper part open. This being the case, a portion of the compressed air in A will pass under the valve, but, being unable to escape at the orifice below, will enter the channel, G, and so ascend into the bellows, D. There will therefore be a constant equilibrium of pressure about the bellows, and thus the valve, C, will be pressed tightly shut against its seat.

When, however, the key is pressed, then the circuit is established, and the magnet, F, becoming excited, draws down its armature, thus shutting the upper part of valve, E, and closing the lower part. The air in the bellows, then being free to escape through the passage, G, cannot equilibrate the pressure in the air chamber, and hence the bellows closes, and at the same time pulls down and opens the valve, C. A blast of air is then free to enter and so sound the pipe. This state of affairs holds as long as the key is held down; but the instant it is released, the circuit is broken, and the various parts regain their normal position. The apparatus is extremely sensitive, and in its prompt action even surpasses the damper movement of a fine pianoforte; so that, in fact, the quickest passages and shortest notes can be played with a clearness, crispness, and brilliancy hardly otherwise attainable. Of course the intervening distance between this mechanism and the keyboard is practically immaterial so long as there is sufficient battery power. In the echo organ, previously referred to as located in the roof of the building, six Leclanché cells are found amply sufficient, although there are some two miles of connecting wires. This very light battery power required, in fact, is characteristic of the whole instrument.

Having seen how each key is worked, we now pass to the means whereby the whole set of 58 keys is caused to control any desired set of pipes. In Fig. 2, A is an air chamber or wind box, fed as before from the main bellows. The small bellows, B, in this case is located outside of the chamber but communicates with it by the passage, C, in which is a double valve, D, similar to valve, E, in the preceding diagram. When the upper part of valve, D, is raised and its lower part closed, there is a free passage for the air to pass from the wind box and into the bellows. When the valve is lowered, as represented, there is a clear passage from the bellows to the outside air. The stem of valve, D, is connected with an electro-magnet, E, arranged as previously described. There is, besides, another magnet at F, which controls a moving armature, G, one end of which forms a latch and engages with the armature of magnet, E. On top of the bellows are two pairs of springs, one pair, H, being in control only when the bellows is down, the other, I, being in like condition only when the bellows is inflated. J is the stop in the organ, on the lower side of which is a switch which comes in contact with one or the other of the metal plates, K and L, according as the stop is pushed in or drawn out. The lead of the circuits is first from plate, K, to magnet, E, thence to the upper spring of pair, I: from the lower spring of same pair to the battery. The second circuit passes from plate, L, to magnet, F, to lower spring of pair, H: from the upper spring of same pair to battery. The object is to move the bellows, and this last moves a series of switches oscillating on a horizontal axis so as to establish connection in 58 key circuits at once. When the stop is pushed in as shown, there is obviously no connection with the battery, because of the pair of springs, I, being separated. Supposing, however, the stop to be drawn out, then the switch on its lower side comes in contact with plate, L, the current passes and excites the magnet, F, which draws back its armature, G, and so releases the armature of magnet, E, the current of course continuing through the pair of springs, H, and so to battery. But the effect of releasing the armature of magnet, E, is to raise the valve, D, so that, as before stated, the air from the wind box is allowed to pass through the passage and into the bellows. The latter then rises, throwing over the 58 switches and so establishing the connection of the keys. But as this rising continues, the springs, H, separate. The circuit is thus broken. At the same time the pair of springs, I, come in contact. The bellows remains, however, inflated, because the position of valve, D, remains unchanged, no circuit being complete through the springs, I, and magnet, E, until the stop pushed in establishes connection with plate, K. Consequently the bellows will stand full and thus push the switches into action as long as the stop beside the keyboard is drawn out. When that stop is pushed in, the circuit closes, magnet, is, E excited, and valve, D, drawn down, cutting off any further supply of air to the bellows, and opening an escape for its contents. As valve, D, falls, the catch on armature, G, slips over the armature of magnet, E; and as the bellows descends, springs, I, once more separate, and thus the parts are again brought to the condition shown in the diagram.

Fig. 2.



It will be observed that this is all done with an open circuit: that the circuit, in fact, is always open, except just when changes are taking place, so that, with a battery like the Leclanché, which stands out of operation when there is no circuit, the exhaustion of the same is very slow and the cost consequently light.

There are various other ingenious attachments of less importance than the foregoing, which are hardly necessary to be described. The credit of the inventions belongs to the builder of the organ, Mr. Hilborne L. Roosevelt, of New York city, and at some future time we shall probably recur to them again.

Beware of Him.

A correspondent writes from Chatham, Ont., that a man, representing himself to be an agent for the SCIENTIFIC AMERICAN, had obtained a number of subscribers in that place and its vicinity. To make the deception more complete, the fellow pretends to be an artist, and represents himself to be authorized by us to make sketches of machinery, public buildings, manufactories, etc.; and he has probably received some money besides for his artistic services, but concerning this the writer does not speak.

If our friends would bear in mind what we so often repeat, that no traveling agents are employed to solicit subscriptions for the SCIENTIFIC AMERICAN, they will save their money and preserve their tempers. We frequently get letters from persons complaining impatiently that they do not get their papers, and adding, after relating the circumstances of their paying their money to some itinerating scamp, that, if he was not authorized to receive their money, it is our duty to follow him up and have him arrested for swindling. Such persons seem to forget that, if they had used the slightest precaution, they would have avoided being swindled. We ask the public to remember that we do not employ traveling agents; and if persons pay their money to irresponsible parties, they should not blame us or expect that we can make their losses good.

Business Prospects for 1876.

Now that everybody has balanced his books and has determined his profits for the year gone by, the future, in place of the past, has become the object of general concern, and questions as to the condition of trade and business prospects for the next twelve months are in every one's mouth. While we note no especially great activity in business circles generally, in our own case we certainly find much cause for self congratulation. Subscriptions to the SCIENTIFIC AMERICAN for 1876 are literally pouring in, in numbers in excess of all previous years; and our new paper, the SCIENTIFIC AMERICAN SUPPLEMENT, has met with a reception exceeding our most sanguine anticipations, placing its success beyond a shadow of doubt. Than these facts no more gratifying evidence of the constantly increasing taste and demand for scientific information could be found; nor could those, who, like ourselves, believe in the advancement of the country's prosperity through the diffusion of useful knowledge, receive more flattering proof that efforts in that direction are by our industrial classes fully appreciated and rewarded.

We would ask all our friends who have not as yet renewed their subscriptions, and all who are engaged in forming clubs to send in their names as rapidly as possible. We continue to forward back numbers, dating from January 1, to all new subscribers, unless specially ordered to the contrary. Those who can conveniently patronize local news dealers, we advise to do so, since they then receive their papers free from the creases necessitated by the folding for the mail; and at the same time they patronize a useful home enterprise, which deserves their encouragement.

A Remarkable War Ship.

In illustration of engineering progress, we give in this week's SCIENTIFIC AMERICAN SUPPLEMENT (No. 8) an interesting article descriptive of the new British man-of-war Inflexible, with diagrams, showing the dimensions and made of operating her enormous guns. This ship is now in course of construction at Portsmouth. Her iron armor is to be two feet thick. The ship is 320 feet long and 75 feet wide, and is to carry two 81-tun guns. These guns will have an exterior diameter of 6 feet, 24 feet length, and 16 inches caliber. The projectile weighs 1,650 lbs., and over a barrel of powder (300 lbs.) is the firing charge. The vessel's engines will be of 7,000 horse power, operating on twin screws. The hull will have 127 watertight compartments. Altogether the Inflexible is the most wonderful specimen of naval architecture ever undertaken.

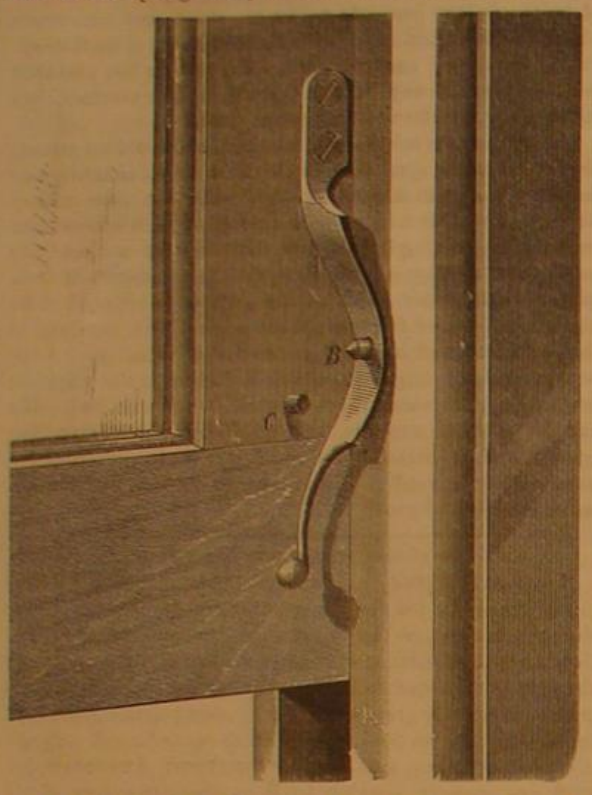
Useful Recipes for the Shop, the Household, and the Farm.

Dried potatoes, which may be kept any length of time, and which, when boiled with a little salt, are not distinguishable in taste from the fresh vegetable, are prepared as follows: After being peeled and cut into disks, they are treated with cold water to which has been added 1 per cent of sulphuric, or 1 to 2 per cent of muriatic acid. Washing in pure water follows, and the pieces are then placed on wire frames and dried in an oven. When done, the disks are of a slightly yellowish tint, and are transparent, like gum.

Dry earth treatment for ulcers has been found very successful. Large, sloughy ulcers, after being washed, were covered with a thick layer of earth, over which a piece of wet paper was placed as a support, the whole being neatly bandaged. In a few days the ulcers began to clear, and when the surfaces looked healthy and granulating, a dressing made as follows was used: A piece of muslin the size of the ulcer was immersed in carbolic oil (in the proportion of 1 part acid to 10 parts cocoanut oil); with this the sore was covered, and over that dry earth was placed, and then moistened earth and a bandage. In a short time the healing process manifested itself satisfactorily, while all odor was entirely removed.

IMPROVED SASH FASTENER.

We illustrate, in the annexed engraving, a new and simple sash fastener, which, when secured, prevents the opening of sashes from the outside, and also their rattling by the wind. A spring band or latch, A, is screwed at its flattened upper end to the sash frame. Its middle portion is bent toward the window frame, and its lower part is carried outward to serve as a handle. In the middle part is a perforation which locks, by the spring action of the latch, on pins arranged along the frame, and one of which is shown at B. By releasing the latch, the sash may be raised or lowered; and by catching the former over the pin, it is retained securely in the required position. A stop pin, C, placed on the sash, back of the spring latch, defines the rearward motion of the



latter, so that it clears the pin on being released without being thrown back too far and thus impairing the efficiency of its spring.

Patented through the Scientific American Patent Agency, June 22, 1875. For further particulars, and for samples of the device, address the inventor, Mr. Peter Meyer, P. O. Box 1,221, Iowa City, Iowa.

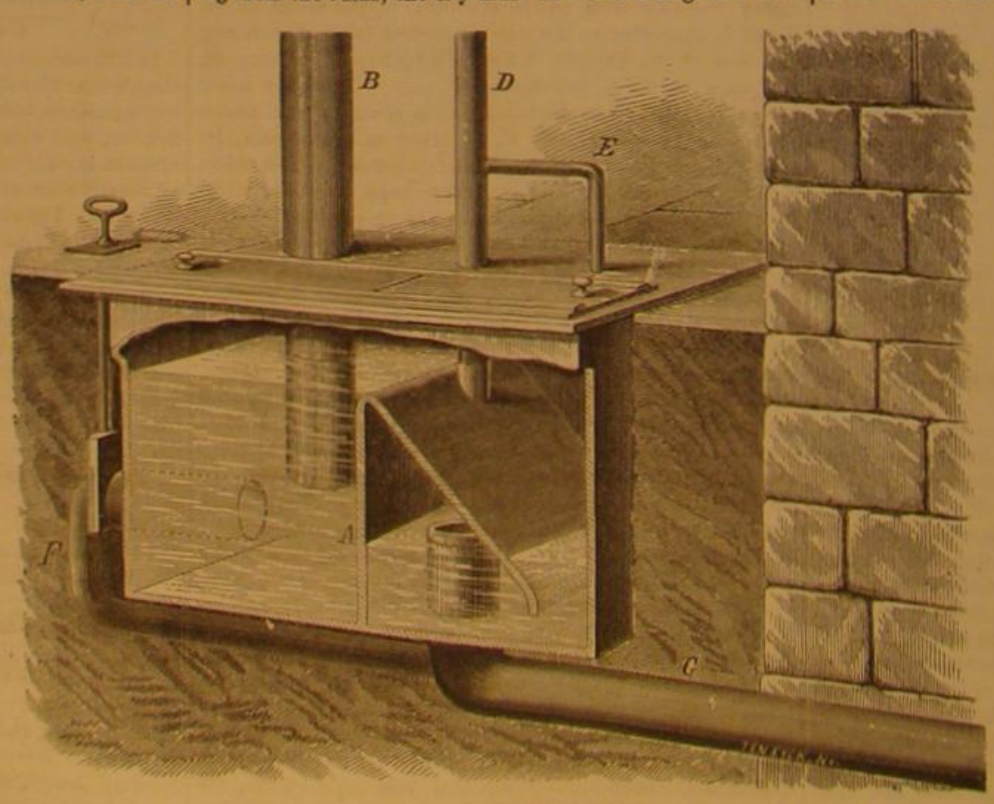
IMPROVED SEWER GAS TRAP.

We have so frequently pointed out the dangers of sewer gas, when the same is allowed to escape into a dwelling through defective plumbing work, that it is hardly necessary again to draw the reader's attention to the great importance of means for preventing its entrance. It is very probable that a large proportion of such diseases as diphtheria, small pox, and typhoid fever, which rage in large cities, are directly owing to this cause. Nor do these effluvia arise solely in the tenements and rookeries of the city. It is a well known fact that epidemics of disease have suddenly appeared in buildings in some of the finest localities, from the neighborhood of which, to all appearances, filth is entirely absent. Only recently, and the circumstance seems to have escaped the notice of the daily journals, one of the largest and most costly edifices, devoted to French flats or suites of apartments in New York, was visited by diphtheria in violent form, hardly a family in the building escaping the visitation; and the cause was plainly traced to defective sewer connections.

The object of the invention here illustrated is to interpose an effective barrier to the entrance of sewer gas to any portion of the house pipes; and to this end, the apparatus is located at the point where the sewer connection enters the building, just inside the wall of the latter, so that all refuse must pass through it before reaching the street drain. It consists of an iron box, having a central diaphragm, A, which is bent down to form a slide, as shown, the lower edge of the bent part not reaching the bottom. B is the main drain pipe of the house, which terminates in the left hand chamber, which thus forms a trap. After entering the latter, the sewage runs over the slide and into the right hand chamber (which is thus another trap), and finally escapes by the pipe, C. This pipe, it will be observed, terminates under the slide, so that its end is really in a separate compartment, entirely cut off, airtight, from the rest of the box by the water seal. To carry off the emanations arising from the open end, the pipe, D, which passes through the diaphragm, leads directly up to the roof of the house, and to the pipe, D, a smaller bent tube, E, is connected, so as to lead off into the same conduit such gases as may arise from the material outside the slide, and to prevent siphoning between the traps. In case the main drain pipe, B, does not communicate with the roof, as is almost always the case, a crosspipe may be led therefrom to the pipe, D, so as to prevent any siphoning which might take place in the first trap of the apparatus through said main pipe. The sliding doors shown above are for giving easy access to the interior.

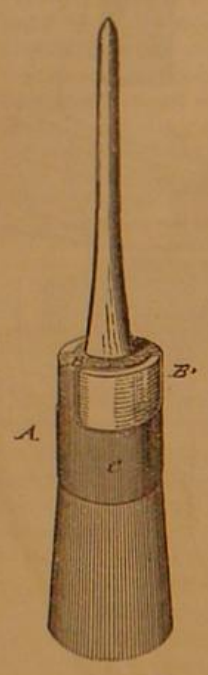
The inventor, who is a practical plumber, claims that this device shuts out completely all sewer emanations from the house which it guards. He points out that it is practically impossible for the gases, even under any pressure which might be generated in the drain pipes, to make their way back through two constantly sealed traps, especially when the convenient outlet offered by the roof pipe, D, is already open to them. No alteration of the plumbing arrangements of the building is required for its insertion, that operation being performed as quickly and as easily as that of placing an ordinary trap in the cellar drain. The pipe, F, serves as an efficient mode of clearing the first chamber in case any sediment should accumulate. It is provided with a valve as shown.

For further particulars address the inventor, Mr. J. T. Campbell, 1,284 Broadway, New York city.



CAMPBELL'S SEWER GAS TRAP.

IMPROVED BRUSH BINDER.



Mr. John Blair, of Boston, Mass., has recently patented a new binder for the bristles of paint and other brushes, which, he claims, is tightly fitting and quickly adjustable, and holds the bristles firmly together where they are in connection with the ferrule. It consists of a continuous piece of soft rubber, which is attached by a cylindrical band in the bristles below the ferrule, and by connecting the perforated yoke part to the ferrule and handle. The ferrule has side openings, which allow the head of the brush to be grasped.

In the engraving, A represents the improved brush handle or binder, which is slipped over the brush handle by its centrally perforated yoke part, B, until it is seated at the base of the same on the bristle ferrule. The yoke, B, connects by its side pieces, B', over the ferrule to the cylindrical main part, C, of the bridle, which is made in one continuous piece therewith, fitting tightly around the bristles below the ferrule, and binding firmly, yet yielding thereon, so as to prevent the paint from rising to the upper part of the bristles. The binder is used with the brush until the bristles are worn down, preserving, in the meantime, the upper part of the bristles in their original condition.

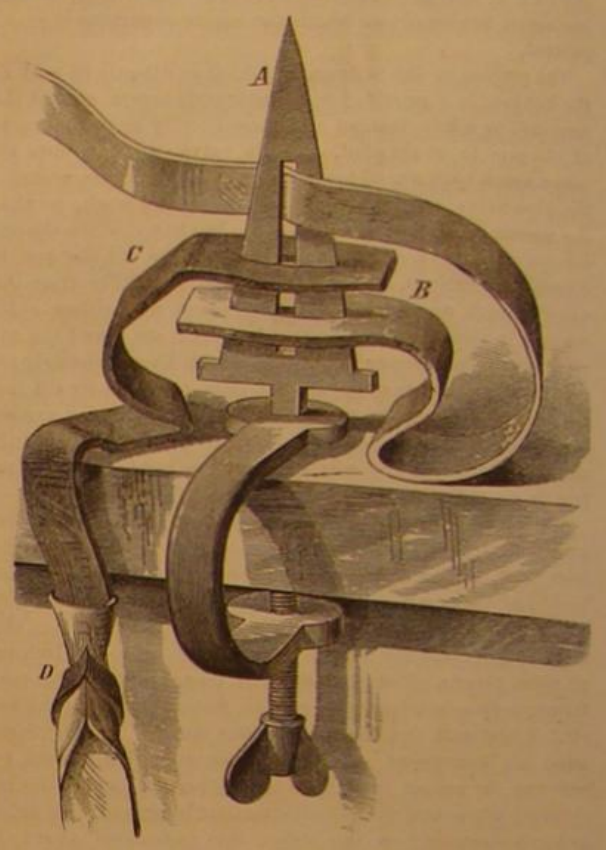
Discovery of an Ancient City.

It is related in Russian journals that, during the recent military survey of the steppes, east of the Caspian Sea, the soldiers discovered the ruins of an ancient city, the existence of which has been utterly unknown in modern times. Judging from the ruins, the city must have had a large and fixed population. Several Arabesque minarets are still well preserved, and bear evidence of the skill of their builders. Remains of extensive aqueducts were also found, some of them still flowing with good drinking water. A number of inscriptions were copied by the officers of the expedition, and brought to St. Petersburgh. According to a tradition of the Turcomans, the country was once very fruitful, and was watered by means of a canal.

IMPROVED CARPET RAG LOOPER.

A new and simple device for securing together the ends of the strips of rags used in weaving carpets is illustrated in the engraving herewith given. It affords a very quick and easy way of performing the operation, and at the same time is so constructed that the rags cannot become caught or tangled so as to necessitate delay to remove them from the apparatus. It seems to be an implement which will greatly facilitate the labor in hand carpet weaving.

A is a triangular slotted blade, having a reduced shank, which is suitably attached to a V-shaped clamp, by which the device is easily and firmly secured to the edge of a table. At the heel of the blade are formed short projecting arms, to keep the strips from slipping under the blade. The



mode of attaching the strips consists in passing the shorter of the two strips, B, over the blade first; then the second or longer strip, C, is forced over, and, finally, the end of B is brought through the slot in the blade. Both strips are then simultaneously lifted off the blade, causing the strip, B, to be drawn by a loop through the slits in both strips, thus forming a weaver's knot, as shown at D. The end of strip, B, is then pulled out of the slot.

Patented November 23, 1875. For further particulars, relative to proposals for manufacture, address the inventor, Mr. W. H. H. Wyckoff, Lesser Cross Roads, Somerset county, N. J.

Bacteria found in the Perspiration of Man.

Dr. Eberth, of Zurich, Switzerland, has found, says the *Medical Record*, by the aid of the microscope, in the sweat of the face some corpuscles which he considered as bacteria. This view became confirmed when he examined the axilla, breast, and inner side of the thigh of several persons in a state of perspiration. The sweat of these parts contained nearly always enormous numbers of bacteria. In most cases they originated from minute bodies found upon the hairs in the mentioned regions, forming little nodules on them, and giving them a grayish or a brick color. They were recognized by the author as accumulations of micrococci. They may rapidly increase in number, are smaller than the diphtherial micrococci, and are nearly indifferent to reagents (concentrated acids, alkalies, alcohol, ether, chloroform). Iodine colors them yellow. The vegetation of bacteria on the hairs may be observed in cases where they are changed already, beginning in places which have clefts between their cells. The vegetation occupies large spaces, especially in the direction of the longest diameter of the hair.

Dr. Eberth observed a mycelium and micrococci, and thinks that the latter are the fruits of the former. Other investigators observed colored sweat, red and blue, which contained micrococci. It was difficult to decide in these cases if the coloring matter was adherent to the micrococci, or if it was a product of the vegetation.

ORGANIC ELEMENTS AS ELECTRO-MOTORS.—It appears, from the author's researches, that the interior of a muscle is negative, which indicates that there is oxidation in the interior and reduction at the exterior, and that all organized bodies appear formed of—so to say—an infinite number of electro-motors, which intervene probably in the phenomena of nutrition.—*Becquérel.*

IMPROVED COUNTERSINK FOR BORING TOOLS.

Mr. Richard J. Welles, of Kenosha, Wis., has recently patented an improvement in countersinks to boring tools, which is illustrated in our engravings. Fig. 1 is a side elevation of a boring bit with the countersink attachment. Fig. 2 is a side elevation of the attachment without the bit; and Fig. 3 is an end elevation. A and B represent the two pieces forming the countersink, said pieces being clamped on the bit shank, C, by screws, D, and having dowels, E, to aid the

Fig. 1

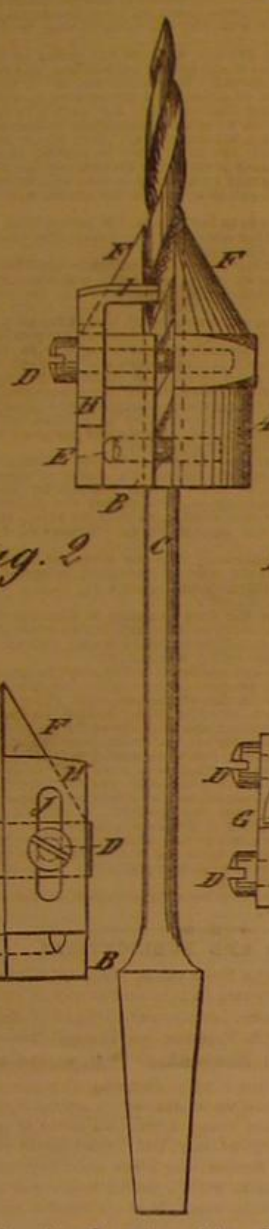


Fig. 2

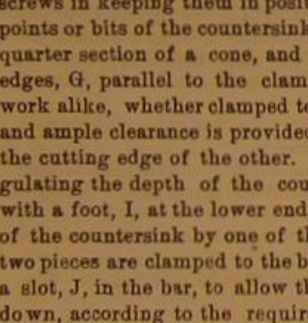
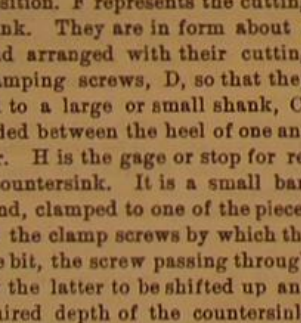


Fig. 3

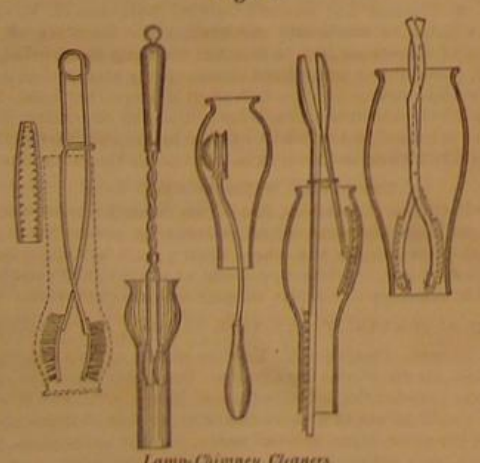


screws in keeping them in position. F represents the cutting points or bits of the countersink. They are in form about a quarter section of a cone, and arranged with their cutting edges, G, parallel to the clamping screws, D, so that they work alike, whether clamped to a large or small shank, C; and ample clearance is provided between the heel of one and the cutting edge of the other. H is the gage or stop for regulating the depth of the countersink. It is a small bar, with a foot, I, at the lower end, clamped to one of the pieces of the countersink by one of the clamp screws by which the two pieces are clamped to the bit, the screw passing through a slot, J, in the bar, to allow the latter to be shifted up and down, according to the required depth of the countersink. The pieces, A and B, are rounded at the upper end, to render the attachment capable of turning on the surface of the stuff without catching and binding on any irregularities thereof.

HOUSEHOLD DEVICES, GATES, AND HINGES.

Continuing our extracts from Knight's "Mechanical Dictionary,"* we select, this week, a number of interesting illustrations of devices pertaining to the dwelling, and also a series of engravings showing a variety of forms of gates and hinges.

Fig. 1.



Lamp-Chimney Cleaners.

In Fig. 1 are represented several kinds of

LAMP CHIMNEY CLEANERS.

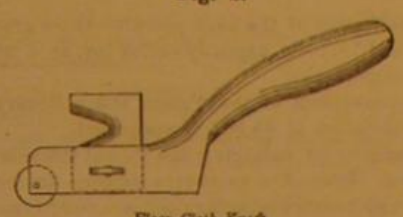
Beginning on the left, the first is simply a pair of brushes attached to the end of bent wire springs, which hold the brushes out against the interior of the chimney. The second device is essentially the same, a handle being added and pads substituted for brushes. The third is a single pad without springs. The fourth has brushes of different shapes adapted to the straight and curved portions of the chimney. The brushes in this case are pressed outward against the chimney by bringing the handles of the implement together. In the fifth device, curved pads replace the brushes, and there is a modification in the shape of the handles.

In order to facilitate the somewhat difficult operation of cutting oil cloth, a

FLOOR CLOTH KNIFE,

represented in Fig. 2, has been devised. In this the blade is

Fig. 2.



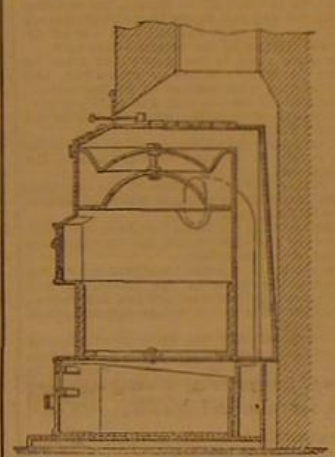
Floor-Cloth Knife.

notched and secured vertically in the lower portion of the handle; the latter is held above the floor by a caster. The edge of the cloth being placed in the notch, and its adjacent portion held, the knife, when pushed forward, makes a neat division, much more easily and accurately than it is possible to perform the same by hand, knife, or shears. The

FIREPLACE HEATER

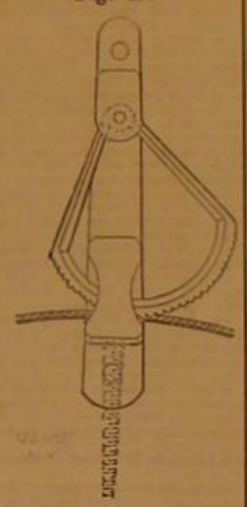
shown in Fig. 3, is set within the fireplace, and serves to warm the room, the pipes discharging into the chimney. The

Fig. 3.



Fireplace-Heater.

Fig. 4.



Clothes-Line Holder.

kind here especially represented is known as the Latrobe, and is base-burning. The pipe passes up the brick flue to heat the air which circulates between pipe and flue to the rooms above, into which it escapes through suitable registers.

Fig. 4 is a simple form of

CLOTHES LINE HOLDER,

designed to secure the line without necessitating the tying of the latter about its supports. It consists of a hook cast upon the main plate, and in a lug of the latter a serrated swinging segment is pivoted. The line is jammed between the serrated portion of the segment and the hook. The

GATES,

shown in Figs. 5 and 6, are as follows: *a* is a gate with adjustable hinges operating on rings on the post, the fastening consisting of a movable latch and staple. *b* shows a mode of setting up the gate, when the outer end sags, by means of the diagonal strut. *c* is another form of setting up the outer end, by means of a tie slat. *d* is a gate, whose top bar is pivoted on the post, the whole device being counterweighted by a box of stone on the extended bar. *e* slides longitudinally, its slats traversing on rollers. *f* is also a sliding gate, which has rollers to keep it level, whether open or shut. *g* is a gate which slides half its length and then rotates on a bar at its mid-length. *h* is a gate of pivoted bars, on the principle of the lazy tongs. *i* is a gate having a set of pivoted slats which assume a vertical position when the counterweighted top slat is allowed to oscillate. *j* is a suspended gate which swings upward, broadside, in a vertical plane. *k* is a gate suspended from pulleys and counterweighted. *l* and *m* are gates operated by equestrians or persons in vehicles by means of ropes.

The ancient Egyptian

HINGES,

which are probably the oldest devices of the kind now known, were crude affairs, and were very similar in construction to those made in our early Western log cabins. A pin projecting from the upper edge of the door was socketed in a vertical hole made in a bracket attached to the wall, and a similar pin on the lower edge of the door was stepped into a socket in the floor or threshold. The illustration, *a*, Fig. 7, is from a model house, found in Egypt by Mr. Salt, and now in the British Museum. The doors of Egypt were either single or double, and were secured by bars and bolts, as seen in the figure. The hinge pieces were usually made of bronze. *b* and *c* show the upper and lower door pins and the sockets, in which the edge of the door is received and in which it is secured by bronze pins. The projection on the upper piece was to keep the door from striking against the wall. *o* shows the general form of a door in remains of stone, marble, wood, and bronze. *p* is a bronze hinge in the Egyptian collection of the British Museum. *q* is the plan of the threshold of an ancient temple with the arrangement of the folding doors. *r* and *s* are four Roman hinges of bronze now in the British Museum.

Fig. 5.

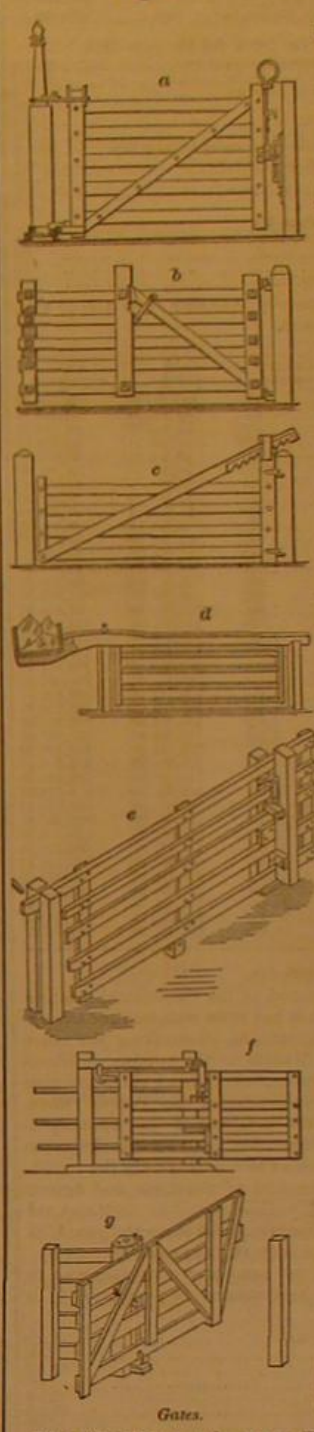
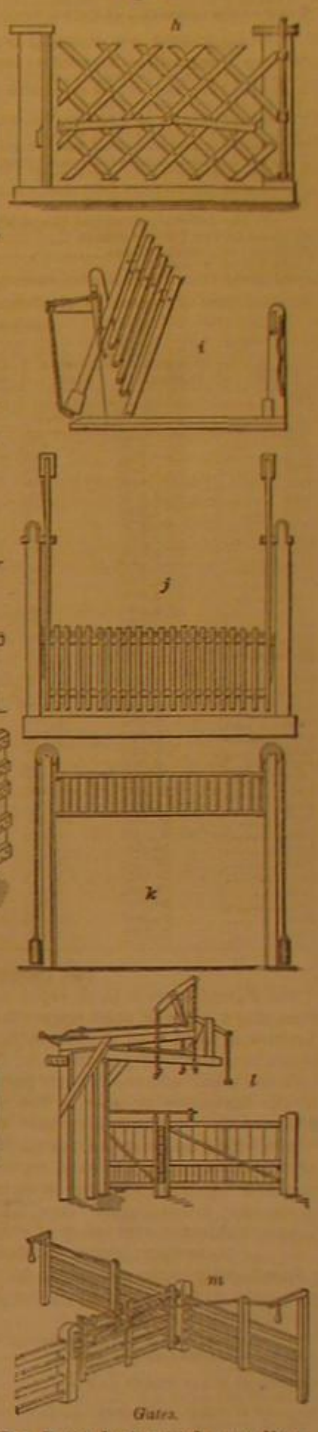


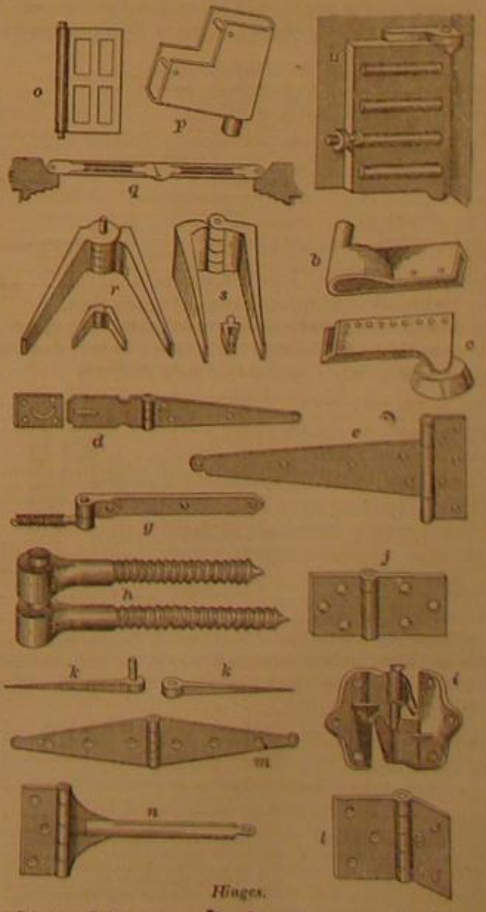
Fig. 6.



Gates. *Gates.*

The other hinges shown in Fig. 7 are designated according to the purposes to which they are applied, or with reference to some structural peculiarity of shape. Thus *i* is a loose joint or self-shutting or blind hinge; *g* is a screw and strap

Fig. 7.



Hinges.

or gate hinge; *h* is a screw hook and eye or gate hinge; *k* is simply a hook and eye; *l* is a butt hinge; *d*, a hasp hinge; *e*, a T hinge; *j*, a table hinge; *m*, a strap hinge; and *n*, cross garnet hinge.

*Published in numbers by Messrs. Hurd & Houghton, New York city.

Abstract from the Congressional Annual Report of the Hon. R. H. Duell, Commissioner of Patents, for the Year Ending December 31, 1875.

Money received by the Patent Office during the year 1875	$743,453.36
Expenditures during the year	721,657.91
Balance to credit of Patent Fund, December 31, 1875	21,795.65
Amount standing to credit of Patent Fund in the Treasury of the United States, January 1, 1875	$865,113.97
Total balance to credit of Patent Fund, December 31, 1875	886,909.62

Statement of the business of the Office for the year 1875.

Number of applications for patents during the year 1875	21,638
Number of patents issued, including reissues and designs	14,897
Number of applications for extension of patents	7
Number of patents extended	28
Number of caveats filed during the year	3,094
Number of patents expired during the year	1,328
Number of patents allowed, but not issued for want of final fee	3,518
Number of applications for registering of trade marks	1,055
Number of trade marks registered	1,138
Number of applications for registering of labels	566
Number of labels registered	313
Of the patents granted there were to—	
Citizens of the United States	14,274
Subjects of Great Britain	338
Subjects of France	83
Subjects of other foreign governments	122

Comparative statement of the business of the Office from 1837 *to* 1875, *inclusive.*

Year.	Applications.	Caveats filed.	Patents issued.	Cash received.	Cash expended.
1837	.....	.....	435	$29,289.08	$33,500.98
1838	.....	.....	520	42,123.54	37,402.10
1839	.....	.....	425	37,260.00	34,545.51
1840	.....	.....	473	38,056.51	39,030.67
1841	775	228	495	40,413.01	32,666.87
1842	547	312	517	36,505.68	31,241 48
1843	761	391	547	35,315.81	30,776.96
1844	819	315	531	42,509.26	36,344.73
1844	1,045	380	502	51,076.14	39,395.65
1845	1,346	452	502	50,264.16	46,158.71
1846	1,272	448	619	63,111.19	41,878.35
1847	1,551	553	572	67,576.69	58,905.84
1848	1,628	607	660	80,732.98	77,716.44
1849	1,955	595	1,070	86,927.05	80,100.95
1850	2,193	604	905	95,738.61	86,916.93
1851	2,258	760	809	112,656.34	95,916.91
1852	2,639	996	1,030	121,527.45	132,869.83
1853	2,673	901	954	169,799.84	167,146.32
1854	3,321	868	1,902	216,459.35	179,540.33
1855	4,435	906	2,024	192,588.02	199,981.02
1856	4,940	1,024	2,302	196,132.01	211,582.09
1857	4,771	1,010	2,910	203,716.16	193,193.74
1858	5,364	934	3,710	245,942.15	210,278.41
1859	6,325	1,097	4,538	256,332.59	252,820.80
1860	7,653	1,084	4,819	137,354.44	221,491.91
1861	4,643	700	3,340	215,754.99	182,810.39
1862	5,038	824	3,521	195,593.29	189,414.14
1863	6,014	787	4,179	240,919.98	229,868.00
1864	6,932	1,053	5,030	348,791.84	274,199.34
1865	10,651	1,937	6,616	495,685.38	361,724.28
1866	15,269	2,723	9,450	646,581.92	639,263.32
1867	21,276	3,597	13,015	681,563.86	628,679.77
1868	20,420	3,705	13,378	693,145.81	486,430.78
1869	19,271	3,624	13,986	669,456.76	557,149.19
1870	19,171	3,473	13,321	678,716.46	560,595.08
1871	19,472	3,366	14,033	699,726 39	665,591.36
1872	18,246	3,090	12,590	703,191.77	691,178.98
1874	20,414	3,248	12,864	738,778.17	679,288.41
1874	21,632	3,181	13,599	743,453.36	721,657.71
1875	21,638	3,094	16,288		

THE CENTENNIAL.

The Patent Office is to be represented at the Centennial celebration, and a space of 10,000 square feet has been assigned for the exhibition of models of American inventions, illustrating the more important and useful industries. Models to the number of about 5,000 are being selected for this purpose, being about three per cent of the aggregate number in the possession of the Patent Office. These, while illustrating in part the progress of our country in "mechanical and manufacturing industries," and the development of American genius and skill, represent in one way only the results attained. Another mode of presentation of the facts and figures in the case is obtainable from the census report of 1870, and the general subject-matter index of patents granted since the year 1790.

MANUFACTURES OF AGRICULTURAL IMPLEMENTS.

In referring to the census, under the head of "manufactories in operation in 1870, exclusively for agricultural implements," it is found that the—

Number of establishments in operation was	2,076
Number of steam engines at work	676
Horse power	15,878
Number of water wheels at work	426
Horse power	10,209
Number of hands employed	25,349
Capital invested	$34,834,600
Wages paid	$12,151,504
Material used, value	$21,473,925

The census shows an increase of $34,578,825 in the value of agricultural implements manufactured over the amount reported in 1860, and of $45,224,174 over the amount reported in 1850, while the total value for the year 1870 of the "mechanical and manufacturing industries" aggregates the sum of $4,232,335,442.

The following are the products of agricultural implements of the manufactories first above referred to, being the articles manufactured and number made:

Cane mills	108	Horse rakes	80,919
Clover hullers	5,206	Lawn mowers	2,536
Corn planters	21,709	Mowers	39,496
Corn shellers	12,914	Plows	864,947
Cotton planters	2,000	Reapers	60,388
Cultivators	88,740	Reapers and mowers	59,645
Fanning mills	19,772	Rollers and scrapers	4,803
Grain cradles	103,646	Seed sowers	6,900
Grain drills	32,033	Scythes	881,244
Hand rakes	207,319	Scythe snaths	17,680
Harrows	9,150	Separators	1,131
Harvesters	3,566	Shovels	25,756
Hay and straw cutters	30,879	Sickles	300
Hay forks	1,298,260	Stump pullers	134
Hoes	135,139	Threshers	22,934
Horse powers	4,541	Other products	5,206,789

PATENTS FOR AGRICULTURAL IMPLEMENTS.

For the articles above enumerated, there have been granted between the years 1790 and 1873, inclusive—that is to say, since the organization of this Office (1790)—the following patents:

Cane mills	66	Horse rakes	373
Clover hullers	100	Lawn mowers	94
Corn planters	647	Mowers	179
Corn shellers	358	Plows	2,451
Cotton planters	173	Reapers	69
Cultivators	1,617	Reapers and mowers	61
Fanning mills	127	Rollers and scrapers	141
Grain cradles	18	Seed sowers	579
Grain drills	186	Scythes	50
Hand rakes	9	Scythe snaths	36
Harrows	229	Separators	334
Harvesters	2,244	Shovels	58
Hay forks	362	Sickles	13
Hoes	201	Stump pullers	191
Horse powers	415	Threshers	732

MISCELLANEOUS AMERICAN PATENTS.

These indicate the scope and versatility of the inventive genius of our country, and all enter more or less into the "mechanical and manufacturing industries" that have been referred to. They are as follows

Bee hives	645	Looms and appurtenances	1,710
Bending machines	144	Paper, manufacture of	269
Boots and shoes, etc	817	Pavements	404
Brick kilns and machines	806	Photography	546
Bridges	425	Planing machines	384
Brooms and brushes, etc	250	Propellers, etc	570
Buckles	388	Printing presses, etc	756
Burglar alarms	165	Railway apparatus	1,552
Burners, gas, lamp, and vapor	793	Roofs and roofing	506
Car brakes	495	Rotary engines	110
Car coupling	961	Saw mills and machines	1,981
Car wheels	314	Sewing machines, etc	2,295
Carriages, etc	1,495	Steam engines and apparatus	1,013
Churns, etc	1,291	Stoves	2,400
Clothes dryers and wringers	984	Straw cutters and machines	401
Curtain fixtures	364	Sugar mills and machinery	343
Fire arms	1,393	Telegraph and instruments	566
Gas and gas apparatus	1,259	Toys	300
Grain cutting, binding, etc	135	Tobacco presses, etc	197
Grinding and grist mills	371	Valves	1,497
Lamps and appurtenances	1,483		

Total number of patents issued since 1836	171,640
Total number of reissues	6,890
Total number of designs	8,883
Total number of trade marks	3,287
Total number of labels	464

In presenting this annual report, the Commissioner makes several suggestions and recommendations for the improvement of business facilities at the Patent Office.

1. To the corps of one hundred examiners now employed, he asks for an addition of twelve more examiners. He also asks for the restoration of the grade of Third Assistant Examiners; and suggests that the duties of Principal Examiners ought to be defined by law.

2. He suggests that all decisions of the courts shall be published in the *Official Gazette*, such publication to have the same force and effect as if published by authority of the courts.

3. The publication of the back patents—those granted between 1836 and 1871—is urgently called for, as a matter of the highest importance.

4. The improvement of the Patent Office library, by an annual appropriation of $5,000, is suggested.

5. The necessity of enlarging the Patent Office is conclusively shown. From five to twelve persons are now compelled to occupy rooms averaging each not more than twenty feet square, this space being also reduced by the cases for letters, papers, etc.; while models have to be tucked away in the attic.

The Commissioner's Report is one of the most straightforward, practical documents ever issued from the Patent Office; and we hope that Congress will adopt the excellent suggestions it contains.

DECISIONS OF THE COURTS.

Supreme Court of the United States.

THE GREEN CORN PATENTS.—RUFUS K. SEWELL, ADMINISTRATOR OF HENRY CLARK, DECEASED, APPELLANT, *vs.* JOHN WINSLOW JONES *et al.*—APPEAL FROM THE CIRCUIT COURT OF THE UNITED STATES FOR THE DISTRICT OF MAINE.—OCTOBER, 1875.

To entitle a plaintiff to recover for the violation of a patent, he must be the original inventor, not only in relation to the United States, but to other parts of the world. Even if the plaintiff did not know that the discovery had been made before, still he cannot recover if it has been in use or described in public prints, and if he be not, in truth, the original inventor.

To constitute an infringement, the thing used by the defendant must be such as to substantially embody the patentee's mode of operation, and thereby to obtain the same kind of result as was reached by his invention. It is not necessary that the defendant should employ the plaintiff's invention to as good advantage as he employed it, or that the result should be the same in degree, but it must be the same in kind.

To infringe a patent, it is not necessary that the thing patented should be adopted in every particular. If the patent is adopted substantially by the defendants, they are guilty of infringement.

In an action for infringement, the first question is whether the machine used by the defendant is substantially in its principle and mode of operation like the plaintiff's. If so, it is an infringement of it.

If he has taken the same plan and applied it to the same purpose, notwithstanding he may have varied the process of the application, his manufacture will be substantially identical with that of the patentee.

The question of infringement depends upon whether the plan which the defendant has employed is in substance the same as the plaintiff's, and whether all the differences which have been introduced are not differences in circumstances not material, and whether it is not in substance and effect a colorable evasion of the plaintiff's patent.

When a party has invented some mode of carrying into effect a law of natural science, or a rule of practice, it is the application of that law or rule which constitutes the peculiar feature of the invention. He is entitled to protect himself from all other modes of making the same application, and every question of infringement will present the question whether the different mode, be it better or worse, is, in substance, an application of the same principle.

When the inventor says: "I recommend the following method," he does not thereby constitute such method a portion of his patent.

Appert's process, embodied in the Durand patent of 1810, contains everything of value that is contained in Winslow's patent, through whom the appellees claim.

Mr. Justice HUNT delivered the opinion of the court:

Jones, as assignee of four several patents for a new and useful improvement in preserving Indian corn, brought his action against Clark, the original defendant, alleging infringements of the same. These patents were issued to Isaac Winslow, and were as follows, namely: No. 34,928, dated April 8, 1862, for "a new and useful improvement in preserving Indian corn;" No. 35,274, dated May 13, 1862, "for a new and useful improvement in preserving green corn;" No. 35,346, dated May 30, 1862; and No. 36,326, dated August 26, 1862.

The two patents last above mentioned were declared and adjudged by the court below to be void, and from this judgment no appeal has been taken. They are no longer elements in the case before us, and are dismissed from further consideration.

The patent first mentioned is for an article of manufacture—a result. The second one is for a process by which a result is obtained. The first is the more full, and embraces all that is contained in the second.

The first objection made to the patents is the want of novelty. It is contended that they were anticipated by the Appert process embodied in the Durand patent of 1810; also by the patent of Gunther, of 1841, and by that of Wertheimer, of 1842. It is an elementary proposition in patent law that, to entitle a plaintiff to recover for the violation of a patent, he must be the original inventor, not only in relation to the United States, but to other parts of the world. Even if the plaintiff did not know that the discovery had been made before, still he cannot recover if it has been in use or described in public prints, and if he be not in truth the original inventor. (Dawson *vs.* Follen, 2 Wash., C. C., 311, Bedford *vs.* Hunt, 1 Mason, 302.)

Durand's patent is described in his specification, enrolled in the English Court of Chancery, as based "upon an invention communicated to him by a certain foreigner, residing abroad, of the manner of preserving animal food, vegetable food, and other perishable articles a long time from perishing or becoming useless."

In describing the nature of the invention, and the manner in which the same is to be performed, he says:

1. "I place the said food or articles in bottles of glass, pottery, tin, or other metals or fit materials, and I close the aperture so as completely to cut off or exclude all communication with the external air," and he describes the various means of effecting that purpose.

2. "When the vessels are thus charged and well closed, I place them in a boiler, each separately surrounded with straw or wrapped in a coarse cloth, or otherwise defended from striking against each other. I fill the boiler so as to cover the vessels with cold water, which I gradually heat to boiling, and continue the ebullition for a certain time, which must depend upon the nature of the substances included in the vessels, and the size of the vessels, and other obvious circumstances, which will be readily apprehended by the operator. Vegetable substances are to be put into the vessel in a raw or crude state, and animal substances partly or half cooked, although these may also be put in raw."

The specification then declares that the inventor did avail himself of the application of heat by placing the vessel in an oven, stove, steam bath, or other fit situation for gradually and uniformly raising the temperature and suffering it to cool again, and that as the choice of the consumer, or nature of the said food or other articles, may render preferable, leave the aperture of the vessel, or a small portion thereof, open until the effect of the heat shall have taken place, at which period the same is to be closed.

The points following are embraced in this patent:

1. It is for the purpose of preserving for a long time animal or vegetable food.

2. The articles thus to be preserved are to be placed in tin or other vessels, so arranged as to exclude communication with the external air.

3. An aperture may be left in the vessel, at the choice of the operator, until the effect of the heat shall have taken place, when it is to be closed.

4. The vessels, thus prepared, are placed in a boiler filled with cold water, which is heated to a boiling point, which boiling shall be continued for such time as shall be required by the substances contained in the vessels.

5. Although a water bath is preferred, the inventor declares he avails himself of heat through an oven, stove, steam bath, or any other situation fit for gradually raising the temperature and suffering it to cool again.

6. Vegetables are to be put into the vessels in a raw or crude state; animal substances, raw or partly cooked.

7. The invention is general in its terms, embracing all vegetables and all animal substances capable of being thus dealt with.

Winslow's patent of April 8, 1862, No. 34,928, is declared to be for an improvement in preserving Indian corn in the green state.

The letters patent declare that the first success of the inventor was obtained by the following process:

"The kernels being removed from the cob were immediately packed in cans hermetically sealed, so as to prevent the escape of the natural aroma of the corn or the evaporation of the milk or other juices of the same. I then submitted the sealed cans and their contents to boiling or steam heat for about four hours. * * * By this method of cooking green corn in the vapor of its juices the ends of the cans are bulged out. Strong cans are required, and dealers are likely to be prejudiced against corn thus put up. I recommend the following method: Select a superior quality of green corn in the natural state, remove the kernels from the cob by means of a curved and gaged knife, or other suitable means. Then pack in cans, hermetically seal the cans, expose them to steam or boiling heat for about an hour and a half, then puncture, seal while hot, and continue the heat for about two hours and a half."

At the close, the inventor says that what he claims to secure by the patent is the new article of manufacture, namely, Indian corn preserved in the green state without drying, the kernels being removed from the cob, hermetically sealed, and heated, as described.

Let us now state the points embraced in this the plaintiff's patent, and compare them with the points heretofore stated as included in the Durand patent.

1. Winslow's declared object is the preservation of Indian corn in the green state.

Durand's is for preserving Indian corn not only, but all vegetable substances in their raw or crude state.

2. Winslow recommends removing the kernels from the cob before the process of preservation is commenced, placing the kernels in cans, sealing them, and exposing them to heat.

Durand, not limiting himself to the article of corn, provides that the articles to be preserved shall be placed in cans, and subjected to heat in the same manner. He does not stipulate or recommend that the article shall be first removed from the cob, the vine, the twig, or whatever may be the natural support of the vegetable to be preserved, as the corn from the cob, the pea from its pod, the grape or tomato from its vine, the peach from its stem, the berry from its stalk. Neither does he recommend that it shall not be so removed. His process embraces the article in whatever form it may be presented. It is for the preservation of raw or crude or uncooked vegetables in whatever form they may be presented, and necessarily includes a case where they have been previously removed from their natural support. A prior removal from the stalk would be the natural, and, in many cases, a necessary proceeding.

3. Winslow directs that the kernels shall be subjected to the heat for a period of about one and a half hours before puncturing, and for about two and a half hours after the puncturing. The double use of the word "about" indicates that the time is not to be considered as precisely specified.

Durand directs that the boiling shall continue for such length of time as shall be required by the particular substances contained in the vessel. Corn, peas, tomatoes, peaches, berries, asparagus, may very likely require great difference in the time in which the heat shall be applied to produce the required effect. In each case that is to be the measure of the time.

4. Winslow says other modes may be adopted so long as hermetical sealing and the use of heat are so managed as to secure the aroma and fresh flavor and prevent putrefaction.

Durand declares that he intends to include in his patent heat through an oven, stove, steam, or any other situation by which the temperature is gradually raised and suffered to cool again.

The same idea is put forth at the close of Winslow's specification, where he declares that what he claims by his patent is the manufacture of Indian corn in its green state, the kernels being removed from the cob, hermetically sealed, and heated.

We are of the opinion that the substance of all that is found in Winslow's patent had, nearly a half a century before he obtained his patent, been put forth in Durand's patent. If Durand's patent were now in force in this country, and a suit brought upon it against Jones, the claimant under Winslow, for an infringement, the right to recover could not be resisted. Durand would show a patent intended to effect the same purpose, to wit, the preservation of vegetables for a long time, employing the same process, to wit, the effect of heat upon vegetables placed in a metallic vessel, the gradual cooling of the same, hermetically sealed after puncture to allow the escape of gases. This is also Winslow's process.

To constitute an infringement, the thing used by the defendant must be such as substantially to embody the patentee's mode of operation, and thereby to attain the same kind of result as was reached by his invention. It is not necessary that the defendant should employ the plaintiff's invention to as good advantage as he employed it, or that the result should be the same in degree, but it must be the same in kind. (Winans *vs.* Denmead, 15 How., 330.)

To infringe a patent it is not necessary that the thing patented should be adopted in every particular. If the patent is adopted substantially by the defendants they are guilty of infrigement. (Hoot *vs.* Ball, 4 McLean, 177; Alden *vs.* Deney, 1 Story, C. C. R., 336.)

In an action for infringement the first question is whether the machine used by the defendant is substantially in its principle and mode of operation like the plaintiff's. If so, it is an infringement to use it. (Howe *vs.* Abbott, 2 Story C. C.; 190, Parker *vs.* Haunth, 4 McLean, 370.)

If he has taken the same plan and applied it to the same purpose, notwithstanding he may have varied the process of the application, his manufacture will be substantially identical with that of the patentee. (Curtis, § 312.)

The discovery in question has been of immense benefit to mankind. By means of food preserved in a compact and nutritious form, protected from its natural tendency to decay, deserts are traversed, seas navigated, distant regions explored. It is less brilliant, but more useful than all the inventions for the destruction of the human race that have ever been known. It is to France that the honor of this discovery belongs, and to Appert, a French citizen. It does not belong to America or to Winslow. Apperi's process presents all that we now know upon the subject. It contains absolutely everything of value that is contained in Winslow's patent.

Other grave questions are presented by the record before us. We are satisfied, however, to place our decision upon the ground that the want of novelty in the patents of Winslow is fatal to the plaintiff's right of recovery. We do not discuss the other questions.

The decree of the court below must be reversed, and judgment ordered in favor of the defendant below.

NEW BOOKS AND PUBLICATIONS.

REPORT ON THE COMPRESSIVE STRENGTH, SPECIFIC GRAVITY, AND RATIO OF ABSORPTION OF THE BUILDING STONES IN THE UNITED STATES. By O. A. Gillmore, Lieutenant-Colonel of the Corps of Engineers, Author of "A Treatise on Limes, Cements, etc." New York city: D. Van Nostrand, 23 Murray and 27 Warren streets.

This book contains Lieutenant-Colonel Gillmore's official report, to the Chief of Engineers of the United States Army, on a series of tests which were partly reported on to the end of July, 1874. The present volume carries the investigation one year further, and gives some very valuable and interesting facts and information, which, taking into consideration the rapid growth of the use of artificial stone, is of the highest practical importance.

DIGEST OF OPINIONS OF THE JUDGE ADVOCATE GENERAL OF THE ARMY, containing a Selection of Official Opinions furnished between September, 1862, and July, 1868. Edited by Major W. Winthrop, Judge Advocate. Washington, D. C.: Government Printing Office.

The scope of this work is fully set forth in its title, and it will be found a useful reference book by the legal profession.

REPORT ON THE HYGIENE OF THE UNITED STATES ARMY, with Descriptions of Military Posts. Washington, D. C.: Government Printing Office.

A voluminous document, containing information down to the end of the year 1874.

JAMES W. TUFTS' CATALOGUE OF SODA WATER APPARATUS. Boston, Mass.

A handsome volume, superbly illustrated.

DYNAMOMETER EXPERIMENTS ON SPINNING FLAX. By E. Cornut, Chief Engineer of the Association of Steam Power Proprietors of Northern France. Lille, France: L. Danel.

An interesting little treatise, of great practical value.

Recent American and Foreign Patents.

NEW MECHANICAL AND ENGINEERING INVENTIONS.

IMPROVED STOPPING MECHANISM FOR SPINNING JACKS.

William W. Sinclair and Edward Galvin, Mottville, N. Y.—This invention consists of automatic mechanism for throwing off the driving belt of a spinning jack in case the squaring band breaks or fails to act. The shifter lever has a strong spring attached to it for throwing it when released by the failure of the squaring band. The said spring is held distended, ready for action, by the shifter lever itself, which is lodged in a notch in a frame piece, and is tripped by a sliding cam rod when the band fails, and throws the belt shifter.

IMPROVED WIND POWER.

Timothy C. Guthery, Freedom, Ind.—This invention relates to an improvement upon the wind wheel covered by patent No. 91,457, and consists in mounting the wheel upon a shaft having its bearings in a rotating bar, to whose upper end a vane is rigidly attached. The object is to render the device simpler and less expensive.

IMPROVED AUTOMATIC WASTE PIPE CLOSING ATTACHMENT.

F. Philip Bourne, Brooklyn, N. Y.—The object of this invention is to furnish an improved attachment for waste pipes, so constructed as to prevent the escape of gases, odors, etc.; and it consists in the combination of a valve chamber or box, bottom plate, chambered top plate, pipes, pivoted valve, pivoted valve plate, and weight with each other, so arranged as, when the waste water is admitted into the pipe in sufficient quantity to overbalance the downward pressure of the weight, the valve will be lowered into an inclined position, allowing the waste water to flow into the pipe. As soon as so much of the water has run out that the weight of that remaining will be overbalanced by the weight, the valve will close. The valve will always have a small quantity of water above it, and will thus effectually prevent the escape of any gas or odor from the waste pipe.

IMPROVED ANTI-FRICTION BEARING.

Cevedra B. Sheldon, New York city.—Good results have lately been obtained with linings for journal boxes, composed of paper and cloth combined with plumbago. Mr. Sheldon's invention proceeds a step further, and obviates the objection of destructibility, which applies to the fragile materials last named above. Plumbago is made into a plastic mass with a suitable cement, and by heavy pressure is forced into the interstices of wire cloth or perforated metal sheets.

IMPROVED TWEER.

Charles M. Morgan, Hesper, Iowa.—The manner of controlling the blast is by raising or lowering a cup, thereby increasing or diminishing the opening for admitting the wind to the fire. Another purpose of the cup is that, by raising or lowering, it loosens the cinders that may have choked up the wind passage to the fire, and causes all fine particles to fall into the chamber below, thereby insuring a clear fire free from dirt. By operating a lever, the valve in the base plate can be moved away from its seat, to allow any dust or cinders that may be in the wind chamber to drop out; and by leaving said valve open when the blast is shut off, a sufficient quantity of air will pass up to keep the fire alive for a long time.

IMPROVED MACHINE FOR POINTING WIRE.

Henry A. Williams, West Medway, Mass.—This invention consists of progressive feeding and turning mechanism, in combination with rolls having tapered grooves, for tapering and pointing wires to make picker teeth, hackle pins, printers' bodkins, taper dowel pins, and the like, the said feed mechanism being so that only a small portion of the wire is at first presented to the rolls. The wire is advanced a little more at each operation, so that, as the size is reduced, the wire feeds into the smaller portion of the grooves, and thus can be reduced to any required size in one groove. This plan saves the necessity of a series of grooves for doing the same work, also the shifting of the work from one groove to another.

IMPROVED EMERY WHEEL.

George H. Peabody, Brooklyn, N. Y.—This wheel is covered with an emery composition formed of powdered rosin, white lead, beach clay, glue, emery, and water, which is applied by tamping it to the surface of the wheel by numerous blows with a small hammer.

IMPROVED GRAIN SEPARATOR.

Michael Laufenburg, San Francisco, Cal., assignor to Treadwell & Co., same place.—A fan blower throws a blast between two separate belts. The upper half of the carrier passes over and under guide rolls at different elevations, so that the straw is shaken repeatedly on the open work belt and the remaining grain caused to fall on a subjacent chute. From this chute the grain is dropped in front of another fan that detaches any dust, and thence into a shaking shoe. By this organization of mechanism the straw undergoes such a thorough sifting that no grain that has been loosened from the head can well be carried off to the stack.

IMPROVED TREADLE.

Henry Reese, Baltimore, Md.—The object of this invention is to lessen the fatigue of operating sewing machines and other devices run by treadle power, by means of a peculiar construction of treadle which prevents the movement of the latter to be made without bending the ancles, and enables the operator to run the machine with a very light expenditure of muscular power. This result is accomplished by a peculiar construction of two independent treadles, hinged or pivoted upon opposite sides of the fulcrum of the main treadle, held in proper horizontal position by means of springs, and arranged adjustably for either foot foremost.

IMPROVED RAILWAY SIGNAL.

Jacob D. Hughson, Prairie City, Ill.—This invention relates to a signal apparatus in which springs, or other analogous means of retracting the bell clapper or hammer, are dispensed with, and two clappers or hammers are so arranged and connected with other parts that they counterbalance each other, to a certain extent, and the rebound of either aids in producing the striking movement of the other: also whereby the signal is always repeated and the sound thus made practically continuous so long as a train is passing.

IMPROVED BALING PRESS.

Christopher C. Campbell, East Chatham, N. Y., and Henry W. King and Allan C. Smith, Canaan, N. Y.—This invention relates to certain improvements in perpetual baling presses, or presses in which the operations of packing the hay into the box and tying it into bales in the baling chamber are performed at the same time; and both followers are detachable, each being taken out successively at the end of the baling chamber and inserted successively in the packing box. The invention consists in the devices for packing the hay or other material in the packing box, which devices are also made to automatically withdraw the follower from the baling chamber and insert it in the packing chamber without handling.

NEW AGRICULTURAL INVENTIONS.

CUTTER BAR FOR REAPERS AND MOWERS.

Thomas Henderson, Black Horse, Md.—The object of this invention is to provide an improved means of attaching the knives of a reaper or mower to the reciprocating bar, whereby the said knives may be more conveniently and safely handled and more readily sharpened. It consists in attaching each alternate knife to a separate bar and then placing and fastening the two bars together so as to form a continuous saw-shaped or serrated cutting edge.

IMPROVED GRATED ENTRANCE TO BEEHIVES.

John S. Harbison, San Diego, Cal., assignor to himself and Andrew Harbison, Newcastle, Pa.—This invention consists of positive gaged passages, of sufficient thickness to permit the rounding of the corners, thereby enabling the bees to pass safely with their loads of pollen, while at the same time gaging the passages to the size of the worker bees. The object is to restrain either the queen or drones from leaving their respective apartments, either in the act of swarming or otherwise.

IMPROVED ROAD SCRAPER.

William H. Bowman, London, O.—A revolving scraper is pivoted to a handle frame, which has an independently swinging front bail that breaks, by a curved end at one side only, the connection of scraper and handles. This is done by pressing on a sliding spring rod and releasing the retaining latches of the scraper. The catches are jointly operated by their fulcrumed connecting lever rods, and lock into a notched casting at each corner of the scraper. The face plates of the handles are recessed to receive the sliding rods which operate the lower catches.

IMPROVED MILK AND CHEESE PAN.

Henry W. Horton, Binghamton, N. Y.—This pan is seated in another receptacle, into which steam is admitted for heating or water for cooling. The novel features are an overflow pipe having a detachable upper portion, to allow access to a series of inlets, through any one of which the water can be made to escape by plugging the passages below. The end pieces of the supporting frames are made in sections, so fitted together that any number of the sections can be put in to make them of any length required for pans of any width.

IMPROVED TOBACCO SUCKER GERM DESTROYER.

Joseph H. Knaus and John R. Harford, New Franklin, Mo.—In using the instrument, the fork of a bar is placed against the tobacco stalk, directly over the sucker germ, and is pressed against said stalk with sufficient force to force the forked bar upward and cause a cutter to project against said germ. A cross bar is then drawn upward with the fingers, which rotates the rod and cutter, and cuts out and destroys the germ, so that it will not grow again.

IMPROVED HAY RACK.

Joseph Hall, Riverside, Neb.—This invention consists of improvements in parts of the hay rack for which a patent was granted to the same inventor, May 1, 1875: said improvements being hook bolts instead of hooks, and other devices, the general end of which is to render the apparatus more substantial.

IMPROVED CHEESE TURNER.

Charles Barlow, Cookshire, Canada.—This invention allows the cheeses to be turned and greased without removing them from the shelves; and the general arrangement is such that each shelf may be readily brought into such position that the cheeses upon it may be conveniently reached.

IMPROVED GRAIN BAG.

Constantin Lazarevitch, Brooklyn, N. Y.—In this improved grain bag, the necessity of sewing up the mouth of the grain bag is obviated. A funnel-shaped part is formed above the mouth of the bag, the mouth being made narrower by closed shoulders on each side of the funnel. The funnel is reversed and forced into the grain, closing thereby the bag securely.

NEW TEXTILE MACHINERY.

IMPROVED FELTING MACHINE.

Jeremiah J. O'Sullivan, Brooklyn, N. Y.—By this invention the inventor claims to dispense with putting in layers, breaking down, stopping off, hardening off, tip-hardening, and all other handling usual in the old process of hat-hardening. The process is as follows: First, having raised the upper cone from the perforated cone, the hat body is placed over the latter. The upper cone being set in position, steam is admitted to the perforated cone. This heats and moistens the hat body; and while this is going on, the upper cone is given a rapid reciprocating motion. The cones, being perfectly true, will cause the whole hat to be finished with an evenness heretofore unable to be obtained.

NEW WOODWORKING AND HOUSE AND CARRIAGE BUILDING INVENTIONS.

IMPROVED VEHICLE TOP PROP BLOCK.

Andrew Butterfield, Huntsville, Ala., assignor to himself and I. I. McKibbin, of same place.—This inventor proposes a spring extension of the block up along the bow, and a cushion on the end for the bow to rest on, whereby the spring extension takes the strain off the bows when the top is down, and prevents them from springing and breaking. The top is also preserved, and has an easy and graceful vibrating motion.

BRACKET BAND FOR VEHICLE WHEELS.

John G. Lefler, Philadelphia, Pa.—The object of this invention is to provide a ready means for repairing the hubs of vehicle wheels by strengthening the connection between the hub and spokes. The invention may also be applied to advantage in new wheels for additional strength; and it consists in a bracket band, or a band which is made to encompass the hub, with bracket extension for each spoke provided with a screw eye or bolt hole, so that when the spoke is inserted in its socket and fastened by a bolt or screw to the bracket extension, it is securely held to the hub against all shrinkage, wear, and rattling.

NEW CHEMICAL AND MISCELLANEOUS INVENTIONS.

IMPROVED BAGGAGE CHECK.

John F. Wheeler and Henry A. De Haven, San Quentin, Cal.—In this improved baggage check a duplicate is taken off from and applied in an instant to the main check, and is carried about by the checker. The slotted main check is attached, by a belt and tag, to the trunk. A spring around the eye of the slot retains the tag, and serves also to lock the duplicate check that slides, by a projecting stud and fastening knob, in the slot of the main check.

IMPROVED LOCOMOTIVE HEAD LIGHT.

William P. Mills, Frank Bell, and James Carey, Jackson, Mich.—This invention consists of side openings through the reflector and the case of the ordinary head light, together with contrivances for setting in different glasses for train signals, to be used instead of the colored lanterns now specially used on trains for that purpose, and thus, by making the head light do the duty of the signal lanterns, save the cost and attendance of them. The inventor claims that the head light affords greater certainty, because it is less liable to go out; and if it does, it is where it will be noticed at once by the engineer, whereas the location of the lanterns used is such that they are not always in view, and at best they are more uncertain as to burning than the head lights are.

IMPROVED CAN-SEALING DEVICE.

Richard Wells, Baltimore, Md.—This invention relates to certain improvements in that class of devices for sealing cans, in which the air is first exhausted by mechanical means, and the can then hermetically sealed. It consists in a plug of metal or other suitable material, screw-threaded so as to be securely and permanently located in the cork stopper or cover of the can. The said plug is hollow, and is also screw-threaded upon its inner surface, into which an interior plug carrying an elastic stopper is secured. This interior plug is provided with side grooves for the escape of the air, and has a squared recess in its top to receive the end of a wrench or turning shaft, which passes through a detachable chamber having communication with the exhausting apparatus.

IMPROVED GUN WIPER.

Evander M. Gregg, Mars Bluff, Ky.—The invention relates to means for swabbing out a gun barrel so as to conveniently liberate the adhering matter on the inside, and consists in a piece of metal having at one end a socket, into which is screwed a bolt, between whose head and a flange are arranged a series of rubber disks with spaces and washers between them. The attachment has also at the upper end a socket in which is secured the small end of the ramrod. The disks can be expressed outwardly so as to form a larger circumference, by merely screwing up the bolt, while, by removing the latter, the disks and washers may both be changed.

IMPROVED LAMP EXTINGUISHER.

Charles J. Knapp, 48 Beekman street, New York city.—This is an ingenious and practical extinguisher for kerosene lamps, claimed to obviate the dangers that attend blowing out either up or down through the chimney. It is applicable to any of the burners now made, and appears to be an improvement of merit. Standards are applied to the narrow sides of the wick tube, and provided at the upper ends with pivoted caps that are operated to close over the wick tube, or are opened by a forked and weighted lever with cap connecting links. The caps, when closed above the wick tube, extinguish the flame.

IMPROVED BIRD CAGE.

Robert C. Breck, Bridgwater, Mass.—Two compartments are made in the cage to receive the food and water vessels. When the food or water is to be replenished, the outer door of the compartments is raised until caught and held by a catch. This leaves the inner door closed, and the outer side of the compartment open, so that the food or water can be put in or taken out, or the compartment cleaned, without any danger of the bird getting out. Triangular plates are pivoted at their angles to the bars of the cage at the upper and lower ends of an opening. The sides of the plates, adjacent to the pivoted angles, are connected by wires, and to the lower plate are attached pins to receive fruit or other articles for the bird to eat. This device may be turned out so that the pins will be without the cage, when fruit may be placed upon them; and when the device is turned inward, the pins will be within the cage, so that the bird can conveniently reach them while standing upon the perch.

IMPROVED SPRING BALANCE FOR EXTENSION CHANDELIERS.

Lyman T. Lawton, West Meriden, Conn., assignor to himself, P. J. Clark, and Joseph Kintz, of same place.—This is a spring top in the bottom of the case of a spring drum, in combination with notches in the drum, and having a cord depending from it, all so contrived that the stop will be caused to engage the drum by its spring, to hold it so as to prevent a heavy chandelier from falling or a light one from rising. It can be readily pulled out of the notches by the cord, to allow of adjusting the chandelier.

IMPROVED BROOM-SEWING MACHINE.

Henry Behren, Columbus, Ohio.—In this machine the jaws may be readily thrown into position for sewing the different seams, and may be opened for taking out the work without requiring the troublesome changing of the pins of different lengths that have to be changed after each seam. To this end jaws are provided with pivoted pawls that lock into racks and notched plates at the sides of the machine.

IMPROVED GALLEY SUPPORTER.

William S. B. King, Brooklyn, E. D., N. Y.—This is an improved device for supporting a galley upon a compositor's case while correcting, so that access to all the type boxes is always free. An illustrated description of the invention will be found on page 402, volume XXXIII.

IMPROVED STUD AND BUTTON.

John B. Bennett and Walter Bennett, Halifax, N. S.—This stud has a head having a recess in its under side; a stem, provided with a pin attached to said head; and a back disk provided with a tube having a horizontal flange on its upper end, which enters the recess in the button head. The flange and tube are slotted for the reception of the pin on the stem, which serves to lock the two parts together.

IMPROVED OIL-BURNING STOVE.

Edwin G. Adams, Cohoes, N. Y.—This stove includes devices whereby oil is forced out of its reservoir and to the surface of water where it is burned. The dampers may be adjusted to leave any desired amount of fire surface.

IMPROVED CAROUSAL OR ROUNDABOUT.

Robert Steel, Philadelphia, Pa.—This is an improved device intended to take the place of the horse carousals or roundabouts now in use in parks and other places of amusement for children to ride upon. It consists in the combination of a rigged vessel with a revolving wheel and its driving mechanism, so that it travels over a cloth painted to represent waves.

IMPROVED HEAT INDICATOR FOR STOVES.

Alfred J. Jourde, St. Louis, Mo.—This invention relates to a thermometer attached to a stove for indicating the inside temperature of the same, so as to admit the proper regulation of the heat, produce a saving of fuel, and indicate also the proper heat for cooking and baking. The instrument is screwed, by a threaded tube of the graduated plate, back of the mercury, into a hole of the stove, and retained by projecting seats at suitable distance from the same.

IMPROVED COMB.

John T. O'Donoghue, New York city.—This is a comb, of metal or any suitable substance, having a hollow head, in which a heating iron of the handle is placed for heating the comb and keeping it warm while using it. By the use of a heated comb, the heat, it is claimed, draws the sap and oil from the scalp into the hair, and thus restores color, vitality, and vigor.

IMPROVED TRUNK.

William J. Large, Brooklyn, N. Y.—This is a new arrangement of two trays, which are so connected by hinges that the upper tray may be conveniently turned up to allow of access to the lower one. New devices are also provided for holding the trays in place.

IMPROVED ICE CREAM FREEZER.

Sylvain M. Gosson, Whistler, Ala.—This ice cream freezer will enable ice cream of any desired number of different flavors to be kept distinct and separate while being frozen. It combines several novelties in mechanical construction, the principal of which is a ring can divided into compartments, in which buckets holding the material to be frozen are placed.

MANUFACTURE OF ANTIQUE COLORED GLASS.

James Baker, New York city.—By this method of turning or spinning the fused glass of any color or tint into disk or oval shape, concentric streaks are formed around the bull's eye at the issuing orifice of the rod, while at the same time different shades are formed by the slightly diminishing thickness of the glass disk from the center toward the circumference. This admits of bringing a certain shading into the glass pieces employed. The peculiar concentric structure of the glass disk produces a brilliant sparkle and semi-translucent effect, which approaches the warm and effective coloring of antique glass, and furnishes thereby colored glass of superior quality for church windows and other ornamental purposes.

IMPROVED POCKET BOOK FASTENERS.

Daniel M. Read, New York city.—This inventor has patented two ingenious devices for securing the flaps of pocket books. The first comprises a spring-pressed sliding catch bar, a series of ratchet teeth formed on a slotted base plate, and a catch pin engaging with the ratchet teeth. The book may by this be drawn snugly together without withdrawing the catch from the lock; and the outer surface of the lock appears entirely smooth, and without any projecting knob or handle. The second device consists essentially in the provision of a pivoted spring pressed cap or catch retaining plate, which is extended in rear of its pivot, so that it can be operated by the thumb or finger to release the catch on the flap from the fastening on the body of the pocket book. With this construction, the fastener may be unfastened with gloved hands without inconvenience, and without injuring the gloves.

IMPROVED MINERS' LAMP.

James C. Marshall, Girardville, Pa.—This invention consists of a spring, in combination with the hook by which the lamp is hooked to the hat. The spring holds a fold of the hat between it and the hook, and thus sustains the lamp when the miner is at work.

IMPROVED SYRINGE.

Charles E. Koechling, New York city.—This syringe is provided with a conical stopper of elastic material back of the nozzle, adapted and fitted for insertion in a bottle, so that it may be directly filled from the latter.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per Line will be charged.

"Wrinkles and Recipes" is the best practical Handbook for Mechanics and Engineers. Hundreds of valuable trade suggestions, prepared expressly by celebrated experts and by correspondents of the "Scientific American." 290 pages. Elegantly bound and illustrated. A splendid Christmas gift for workmen and apprentices. Mailed, post paid, for $1.50. Address H. N. Munn, Publisher, P. O. Box 772, New York city.

To Manufacturers—A first class Electroplater, having long experience in coloring all kinds of metals, either by electroplating or dipping, wishes to change his position. Address A. Wolf, 429 Callowhill St., Phila.

Mach'y Depots, Mech. Eng'rs, Millwrights, New Manuf'g Enterprises—Send for Catalogue of best line Shaft outfit in the country. A. B. Cook & Co., Erie, Pa.

One 12 in. Mill Saw File of our manufacture filed 70 Gang Saws at McGraw & Co.'s Saw Mill (the largest in America), Bay City, Michigan. Passaic File Works, Paterson, New Jersey.

An Interest in Sewer Trap, described on page 18 of this paper, will be sold to a Capitalist or good Manufacturing Co. Address J. T. Campbell, 1284 Broadway.

Glass, True Blown Cylinders. T. Deguan, 129 Milk St., Boston, Mass.

Correspond with the Allen Fire Supply Co., Prov., R. I., for the manufacture of hardware specialties.

For Sale, to Close an Estate—A Valuable Patent Evaporating Pan for Parlor Stoves. For particulars, apply to Box 52, Troy, N. Y.

A Situation as Engineer wanted by an experienced man who can give good references; is so anxious o get a position that he is willing to go as fireman, sooner than be idle. Address Philip Duggan, 73 West St., N. Y.

A Party offers a share of a valuable invention to one who will procure a Patent for the same. For particulars, address J. F. Ra, Box 773, New York City.

L. Duvinage, 1745 N. 11th St., Philadelphia, Pa., will act as Agent, erect Machinery at the Centennial Exhibition, and make drawings.

An intelligent practical Machinist desires employment in any capacity. Address Box 88, Stroudsburg, Monroe Co., Pa.

For Sale—Queen's Educational Microscope, Polariscope and Camera Lucida attached. New, very cheap. E. B. Kiersted, Hancock, N. Y.

For Sale—A good manufacturing business, secured by Patent. Address H. R. Van Eps, Peoria, Ill.

Wanted—A Partner in a long established and profitable Mach'ne Business, with from $5,000 to $8,000, to develope one of the most promising patents ever produced. Address Lock Box 1004, New Haven, Conn.

For Sale—Two Brick Machines, "Sargent" Patent—in use one year. Apply 27 So. Charles St., Balt., Md.

Shafting, whole or clamp Pulleys, best style Hangers. 5 to 8 cts. per lb. S. E. Harthan, Worcester, Ms.

Leather and Rubber Belting, Packing and Hose. Greene, Tweed & Co., 18 Park Place, New York.

Hand Fire Engines, Lift and Force Pumps for fire and all other purposes. Address Rumsey & Co., Seneca Falls, N. Y., U. S. A.

Roth's Saw File Guide, illustrated in this paper Jan. 1, 1876, is manufactured by E. Roth & Bro., New Oxford, Pa. One, as sample, $2. Agents wanted.

Wanted—A Bone Crusher, suitable for crushing bones size of nut coal. A stamp mill preferred. P. O. Box 3369, Boston.

½, 1, & 2 Horse Engines, $30, 60, & $100; Boilers for same, $75 & $100. T. B. Jeffery, 253 Canal St., Chicago.

Abbe Bolt Headers, the best—Prices reduced; 2 sizes made. Palmer Power Spring Hammers, 10 sizes. See machines, or write for information before buying. S. C. Forsaith & Co., Manchester, N. H.

Steel Castings, from one lb. to five thousand lbs. Invaluable where great strength and durability are required. Send for Circular. Pittsburgh Steel Casting Co., Pittsburgh, Pa.

Use Yocom's Split-Pulleys on all Shafting, same appearance, strength and price as finished Whole-Pulleys. Shafting Works, Drinker St., below 147 North Second St., Philadelphia, Pa.

Blake's Belt Studs are the best and cheapest fastening for Leather or Rubber Belts. Save ten times their cost. Greene, Tweed & Co., 18 Park Place, N. Y.

Linen Hose for Factories—1, 1½, 2 & 2½ inch. At lowest rates. Greene, Tweed & Co., 18 Park Place.

Fine Castings and Machinery, 96 John St., N. Y.

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. Frisbie & Co., New Haven, Ct.

Water, Gas and Steam Goods—Send eight stamps for Catalogue, containing over 400 illustrations, to Bailey, Farrell & Co., Pittsburgh, Pa.

For best Presses, Dies, and Fruit Can Tools, Bliss & Williams, cor. of Plymouth and Jay, Brooklyn, N. Y.

For Solid Wrought-iron Beams, etc., see advertisement. Address Union Iron Mills, Pittsburgh, Pa., or lithograph &c

Hotchkiss & Ball, Meriden, Conn., Foundrymen and workers of sheet metal. Fine Gray Iron Castings order. Job work solicited.

Peck's Patent Drop Press. Still the best in use Address Milo Peck, New Haven, Conn.

All Fruit-can Tools, Ferracute W'k's, Bridgeton, N. J.

American Metaline Co., 61 Warren St., N. Y. City.

For Solid Emery Wheels and Machinery, send to the Union Stone Co., Boston, Mass., for circular.

Hydraulic Presses and Jacks, new and second hand. Lathes and Machinery for Polishing and Buffing Metals. E. Lyon, 470 Grand Street, New York.

Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass.

For best Bolt Cutter, at greatly reduced prices, address H. B. Brown & Co., New Haven Conn.

Diamond Tools—J. Dickinson, 64 Nassau St., N. Y.

Temples and Oilcans. Draper, Hopedale, Mass.

Notes & Queries

T. A. B. and others, who ask as to books on the locomotive engine, should read Forney's "Catechism of the Locomotive."—D. W. P. will find formulæ on the strength of boilers on p. 186, vol. 32.—J. C. W. will find full instructions for polishing lenses on p. 363, vol. 31. Consult Prechtl's "Dioptrik," if you can read German.—J. H. R. should use the Léclanché battery. See p. 362, vol. 31.—P. H. G. will find directions for polishing shirt bosoms on p. 203, vol. 31.—H. H. T. will find particulars as to the invention of the screw propeller on pp. 151, 241, vol. 30.—E. R. J. will find a description of the method of preparing bone charcoal on p. 54, vol. 28.—J. L. H. will find a recipe for cement for glass and brass on p. 117, vol. 32.—F. B. S. will find a description of an electric engine on p. 241, vol. 33.—A. K. will find full directions for mounting maps, etc., on p. 91, vol. 31.—R. W. will find that painting on zinc is described on p. 116, *Science Record* for 1874.—W. N. C. will find directions for bluing steel work on p. 123, vol. 31.—W. A. will find directions for hardening needles on p. 347, vol. 31.—J. C. R. will find the dimensions of the Great Eastern steamship on p. 346, vol. 31.—J. C., of Moscow, Russia, will find a description of a wood-splitting machine on p. 79, vol. 28.

(1) S. L. S. asks: Please to inform me how I can dissolve aniline green, or how to prepare it for coloring purposes. A. We are acquainted with two varieties of this color, namely, aldehyde green and iodine green. The former is soluble in 2 parts of sulphuric acid, and from 50 to 70 parts of alcohol. The latter dissolves readily in equal parts of alcohol and water.

(2) W. M. J. asks: 1. Why would it not answer as well to place the coils of a magnet $\frac{1}{16}$ of an inch apart instead of putting them the thickness of a fine silk thread apart? What would be the result provided the same length of wire be used? A. It would not answer so well, because the same number of convolutions could not be contained in the space occupied by the wire when the latter is covered with a thin layer of silk only. 2. What is the theory of a current of electricity, passing around a piece of soft iron, magnetizing the same? A. Ampère's theory assumes that each individual molecule of a magnetic substance is traversed by a closed electric current. It is further assumed that these molecular currents are free to move about their center of gravity. The coercive force, however, tends to keep them in any position in which they may happen to be. When a current of electricity is passed around the substance, its tendency is to place all of the molecular currents in a parallel direction; by this means the action of the latter on external matter becomes apparent. 3. Is the magnetic influence derived from the passage of a current of electricity? A. Yes. 4. Would it not do as well, if practicable, to replace electricity with heat? A. Yes. It is not practicable, however, until the heat is first transformed into electricity.

(3) J. R. C. asks: If the two disks of an achromatic object glass are $5\frac{3}{16}$ inches in diameter, the bi-convex and the contact side of flint glass being ground to 31 inches radius, what should be the curvature of the posterior side of the flint glass? If the disks be 4¼ inches in diameter, and the three curves (as above) are ground to 24 inches radius, what should be the posterior or correction curve? The lenses are of French glass. A. Assuming the glass to be of medium quality, in the first instance, the posterior curve should be concave, of 146 inches radius. The latter should also be concave, of 113 inches radius.

(4) J. E. asks: How can I make glycerin soap? A. It is made by incorporating, with any mild toilet soap, $\frac{1}{12}$ or $\frac{1}{10}$ by weight of pure glycerin, while in the melted state. It is generally tinged of a red or rose color with a little tincture of orchil or of dragon's blood, or orange yellow with a little annatto. It is variously scented; but oil of bergamot or rose geranium (ginger grass) supported with a little oil of cassia, or oil of cassia supported with essential oil of almonds, appears to be the favorite perfume. The greater portion of the so-called glycerin soaps contain not a particle of glycerin.

(5) J. F. P. says: I propose to build a fruit house with ice house overhead. I propose a triple brick wall, with two air spaces of two inches each, with cut-off at every two feet in hight. Would it be better to fill one or both spaces with non-conducting material, like sawdust, or leave them as dead air spaces? A. In this case the air would suffice.

(6) J. O. P. asks: How can I make vinegar in 10 hours, from pure cider? A. The best ferment is vinegar. An old cask in which vinegar has been kept is the best to ferment in. Other ferments are used, such as bread soaked in yeast, sour dough, dough of wheat, or rye bread soaked in cream of tartar and vinegar. All these are used in small quantities, a few ozs. to the barrel. Vinegar made with them is more apt to spoil. The more ferment there is present, the quicker will be the process. The cider is put into the cask, which is best painted black outside to absorb the sun's rays when the weather is cool; the bung is left out, the bung hole is covered with a piece of slate, and in about four weeks the rectification is complete. The lower the temperature is, the slower will be the change.

(7) G. J. asks: In what position is the compass placed on board iron steamers, so as not to be affected by the metal of which the ship is constructed? A. It is mounted on an elevated standard, sufficiently high to be out of the sphere of the ship's attraction.

(8) J. C. R. asks: Where is native sulphur found, outside of Sicily? A. The great depositories of sulphur are either beds of gypsum and the associate rocks, or the regions of active or extinct volcanoes. In the valleys of Noto and Mozzaro, in Sicily, at Conil, near Cadiz in Spain, at Bex in Switzerland, at Cracow in Poland, it occurs in the former situation. Near Bologna, Italy, it is found in fine crystals, imbedded in bitumen. Sicily and the neighboring volcanic isles, Solfatara near Naples, and the volcanoes of the Pacific Ocean, etc., are localities of the latter kind. It is also deposited from the hot springs of Iceland; and in Savoy, Switzerland, Hanover, and other countries, it is met with in certain metallic veins. Near Cracow and in Upper Egypt there are large deposits. A fiberous variety is found near Sienna, in Tuscany, and is abundant in the Chilian Andes.

(9) G. M. says: I wish to know something of the nature and properties of phosphorus. A. Consult some elementary work on chemistry.

1. Does lodestone possess the same properties, in every respect, as an artificial magnet? A. Yes. 2. Which is the most powerful? A. Artificial magnets are much the more powerful. 3. Where is lodestone found? A. Lodestone occurs in large quantities in the northern parts of New York State. 4. In a horseshoe magnet, made of a bar of steel 8 inches in length, how far apart should the ends be to secure the greatest power? A. About ½ inch apart.

(10) W. T. G. asks: 1. What are the qualifications necessary to become a midshipman in the United States navy? A. A fair English education, good physical development, and age between 14 and 18 years. 2. Who would be the proper person to apply to for a position in the lake squadron? A. There is no lake squadron. To become a midshipman requires recommendation to the Secretary of the Navy by the member of Congress of your district. 3. Which offers the best chance for study and advancement, the United States navy or the merchant marine? A. In the navy, you are sure to be advanced if you live long enough. In the merchant service, the case is the same as in any private pursuit; individual merit and ability tell.

(11) S. H. L. says: I have an ornamental piece of white ivory, in the shape of a cylinder, which has lately cracked. Do you know of any plastic material with which I could fill the crack, to conceal the defect, and not in any way affect the ivory? A. Place a small quantity of pure gelatin in a strong solution of alumina. When entirely penetrated by the alumina, remove from the solution, and use immediately. When dry, it may be readily polished.

(12) J. R. says: I am interested in a quartz mine, which assays from $40 to $80 per tun of gold; but the sulphuret of iron is so abundant that the quartz mill men claim that they cannot amalgamate the gold. Can you inform me of some cheap method of destroying the sulphuret of iron? A. Pulverize the ore, and roast it at a high temperature in a current of air. This will expel the sulphur as sulphurous acid gas, leaving the iron behind as an oxide.

(13) O. C. says: You say that the earth received its motion at the creation, and that motion keeps up from the fact that there is no resistance. As the moon draws after it a great tidal wave, extending nearly from pole to pole, the land must feel this draft; is not this an enormous resistances, and would it not of itself bring the earth and moon to a standstill, if there were not some great and perpetual force keeping them in motion? A. Mayer has demonstrated that the tidal wave due to the moon exerts a retarding influence on the rotation of the earth, but that, at the present period of its existence, the retardation is exactly counterbalanced by the acceleration due to its contraction in size by cooling. He holds that there will come a time when the cooling has proceeded so far that no more contraction will take place, and that then the retardation by the moon's action will commence, and go on until, in the course of ages, the earth will always turn the same side to the moon. He holds also that the moon has gone through this process.

(14) J. C. R. asks: 1. Are there any sulphur mines in the United States? A. Sulphur is found in this country near the sulphur springs of New York, Virginia, etc., sparingly, in many coal deposits and elsewhere, where sulphide of iron is undergoing decomposition, and in microscopic crystals at some of the gold mines of Virginia and North Carolina; as a powder and in crystals in the western lead regions: in cavities in the limestone, in minute crystals on cleavage surfaces of galena; and the beds of California afford large quantities of sulphur for commerce. 2. Excepting for SO_2, gunpowder, and friction matches, is there any considerable use or demand for sulphur? A. Yes, it is used in large quantities for sulphurizing hops and vines; as a preventive against some diseases of these plants, the quantity of sulphur used annually for this purpose in France, Spain, and Italy amounts to about 45,000 tuns. It is further employed in the production of sulphites and hydrosulphites, sulphide of carbon, cinnabar, mosaic gold or bisulphide of tin and other metallic sulphurets, ultramarine, various cements, and for vulcanizing and ebonizing india rubber and gutta percha.

(15) O. C. says: Suppose the continents led east and west, and the oceans extended around the globe in the same direction, with no land to check the tidal wave, what would be the result? Would not the tidal motion of the sea constantly increase, rushing like a cataract over land of an ordinary hight, and carrying everything before it? A. Undoubtedly some straits have been made, or at least their formation largely assisted, by the tidal waves. If there were no land to check the tidal wave, it would go round from east to west, and not be deviated in various directions, as is now the case. In some narrow straits it might rush, as is now the case, but not reach such a hight as to carry everything before it, the hight of the tides being due to the balanced attractions of earth, sun, and moon.

How far are the seven stars of the *Pleiades* supposed to be from each other? A. The mutual distance of the stars is on an average equal to their distance from us; there are, however, spots in the heavens where stars are fewer, and where this distance is greater; and inversely, there are some star groups where the distance is much smaller; such a group is the *Pleiades*, their material distance varying from one fiftieth to a five hundredth part of the distances from us. The telescope reveals clusters where the stars are still closer together, hundreds of them throwing a glow around like that of a furnace.

(16) J. J. asks: Do you know of any means whereby the law of gravitation can be suspended? A. This law is so universal and inherent in matter that there is absolutely no means of the kind.

(17) W. H. says: We have a reservoir on a hill which we wish to make use of for fire purposes in our mill, situated at the foot. It would be costly and inconvenient to tunnel through the side of the hill in order to lay pipe from the bottom of the reservoir to the mill, the top of which is 60 feet below the bottom of the reservoir. Could a siphon be used with advantage and certainty, so as to give us command of all the water in the reservoir in case of fire? The siphon could be sunk in the bank a few feet below the level of the water surface. If a siphon be practicable, how deep below the surface ought it be laid? The reservoir is 20 feet deep. A. The reservoir being 20 feet deep, and the highest part of the bend being a few feet below the surface of the water in the reservoir, there can be no doubt of a siphon's working well. The shortest leg of a siphon ought not to be more than 30 feet long, as the weight of the atmosphere counterbalances only from 32 to 36 feet of a column of water; but in this case your shortest leg will be not more than, say, 18 feet. The pipe should be so laid as to prevent freezing; for this purpose four feet below the surface will be deep enough; it should be also sunk in the bank down the side of the reservoir to guard against the same difficulty in case of low water. Take iron pipe and cover it with tar. 2. Is there a possibility of boring through the side of the hill to the bottom of the reservoir? A. In boring through the side of the hill, there would be danger of leakage to your reservoir, through which you might lose all of the water.

(18) C. G. W. asks: Is there any chemical that will assist a diamond in drilling hardened steel? A. Moisten the steel with a little turpentine or benzole. The latter is the better of the two.

(19) R. H. B. says: I have a tin roof put in with what tinners call standing seams. In a high wind it rumbles a good deal. Is that an ill omen? A. Tin plates for roofing are sometimes put together in the shop in rolls, taken to the building, and laid upon the roof, extending from the ridge to the eaves; the edges of the rolls are brought together, secured to the roof by nailing a cleat of tin between them, and the two edges and cleat are made into a standing joint, bent over at the top, one within the other, into what is called a double lock. By this style of roofing, the tin has quite a limited nailing to the roof boards; and should the edges become loose at any place to admit the entrance of the wind, it could very easily be stripped off by that means. This danger, provided the rolls are wide, more than compensates for any advantage it may possess in respect to its yielding, without injury, to expansion and contraction. The usual mode of laying the tin, plate by plate upon the roof, where every plate is securely nailed, has generally, we think, met every reasonable expectation in regard to durability, and is to be much preferred to the former method.

(20) S. L. T. asks: I am about building a sawmill in which I wish to run a muley saw or a 36 inch buzz saw. There are two engines in view; one has a cylinder 5 x 10 inches with a 30 inch balance wheel, the other has a cylinder 6 x 8 inches with an 8 inch balance wheel. Which in your opinion is the best for me? A. The 6 x 8 engine.

(21) W. O. P. asks: Is it practicable to melt cast iron on an ordinary blacksmith's forge, in sufficient quantity to make a casting of 15 or 20 lbs. weight? A. No.

(22) L. L. H. asks: The wild cane growing throughout many parts of our country can be utilized for making pipes for conveying water and other liquids. Some of them attain a diameter of several inches. With an iron rod heated to redness, the joints may be entirely cleaned out; and by means of large corks bored with smooth holes, they can be united in any length. By coating them with coal tar they will remain serviceable for years. Is there a way by which they may be curved or bent (and remain so) so as to suit a change of direction? A. Try steaming them, as is done for wood bending.

(23) J. A. G., of Manchester, England, asks: Can bright steel goods be hardened and tempered without affecting the polish on them? A. No.

(24) O. F. says: 1. We have a 10 by 16 inches single valve engine, of which the valve is 10¼ inches long and 5⅛ inches wide, with a recess in it for steam exhaust 9 inches long by 2⅝ inches wide. The entire width of valve seat is 7 inches, and the width between outside margins of steam ports is 4¾ inches, and between inside edges, 2¾ inches, the ports being consequently each 1 inch wide. The exhaust port is 1⅜ inches wide, and all are 9 inches long. The throw of the valve is 2¼ inches, the eccentric being set so as to begin to admit steam as the piston reverses its motion. The feed pipe is 2½ inches and the exhaust pipe 3 inches diameter. The engine runs at 120 revolutions per minute. Are the ports, valves, and other portions rightly proportioned? A. The cylinder exhaust port is a little too narrow, and the valve travels too little. 2. The piston does not come to within an inch of the cylinder heads. Can anything be done to economize steam and improve the working capacity of the engine? A. There is too much clearance at the ends of the stroke, to remedy which increase the thickness of the piston head or the cylinder heads. 3. The present boiler is 10 feet long and 3 feet in diameter, with 26 three inch tubes, supplemented by a heater. How much boiler room would be required to run the engine at 200 revolutions per minute, and maintain 60 lbs. pressure in boiler? A. Your boiler pressure, if increased by nearly one third, will maintain 200 revolutions.

(25) C. G. asks: What is the proper way of packing the stuffing box around a steam engine piston rod? A. Use the ordinary small sized prepared packing, and a small packing tool.

(26) Y. I. asks: 1. When my engine is running very light, I find that, before it is necessary to replenish the furnace with fuel, it is so far burnt down that part of the fuel falls through the grates, and is thus lost. What should be done to prevent this? A. To prevent the waste of fuel referred to, put a damper to the ash pit and in the chimney. 2. Is it right, in such a case, to open the flue doors? A. Sudden drafts of cold air are injurious to the boiler. 3. Do you not think that all boilers should have a damper in the stack to regulate the draft with? A. Yes, or over the mouth of the ash pit. 4. Is it injurious to a boiler to open the fire doors in case of too much steam? A. Yes, slightly. 5. How are leaky engine cocks, such as cylinder and blow-off cocks, ground? A. The unground shoulder should be eased off with a file, and the plug ground as directed in "Wrinkles and Recipes." 6. Are hand force pumps ever used for cleaning boilers? A. Yes, but a boiler cannot be thoroughly cleaned by a force pump. 7. Does it injure a boiler to blow it out, and immediately wash it out by means of a pump with cold or luke-warm water? A. Yes. 8. When twin boilers are connected by a mud drum laid under them, into which the feed water is also forced, should the connecting pipes be large? A. Yes, the larger the better.

(27) J. E. W. says: I wish to build a foot lathe for turning ordinary light work. Of what size should the drive pulley and the small pulley be, to get the fastest motion with the least power? A. Make the treadle pulley about 30 inches, and the lathe pulley about 6 inches. 2. What should be the stroke or length of the crank? A. About 4 inches.

(28) A. M. H. asks: What will be the difference in time between two clocks having pendulums of the same length, one vibrating in an arc of 10°, the other in 11°? Both are supposed to run for 24 hours. Is there a rule for arcs of any number of degrees? A. If the vibration is less than 10°, and the pendulum is free, that is, if it has no work to do, the difference in time for different vibrations is so small that it need not be taken into account. It is advisable to have the vibration as small as possible; then the barometric change in the atmosphere has less effect upon it.

(29) F. D. and others ask as to the best possible method of arranging saw mill gearing: The method which obtains the desired speed on the saw, with the least number of gears, shafts, bearings, or pulleys, is always the best. Always get the speed as direct from the driver as possible. Every additional piece entails a loss of power in the excessive friction.—J. E. E., of Pa.

(30) B. P. F. asks: 1. Can you give me the dimensions for a drying house for lumber? A. The size of your house should conform to the dimensions and quantity of the lumber you propose to season; perhaps 20 by 35 feet and 15 feet high might answer in the absence of any particular requirements. 2. At what point or points should the steam be allowed to enter and escape? A. The steam should circulate through a coil of 1 inch iron pipe to the extent of, say, one superficial foot of heating surface to every 50 cubic feet of air in the house. Place the pipe in stacks about 25 feet long, one pipe over another, connected at the ends and graded to discharge the drip water from the top to the bottom; let the pipe from the boiler connect at the top, and another pipe return to the boiler from the bottom, of the stack; and this will keep up the circulation and return the drip water to the boiler. Provide ventilation as described in answer to G. J. P., No. 43, in this issue. 3. How long should the lumber remain in the house? A. The lumber should dry in from four to six days.

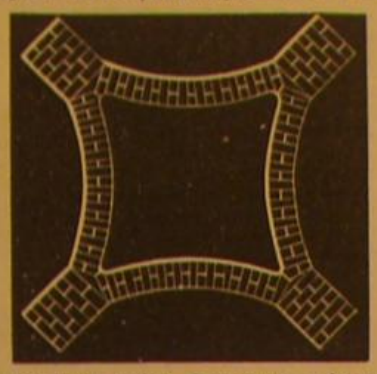
(31) J. B. Jr. asks: What shall I put on pine knots so that they will not show through, after painting the boards? A. Shellac varnish.

(32) A. S. asks: 1. Which is the best of the following two plans for heating the rooms in factories, putting the steam pipes round the rooms below the windows, or overhead, hung from the ceiling? A. Below the windows. 2. Would it take more steam to heat the rooms with the pipes hung from the ceiling than with them below the windows? A. Yes. 3. Which of these ways would be most liable to cause fire? A. Over the windows. 4. Would 2 six inch cast iron pipes heat a room with less steam than 6 one inch wrought iron pipes, on the same conditions as mentioned in question 1? A. Provide one superficial foot of heating surface in your pipes for every 70 cubic feet of air contained in your room; the one inch wrought iron pipe is the best: let the steam enter at the highest point and return at the lowest, and set the pipe in a continuously descending grade between those points, that the pipes may not be trapped with water.

(33) S. A. T. says: We have a paper mill built on a light bottom of quicksand, and within 200 feet of a hill or bluff 100 feet high. In the mill are two large tubular boilers for generating steam, using an iron stack or chimney, which is very expensive on account of its short life, and a brick chimney is out of the question on account of our sandy foundation. It occurred to us to dig a trench or ditch of suitable size from the boilers to the top of the bluff, and there build a brick chimney of proper hight, the whole to act as chimney to our boilers. Could we get a good draft in that way, and would dampness of earth affect it? A. Such a construction would be practicable, especially if lined with brick. In starting the fires, it might be necessary to build a temporary fire at the foot of the vertical portion.

(34) T. A. W. asks: Is there any means of revivifying the common hydraulic cement when once damaged? A. Yes; reburning it.

(35) J. L. C. says: I wish to build a cistern which, on account of the nature of the soil, must be built nearly all above ground. My experience is that the ordinary square walled cisterns, if above ground, are not to be depended on, and generally leak. It is not convenient for me to build a round cistern, and I have planned one, shown in the diagram, which I think will be very strong and will suit my case exactly. It is constructed on the principle of the arch, and the pressure of the water strengthens rather than weakens the walls, provided the four corners, which are supplied with buttresses, are made to bear the strain. This being so, I can save material and make the cistern walls 9 inches instead of 14 inches thick. Please give me your opinion. A. The principle is a correct one. A good foundation would be required for the whole of it, to prevent settling, which would cause cracks. Greater strength could be obtained by anchors extending diagonally from one buttress to the opposite one; these could be made of iron pipe covered with tar, and secured by means of nuts over plate washers.



(36) E. C. H. says: 1. I have some photographic lenses, double convex, of good quality: one is 2¼ inches in diameter and of 8 inches focus; the other is 1 inch in diameter and of 5 inches focus. Can I construct a telescope with them, by the addition of other glasses, if necessary? A. You cannot construct a telescope with lenses intended for photography. The simplest possible telescope consists of an object lens of very long focus, say from 20 to 40 inches, and an eye piece, which is one small lens or is compounded of two or more small lenses of very short focus, say 1 inch or less. 2. How shall I arrange them, and what other lenses would I require? A. We refer you to the first number of the SCIENTIFIC AMERICAN SUPPLEMENT, where the construction of telescopes is fully described and illustrated. 3. Can a magic lantern be made with these lenses, and how should I arrange them? A. You can make a magic lantern with them; photographic lenses are excellent for that purpose; but then you want so-called bullseye condensers, between the picture to be enlarged and the light. These bullseye lenses must be some 3 or 5 inches in diameter, and have a focus of about 6 inches.

(37) F. E. D. B. asks: How many chair rockers of a common rocking chair can be sawn in an hour with a band saw? We have a man here who says he can saw 400 in an hour. Is it possible? A. The man claims that he can saw 6⅔ pieces per second. The average length of a rocker is 2 feet, to be sawn on both edges, equal to having 13⅓ feet (lineal) per second. Probably several would be sawn through at each cut; and in most cuts, the concave part of one and the convex of the other would be made at same cut. This renders such a feat possible, and it seems no more difficult than for one circular saw to cut 9 boards 24 inches in width, 1 inch thick, and 16 feet long in one minute. This I have seen done. At this rate of sawing the incredible amount of 172,800 feet of lumber would be sawn in 10 hours.—J. E. E., of Pa.

(38) W. H. says: We want to convey about 12 horse power into a building 37 feet distant. Is there any way of making cotton rope impervious to the weather, so as to make it serve the above pose? A. We would recommend a rubber belt.

(39) I. A. M. says: 1. Of what diameter should a circular saw be for general use, more particularly on oak logs? A. From 50 to 60 inches. 2. How many horse power would be necessary to run it? A. From 15 to 30 horse power. These answers, however, depend in each case on the average size of the timber, and amount of work to be performed. As a rule, each horse power, well applied, will saw one thousand feet of lumber with a circular saw; this varies slightly with the hardness of the timber and power used. For example, it is easier to make 30,000 feet of lumber with 30 horse power than 5,000 with 5 horse power, partly owing to the greater proportionate amount of friction in the smaller power mill and other obvious causes.—J. E. E., of Pa.

(40) J. E. J. says: 1. Would an achromatic spyglass of 50 power be of any use for astronomical purposes? Would it show the globular form of the planets, and Jupiter's moons and Saturn's rings? A. Yes, if it is a good one. 2. How far could a man be seen with such a glass on a clear bright day? A. Fifteen or twenty miles.

Would it be safe for a person never having seen a course of chemical experiments to attempt to perform those given in elementary chemistry without the aid of an instructor? A. Yes, in most cases, if done with proper care.

(41) C. L. asks: In building a telescope, the objective of which is 5 inches in diameter, how ought the lenses to be set? Focus of object glass is 72 inches. How many, and of what sizes, should the remaining lenses be? A. The object glass should be made of two lenses placed in contact. The outside lens is a double convex; the outer curve may be 49·3 inches radius, the inside curve 16 inches. The inside lens is a concavo-convex flint with the concave side fitting the crown, also of 16 inches radius, and the exterior curve of 78·4 inches radius. The eye piece may be made of two plano-convex lenses, of equal focal lengths, with their convex sides toward each other. Their distance apart should be two thirds the focal length of either. The lens toward the objective should be ¾ inch, the other ½ inch in diameter.

(42) J. T. H. says: I have been troubled for three months with heating of a sawmill mandrel, and would like to know the cause. A. See article in SCIENTIFIC AMERICAN SUPPLEMENT, No. 3, on the heating of journals.

(43) G. J. P. asks: We have 2 drying houses, 18x32 feet, with 6 lines of 4 inch cast iron pipe 25 feet long. One party says that ventilation is required, so he has cut 3 holes 18 inches square in the roof, and put a square box pipe up through the 3 holes, and then cut a hole in the end 2 feet square; but he does not think it best to make the buildings tight. I tell him he ought, in order to keep his houses warm, to keep them as tight as possible. Which is right? A. There should be some ventilation, and it had better be under control. Provide a box shaft about 16 inches square, at one end of the building, extending from near the floor to 2 feet above the roof, covered at top and with openings on the sides above the roof; at the other end of building, provide a like shaft, but short, horizontal, passing through the side of the building near the floor; in each shaft place a board valve or damper working on centers, and by means of these you can have as much or as little ventilation as the circumstances may require.

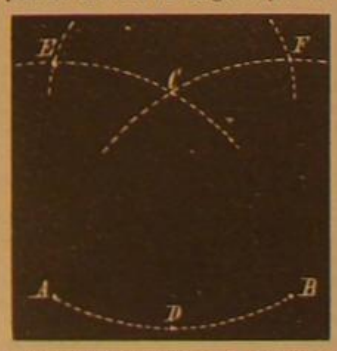
(44) F. J. F. says: In reply to a correspondent who stated that he had a boat 50 feet long by 18 feet wide and 3½ feet deep, you told him to use 2 engines of 7 inches bore by 12 inches stroke. If he puts 2 such engines in the boat, he might as well have no boat at all. I had a boat of 14 feet beam by 60 feet long; and I used 2 high pressure engines of 7 inches bore and 24 inches stroke, and all she would make up stream was 2½ or 3 miles per hour. A. Our advice to our correspondent was based upon examples of successful practice. Of course the model of the boat may affect the power required to a very great extent, as well as too small a boiler, a wasteful engine, or the like.

(45) F. H. R. says, in reply to A. E. R.'s query as to closing the drip cocks of steam heaters: If the air is out of the pipes, in either case the heat will be just the same whether the water only is run through the drip cocks or whether steam goes with the water. The pressure of steam in the pipes should be no more in either case if the back pressure valve is all right.

(46) H. L. P. says: In reply to N. W., who asked for your theory concerning the motion of the earth, you replied that "it persisted in its motion by the absence of resisting obstructions." Is not the air which presses on the surface an obstruction? A. The air which surrounds the earth is no more obstruction to its motion than is the water in the ocean, as both belong to the earth and move with it. Remember that the diameter of the earth is 8,000 miles, and the hight of the dense atmosphere only a few miles, while at the hight of 30 or 40 miles scarcely a trace is left. The earth moves with the atmosphere through the practically empty space beyond.

(47) W. P. H. says, in answer to J. D. H., who asks how to thicken his stove patterns, so as to take a heavier set of castings from them: Prepare the mold as usual, and then insert something between the top and bottom of the flask, which will separate them sufficiently for the additional thickness desired. The cavity is small, and can usually be filled by sprinkling sand on the face of the flask when open. An ingenious man can also vary the additional thickness as he desires.

(48) W. S. D. says, in reply to the question, how to construct a perfect square, with dividers or compasses only, without the aid of scale, pencil, ruler, or straight edge, or any other instrument, on a given base or a line drawn between two given points: Let A B be the given points. From



A as a center, with a radius = A B, describe the arc, E C; then with B as a center, describe the arc, F C; with C as a center, describe the arc, A D B; then again, with C as a center and a radius = A D (⅔ A B, measured on the arc) describe the arcs at E and F; then will the points, A, B, E, F, form a perfect square.

(49) E. H. R. says, in reply to H. F. K.'s query as to boiler capacity for a steam heater; Provide one fifth as much boiler surface (in square feet) as you have of radiating surface in the steam pipes, and you will heat your building with economy.

(50) M. R. C. says, in reply to I. O. A., who complains of the fatigue of the eyes: The trouble arises from partial paralysis of the retina or nervous coat of the eye, caused by bright white light; and it may be obviated by decomposing the rays from the lamp by means of a tinted shade. White porcelain is very good, or thin tissue paper (white, straw-colored, or such), hung between the light and the operator so as to shade the white wood, will do. If the person be short-sighted he may require a concave glass to suit the sight. If he be long-sighted from advancing years, weak lenses may be required. If the glasses are suitable for the sight, and the fatigue continue, rest should be enjoined. Strengthen the general health; sea bathing or bathing with sea salt and water good.

(51) S. says, in reply to A.'s query as to how to get a good color on casehardened goods: Use leather scraps for the purpose. The leather should be charred sufficiently to pulverize easily, and then be pounded, not too fine, say about the size of peas. The articles should be imbedded in this in an iron box, luted with clay, and heated red hot for from 1 to 6 or more hours, as they are to be hardened to a greater or less depth, and then dumped into cold water and dried off before they rust.

(52) M. R. C. S. says, in reply to J. H. L. The splitting of the nails may be due to dry heat, as of a stove during cold weather. Keep the nails cut short; do not scrape or file the surfaces; moisten with a little glycerin or almond oil to which a little *liquor potassæ* has been added. The nails becoming concave is not, I believe, due to debility always, as I have seen it in one case where the person was well nourished.

(53) A. W. C. says, in reply to R. I. S., who asks how to settle rain water: The best plan that has as yet been found in Canada is to put about 2 ozs. powdered alum and 2 ozs. borax into a twenty barrel cistern of black rain water; in a few hours the water will be purified, and comparatively waste water may thus be made fit for cooking purposes. This mixture has the same effect on lime water, precipitating the offensive particles to the bottom of the receptacle.

(54) A. W. C. says, in answer to T. B., who asks as to using potatoes for manufacturing purposes: Desiccated potatoes have long been used as an article of diet by the naval and mercantile marine of Great Britain; and they were the staple diet of the explorers of the northwest passage under McClintock.

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

Dr. T.—It contains 85 per cent lead and a trace of silver, but no gold.—J. M. McW.—It is kaolin clay.—R. T. W.—No. 1 is mud shale, containing pyrites. No. 2 is hardened blue clay.

COMMUNICATIONS RECEIVED.

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

On Drawbridges. By C. V. W.
On the Tails of Comets. By E. B.
On a New Wash Bottle. By W. K.
On a New Motor. By T. H.
On a Double Channel Theory. By W. T. C.
On a Boiler Explosion. By G. H. K.
On Working Men at the Centennial. By W. P. E.
On a Meteor. By E. S.
On Bored Wells. By R. A. R.
On Cleansing Water Mains. By H. O. A.
On Penguins. By W. E. D.

Also inquiries and answers from the following:

H. D.—G. R.—J. T. B.—J. W. P.—W. T. C.—E. G. B.—H. V. M.—E. T. H.—W. M.—J. C.—G. C.—J. C. D.—J. S.—C. S.—J. G. A.—R. M.—J. C. W.—W. D.—F. O. J.—N. P.—W. B. W.

HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail, if the writer's address is given.

Hundreds of inquiries analogous to the following are sent: "Who sells miniature locomotive engines? Who makes the best steam pumps? Who sells mica lamp chimneys? Who makes paper barrels? Who sells millstones? Whose is the best glue? Why do not makers of electric telegraph apparatus advertise in the SCIENTIFIC AMERICAN?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

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

January 18, 1876,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Adze eye dies, etc., L. Chapman	172,254, 255, 256, 257
Alarm signal box, fire, J. B. Edson	172,404
Alarms, fuse for fire, J. O. Fowler, Jr.	172,411
Anchor, T. J. Whitecar	172,525
Artist's color dish, C. C. Poole	172,342
Axe dies, L. Chapman	172,250, 172,251, 172,252
Axe eyes, machine for opening, L. Chapman	172,249
Back lash spring, T. Alsop	172,366
Bale tie, G. Gale	172,417
Bale tie, D. H. Mathias	172,330
Baling, buckle for cotton, C. R. Herron	172,434
Base ball, S. Hipkins	172,315
Bed bottom, spring, G. F. Bethune	172,293
Bed bottom, spring, W. Crich	172,300

Bed clothes holder, L. S. Weed 172,358
Bed, spring, H. W. Ladd 172,327
Bee hive, W. L. Hamilton 172,420
Bobbins, winding conical, G. Campbell 172,298
Boiler tube stopper, P. Walker 172,523
Boiler incrustation compound, J. Clegg 172,300
Boiler tube and flue, C. S. Dean 172,302
Bolts, manufacture of, W. J. Lewis 172,429
Boot-burnishing machine, A. J. Wilbur 172,539
Boot peg, C. M. Higgins 172,435
Boots, etc., trimming soles of, W. Jackson 172,444
Bottles, forming chokes in, H. Miller 172,275
Brick machine, J. K. Caldwell 172,384
Bricks, etc., making, Walsh and Taylor 172,357
Broiler, S. M. Fort 172,410
Brush, Heliolg and Eke 172,432
Brush, dust, R. H. Warren 172,530
Buckle, lever, S. Wales 172,527
Buckle, trace, W. Challenger 172,388
Bullets, machine for casting, C. S. Meeker 172,273
Burial casket, A. Pitman 172,482
Burner, vapor, H. Wellington 172,533
Butter package, A. J. Dibble 172,399
Button, A. Young 172,543
Candle, miner's, P. R. Gottstein 172,423
Car axle lubricator, C. D. Flynt 172,408
Car coupling, Bailey and Garner 172,371
Car coupling tool, H. Sullings 172,520
Car, refrigerator, A. W. Zimmerman 172,546
Car seat, W. W. Parker 172,477
Car wheel, chilled, W. W. Lobdell 172,461
Carbureter, air and gas, Porter and Grimes (r) 6,865
Carpets, screw for stair, M. Krickl (r) 6,859
Carriage axle, J. C. Jenkins 172,522
Cartridge, L. W. Broadwell 172,382
Cartridge cases, making, J. V. Meigs 172,333
Cartridge-loading implement, W. G. Rawbone 172,496
Cartridge shot, A. B. and R. A. Kay 172,446
Center board, W. Austin 172,291
Chair, nursery, L. P. Lawrence 172,458
Chair, oscillating, Guildersleeve and Grimm 172,310
Chairs, foot rest for, J. H. Travis (r) 6,868
Change gate, W. C. McGill 172,332
Cheese cutter, B. G. Yates 172,542
Chuck, planer, W. Esty 172,306
Churn, E. F. Beard 172,294
Churn, D. L. Epperson 172,405
Churn and butter worker, E. W. Kitchen 172,450
Cigar machine, Nittinger and Theobald 172,472
Cigarette former, H. D. Bacot 172,370
Circuses, etc., seat for, J. E. Kelley 172,369
Clock-winding device, J. N. Rice 172,499
Clothes pin, D. M. and A. G. Cummings 172,262
Coffee pot, L. C. Lomer 172,462
Cooler, milk, L. Clark 172,389
Corset attachment, J. D. Banfield 172,372
Coupon-cutting apparatus, E. L. Hutchinson 172,442
Cultivator teeth, J. C. Bannigan 172,373
Curry comb, F. M. Shepard 172,539
Desk and seat, school, Kline *et al.* 172,451
Desk, office, W. S. Wooten 172,364
Distilled spirits, purifying, S. Sweet, Jr. 172,283
Doffer combs, operating, E. Wright 172,541
Door and gate spring, L. Gallaher 172,418
Drilling, bit for rock, J. B. Waring 172,529
Elevator, water, A. B. Flowers 172,407
Elevator, water, Jones and Holmes 172,445
Emery grinding wheel, S. G. Morrison 172,337
Engine air heater, B. T. Babbitt 172,368
Engraving machine, J. C. Guerrant 172,426
Equalizer, draft, S. Smith 172,514
Exhaust mechanism, J. D. Butler 172,245
Explosive compound, C. Felhoen 172,517
Fare box, C. H. Goebel 172,421
Faucet, Hornbostel and Carroll 172,317
Faucet, E. R. Tomlinson 172,525
Feller, machine for sawing, L. S. Welch 172,286
Fence post, L. Lightfoot 172,460
Fence post, A. Taylor 172,521
Fences, forming barbs on wire, Hill and Jayne 172,437
Fifth wheel, F. A. Hollenbeck 172,438
Fire arm magazine, J. W. Keene 172,447
Fire arm, revolving, Boardman and Peavey 172,243
Fire arm cartridge extractor, J. W. Keene 172,448
Flax and hemp machine, J. Stewart 172,519
Food for stock, steaming, R. Dalley 172,301
Fruit dryer, W. R. Davis 172,396
Fruit dryer, G. A. Deitz 172,398
Fruit jar, J. Young 172,289
Fruit jar clamp, T. Hipwell 172,316
Fruits, etc., unpacking, dried, H. F. Patton 172,278
Furnace, hot air, J. B. Pierce 172,481
Furnace ore, H. G. Livermore 172,329
Furnace, glass tempering, F. B. De La Bastie 172,303
Furniture, school, E. G. Durant 172,401
Gage, saw bench, L. Sawyer 172,279
Gage, siding, W. E. Babcock 172,292
Gas, manufacture of, G. Olney 172,474
Gaseous liquids, making, A. A. Mondollot, Fils 172,335
Generator, steam, J. A. Miller (r) 6,862
Gimlet, B. F. Bee 172,377
Glove, W. H. Rowles 172,345
Goblet molds, glass, J. H. Hobbs (r) 6,860, 6,861
Guano distributor, B. A. Barrett 172,374
Gun lock, J. S. Duffie 172,400
Gun sight, McFarland and Hadley 172,465
Hair restorative, A. R. Kinyon 172,449
Hammering machine, metal, L. Chapman 172,246
Harness, elastic tug link for, A. J. Peters 172,479
Harness rosette, G. A. Keene 172,324
Harness rosette, Reynold and Zahn 172,497
Harvester, W. F. Cochrane 172,261
Harvester cutter, F. H. Wolkenhauer 172,288
Hat-pouncing machine, M. S. Drake (r) 6,858
Heater, steam, G. W. Blake 172,378
Heating apparatus, D. W. Abbott 172,364
Hoe eye die and punch, L. Chapman 172,258
Hog ring blank, E. N. Wing 172,360
Hooks, snap, G. M. Hubbard 172,319, 172,320
Hook, snap, W. E. Sparks 172,352
Hook, snap, E. J. Steele 172,355
Horse power, W. W. Dingee 172,304
Horse power for hoisting, P. K. Dederick 172,397
Horses' feet, frog pad for, A. F. Olds 172,473
Horseshoes, E. L. Tevis 172,522, 172,523
Horseshoe calking vise, Kimball & Trainor 172,271
Horseshoes, making, G. Bryden 172,383
Hose coupling, A. J. Morse 172,470
Household utensil, J. Pfeifer 172,541
Ice cream freezers, dasher for, C. W. Packer 172,475
Indicator, speed, W. W. Wythe 172,363
Jack, lifting, S. Mosher 172,471
Kettle, J. Wiley 172,528
Label for bottles, J. L. Dawes 172,364
Lamp, Hadfield & Clark 172,429
Lamp and gate, signal, W. E. Prall 172,494
Lamp, carriage, J. A. Howell 172,444
Lamp shade supporter, E. Stevens 172,518
Lamps, etc., filling liquids in, W. Sedgwick 172,507
Lantern slide, magic, A. H. Tiltt 172,524
Lathe slide rest, J. Plat 172,480
Leather, cutter for, A. Dewes (r) 6,857
Leather, etc., fastening for, E. L. Wires 172,361
Lemon squeezer, E. M. Sammis 172,505
Lock, G. Bayer 172,375
Lock for trunks, etc., C. H. Stall 172,516
Loom, E. B. Bigelow 172,296
Loom picker, C. E. L. Holmes 172,439
Lounge, W. Seng 172,281
Lubricator, D. T. Pray 172,543
Malt, extracting, E. U. Weiss 172,532
Medicated plaster, A. D. Richards (r) 6,867
Metal coating iron sheets, Morewood & Rogers 172,336
Mill, grain-cleaning, J. Allison 172,290
Millstone-dressing machine, L. S. Hogeboom 172,367
Mining machine, G. D. Whitcomb 172,287
Mirror, A. Huber (r) 6,866
Molds, forming, R. J. Howdon 172,318
Motor, electro-magnetic, J. H. Guest 172,309
Motor, spring, E. Lambkin 172,456
Mucilage bottle, G. R. Wight 172,536
Musical spelling tablet, J. Juch 171,268
Muzzle, A. Miller 172,468
Nail machine, cut, W. Haddock 172,427
Nail machines, crank pin for, W. Haddock 172,428
Nut lock, F. M. F. Cazin 172,387
Nut machine, A. Marland 172,272
Oil cloth, felted, C. A. Sitzler 172,348
Organ, pipe, A. B. Felgemaker 172,307
Passenger register, H. R. Gillingham 172,420
Patterns, notching, A. Warth 172,531
Pianoforte, S. P. Brooks 172,244
Pianoforte key, U. Pratt 172,486
Pick eye dies and punches, L. Chapman 172,260, 253, 259
Pick eyes, forming, L. Chapman 172,247
Picture exhibitor, G. A. Lauer 172,328
Picture frame calculator, B. Kilbourn 172,270
Pipe, tobacco, B. Lorillard 172,463
Pistol, spring air, A. Bedford 172,376
Plaiting machine, C. E. Carpenter 172,386
Planing machine shield, H. H. Baker 172,293
Planter, corn, S. P. Babcock 172,369
Planter, corn, L. Scofield 172,280
Planter, cotton seed, J. C. Jenkins 172,323
Plow, gang, E. C. Eaton 172,403
Plow handle, W. A. Couch 172,394
Pneumatic railroad signals, W. E. Prall 172,493, 487, 490
Pneumatic signal valve, W. E. Prall 172,492
Pneumatic signal, W. E. Prall 172,491, 172,489
Pneumatic water supply, W. E. Prall 172,488
Polishing wheel, C. N. Bacon 172,242
Power, spring, Frahm *et al.* 172,412
Press, wine and cider, C. Müller 172,338
Printers' use, lock-up for, A. Shedlock 172,347
Printing block, color, J. Perkins 172,340
Puddler, revolving, G. H. Sellers 172,508
Pump, F. T. Forbes 172,265
Pump piston, L. D. Hovey 172,440
Pump, rotary, L. D. Green 172,424
Pumps, bucket for chain, A. D. Crosby 172,395
Punch, conductor's, F. B. Woodruff 172,540
Railroad signal, etc., electric, D. Rousseau 172,503
Railroad chart protractor, A. Hill 172,426
Railroad cutlery, E. L. Hutchinson 172,442
Railroad ticket shears, etc., R. McCully 172,331
Raker and loader, hay, G. Lambert 172,455
Rawhide, treating, H. Royer 172,346
Reaper reel, S. Hamilton 172,311
Refrigerator, W. Spear 172,353
Rein holder, Miller & Norton 172,274
Rolling hoop iron, roll for, B. Lauth 172,457
Roofing composition, C. B. Hutchins 172,321
Sack holder, G. H. Cornell 172,299
Saw bench gage, L. Sawyer 172,279
Saw gummer, J. Connor 172,392
Saw gummer, J. W. Mixter 172,469
Saw handle, crosscut, S. Boone 172,381
Scholar's companion, W. A. Harwood 172,431
Screw, wood, T. J. Sloan 172,351
Screws, making wood, T. J. Sloan 172,349, 172,350
Semolino, purifying, H. Seck 172,506
Sewer trap, ventilated, J. T. Campbell 172,385
Sewing machine, B. Frese 172,308
Sewing machine, Young and Barber 172,545
Sewing machine for knitted fabrics, W. Pearson 172,478
Sewing machine tension, C. F. Ritchel 172,500
Sewing machine dress protector, R. & G. Blake 172,379
Shackles, J. C. Palmer 172,476
Shawl strap, F. Turner 172,526
Sheet metal, molding, Kittredge *et al.* 172,326
Shoe, J. Knowlton 172,453
Shot case, Hill & Taylor 172,314
Shovel, wooden bladed, D. M. Cummings 172,263
Sifter, ash, E. Herzberger 172,313
Signal box, electric, E. J. French 172,415
Sledges, making, L. Chapman 172,248
Spark arrester, R. P. Faries 172,406
Spear, eel, S. P. Hedges 172,312
Spindle sheath and cop tube, G. H. Simmons 172,510
Spinning frame traveler, F. J. Dutcher 172,402
Spinning machine spindle, D. H. Rice 172,498
Spoke socket, J. B. Goldsmith 172,422
Sprinkler, J. C. Melcher 172,467
Steerer and propeller, J. H. Allyn 172,367
Stereotype plates, planing, J. W. Kellberg 172,325
Stone dressing and sawing, S. Steinbeck 172,517
Stove, G. Newcomer 172,276
Stove pipe shelf, W. Patterson 172,339
Stove water heater, J. H. Mitchell 172,334
Stove, self-closing door, N. A. Boynton, (r) 6,864
Straw cutter, L. Cossitt 172,393
Street sweeping machine, T. MacNeil 172,464
Stump extractor, J. Platten 172,483
Suspender ring, G. W. McGill 172,466
Suspenders, W. P. Vrooman 172,356
Syringe attachment for commodes, M. Ross 172,344
Table, ironing, J. L. Young 172,544
Table slide, extension, H. R. French 172,413
Tables, slides for extension, H. R. French 172,414
Telegraph, automatic, T. A. Edison 172,305
Telegraph wires, insulating, W. E. Prall 172,495
Telegraphs, coupling for train, A. Ryder 172,504
Telegraphic machine, G. M. Phelps (r) 6,863
Telegraphy, automatic, Foote & Randall 172,409
Thill coupling, W. H. Trissler 172,284
Thrashing band cutter and feeder, Gearhart *et al.* 172,419
Time pieces, escapement for, J. F. Watson 172,285
Tobacco pipe, B. Lorillard 172,468
Tool, D. W. Norris 172,277
Trap, fly, O. M. Pond 172,484
Tubes, welding ends of, A. L. Ide 172,443
Umbrella for wagons, G. Bockstaller 172,380
Umbrella runner, H. S. Frost 172,416
Umbrella sticks, joint for, Briggs & Clarkson 172,297
Urinal, W. L. Hepineuze 172,433
Valve, stop, M. Willard 172,359
Vehicle axle, J. C. Spooner 172,517
Vehicle hub, C. H. Guard 172,425
Ventilating vessels, E. C. Soule 172,282
Wagon, dumping, J. Kramer 172,454
Wardrobe, folding, H. Smith 172,513
Washing machine, H. Skipper 172,512
Washing machine, boiler, Rodecker & Pifer 172,502
Wax, sealing, W. R. Clough 172,391
Whiffletree, R. D. Hale 172,266
Whiffletree, C. G. Stearns 172,354
Whiffletree, D. Wilcox 172,537
Window screen frame, J. R. & C. W. Simpson 172,511
Window, show, O. B. Potter 172,485
Wire barbs, securing, M. Knickerbocker 172,452
Wood, filling, N. Wheeler 172,534
Wood, treating, M. Robling 172,501
Wrench, pipe, Adams & Gates 172,365

DESIGNS PATENTED.

8,905.—STOVE.—R. Backus, Albany, N. Y.
8,906.—BUTTONS.—I. Lehman, New York city.
8,907.—KETTLE.—J. Lundgren, New York city.
8,908.—KETTLES.—J. Wiley, Allegheny, Pa
8,909, 8,910.—CUTLERY HANDLES.—E. L. Brittin, Derby, Conn., *et al.*
8,911.—CUTLERY.—L. Brittin, Derby, Conn.
8,912.—TEA SET HANDLES.—J. Hall, Boston, Mass.
8,913.—BUCKLES.—W. L. Starr, Newark, N. J.
8,914 to 8,916.—CARPETS.—J. Hamer, Dutchess co., N. Y.
8,917 to 8,919.—CARPETS.—A. Heald, Philadelphia, Pa.
8,920.—GRATE.—F. A. Magee, Chelsea, Mass.
8,921.—HARNESS TRIMMINGS.—S. Wiener, Newark, N. J.

SCHEDULE OF PATENT FEES.

On each Caveat $10
On each Trade mark $25
On filing each application for a Patent (17 years) $15
On issuing each original Patent $20
On appeal to Examiners-in-Chief $10
On appeal to Commissioner of Patents $20
On application for Reissue $30
On filing a Disclaimer $10
On an application for Design (3½ years) $10
On application for Design (7 years) $15
On application or Design (14 years) $30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, January 10 to 20, 1876.

5,584.—J. C. Rorick, Wauseon, Ohio, U. S. Square and miter bar. Jan. 10, 1876.
5,585.—T. M. Carroll, Oelwein, Iowa, U. S. Apparatus for heating water. Jan. 10, 1876.
5,586.—J. L. Little, Muncie, Ind., U. S. Duster. Jan. 10, 1876.
5,587.—C. Carpenter, Hamilton, Ont. Extension of No. 785. Door knob. Jan. 13, 1876.
5,588.—R. W. Drew *et al.*, Montreal, P. Q. Lubricating cup. Jan. 15, 1876.
5,589.—L. D. Craig, San Francisco, Cal., U. S. Tenon fastener for chairs, etc. Jan. 18, 1876.
5,590.—J. Keith, Providence, R. I., U. S. Sewing machine. Jan. 18, 1876.
5,591.—G. S. Tiffany, London, Ont. Brick-making machine. Jan. 18, 1876.
5,592.—W. W. Jilz, St. Louis, Mo., U. S. Well auger. Jan. 18, 1876.
5,593.—T. W. Lion, Brentsville, Va., U. S. Making illuminating gas. Jan. 20, 1876.
5,594.—J. O. Montignani, Albany, N. Y., U. S. Mop and brush holder. Jan. 20, 1876.
5,595.—R. S. Morse, Wilton, Me., U. S. Washing machine. Jan 20, 1876.
5,596.—N. Cassitt, Brockville, Ont. Mowing machine frame. Jan. 20, 1876.
5,597.—J. B. Winters, London, Ont. Bridge. Jan. 20, 1876.
5,598.—G. M. Fuller, Holyoke, Mass., U. S. Manufacture of pipes. Jan. 20, 1876.
5,599.—S. Bretzfield *et al.*, New York city, U. S. Recording apparatus for billiard games. Jan. 20, 1876.
5,600.—R. H. Isbell, New Milford, Conn., U. S. Ornamenting buttons. Jan. 20, 1876.
5,601.—D. J. Miller, Santa Fé, New Mex., U. S. Calendar. Jan. 20, 1876.
5,602.—W. Bohren, Montreal, P. Q. Hand rest for pianos. Jan. 20, 1876.
5,603.—A. Payette, Montreal, P. Q. Axle. Jan. 20, 1876.
5,604.—G. MacLellan, Glasgow, Scotland. India rubber compounds. Jan. 20, 1876.
5,605.—O. Adams, Battle Creek, Mich., U. S. Rotary steam engine. Jan. 20, 1876.
5,606.—R. A. McCauley, Baltimore, Md., U. S. Apparatus for cleaning sinks, etc. Jan. 20, 1876.
5,607.—M. Wilson, Strathroy, Ont. Sulky harrow and hay rake. Jan. 20, 1876.
5,608.—M. H. Strong, Brooklyn, N. Y., U. S. Making illuminating gas. Jan. 20, 1876.
5,609.—J. Chapman, St. John, N. B. Street lamp lighter. Jan. 20, 1876.
5,610.—W. E. Gard, New York city, U. S. Brick handling apparatus and truck. Jan. 20, 1876.
5,611.—J. Pike, Chicago, Ill., U. S. Making oakum. Jan. 20, 1876.

Advertisements.

Back Page ------ $1.00 a line.
Inside Page ----- 75 cents 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 Friday morning to appear in next issue.

THE LIGHTNING DIE AND TAP FOR USE IN BIT BRACE.



Work finished at one cut. Die adjustable for wear. Unsurpassed for threading bolts and nuts ¾ in. and under with rapidity and precision. WILEY & RUSSELL MANUFACTURING CO., Greenfield, Mass.

PATENT REPORTS—IN GOOD ORDER—From 1847 to 1870—22 years. Cost owner much time and money. Will be sold for best offer. Box 230, Norwalk, Conn.

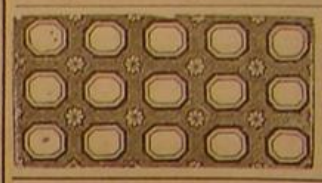
CENTENNIAL DRILL CHUCKS ARE A SUCCESS. They hold 1-64 to ¾ in. and warranted. Sent by mail, prepaid, for $4.25. Send for new reduced Price List of Lathe and Drill Chucks
A. F. CUSHMAN, Hartford, Conn.

10 DECALCOMANIE, or TRANSFER PICTURES, with book of 24 pp., giving full instructions in this new and beautiful art, sent post-paid for 10 cts. 100 assrtd pictures, 50 cts. They are Heads, Landscapes, Animals, Birds, Insects, Flowers, Autumn Leaves, Comic Figures, &c. They can be easily transferred to any article so as to imitate the most beautiful painting. Also, 5 beautiful GEM CHROMOS for 10 cts.; 80 for 50 cts. Agents wanted. Address J. L. PATTEN & CO., 963 William Street, New York.

REVERSIBLE HOISTING ENGINE FOR ALL PURPOSES.
Cheap, simple, durable, and effective. Address LIDGERWOOD M'F'G CO., 165 Pearl St., N. Y.

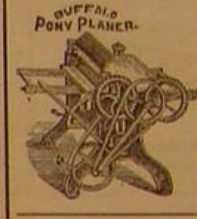
AMATEUR WORKERS IN Rare and Fancy Woods
Can find everything they desire, and four books of Beautiful Designs.
Send 3c. stamp for our new and enlarged Catalogue and price list (3d edition just issued) to
GEO. W. READ & CO.,
186 to 200 Lewis St., foot 5th to 6th St., E. R., N. Y.

How to Learn Phrenology. "The American Institute of Phrenology" (Incorporated by the State Legislature) will instruct a class, beginning July 6, 1876, to accommodate Teachers, Students, Ministers and others during vacation. Another Course will be open Nov. 6. Circulars, giving full explanation sent by mail, on application to S. R. WELLS & CO., Agents, 737 Broadway, New York.



Send for samples and prices of Felt Ceiling for rooms in place of plaster, felt carpeting, &c.
C. J. FAY, Camden, N. J.

FINE TOOLS AND FOOT LATHES. Taps and Dies, Morse Twist Drills, Chucks, Scroll Saws, Supplies of all kinds for Machinists and Amateurs. Send 6 cents in stamps for *Complete Illustrated Circular*.
JACKSON & TYLER, 16 German St., Baltimore, Md.



NEARLY ONE THOUSAND IN USE.
BUFFALO PONY PLANER. Will earn itself and pay expenses of running in a days. Price from One Hundred Dollars and upwards each. Also, Small Pony Planers and Matchers, and Planing Machine Knives. Recommended as superior and extra in quality. Circulars free. One Hundred Scroll Work designs free on receipt of stamp. Address
GEO. PARR,
Buffalo, N. Y.

WHIPPLE'S Patent Door Knob.
Awarded a Bronze Medal at the American Institute Fair for 1874. The Judges say: "We consider this method of fastening DOOR KNOBS a great improvement over anything yet invented for the purpose, as it obviates the use of side screws and washers, and can be regulated to suit any thickness of Doors." Send for Circular.
THE PARKER & WHIPPLE COMPANY,
West Meriden, Conn., or 97 Chambers St., N. Y.

BIG PAY to sell our RUBBER PRINTING STAMPS. Terms free. TAYLOR & HARPER, Cleveland, O.

ON THE CAUSES OF KNOCKING IN HIGH PRESSURE ENGINES. By Joshua Rose. With Nine Engravings. A valuable practical treatise. Price 20 cents. Contained in Nos. 1 and 2 of "Scientific American Supplement," to be had at this office, and of all newsagents.



Made from pure long fiber Asbestos, Self-Lubricating, Indestructible, adapted for Locomotive and Stationary Engines, will save ten times its cost in the one item of repacking, besides requiring less oil than any other packing in use. Loose, flat and round, all sizes. Send for testimonials, etc.
H. W. JOHNS, 87 Maiden Lane, N. Y.,
MANUFACTURER OF PATENT ASBESTOS ROOFING, STEAM PIPE, AND BOILER COVERINGS, PAINTS, FIREPROOF COATINGS, ETC. SEND FOR CIRCULARS, PRICES, ETC.

Established in 1853.
LOVEJOY, SON & CO.,
ELECTROTYPERS and STEREOTYPERS,
15 Vandewater Street, New York.

SCIENCE RECORD For 1876.



SCIENCE RECORD is a splendid book of 800 pages, published annually, about the 15th of January. Illustrated with many engravings. Price $2.50.
THE Volume for 1876 will be published about January 15th. Its contents will embrace the most Interesting Facts and Discoveries in the various Arts and Sciences that have transpired during the preceding year, exhibiting in one view the General Progress of the World the following Departments:
CHEMISTRY AND METALLURGY,
MECHANICS AND ENGINEERING,
ELECTRICITY, LIGHT, HEAT, SOUND,
TECHNOLOGY, THE USEFUL ARTS,
BOTANY AND HORTICULTURE
AGRICULTURE,
RURAL AND HOUSEHOLD ECONOMY,
MATERIA MEDICA, THERAPEUTICS, HYGIENE
NATURAL HISTORY AND ZOOLOGY,
METEOROLOGY, TERRESTRIAL PHYSICS,
GEOGRAPHY,
GEOLOGY AND MINERALOGY,
ASTRONOMY,
BIOGRAPHY AND NECROLOGY.
Every person who desires to be well informed concerning the Progress of the Arts and Sciences should have a copy of SCIENCE RECORD for 1876. It will be a most interesting and Valuable Book, and should have a placern every Household and Library.
800 pages Octavo. Handsomely Bound. Many Engravings. Price $2.50. Sent, post-paid, on receipt of price.
All the preceding volumes of SCIENCE RECORD may be had separately at $2.50 each, or $10 for the five volumes, 1872, 1873, 1874, 1875, and 1876.
MUNN & CO., PUBLISHERS,
37 Park Row,
New York city

Founded by Mathew Carey, 1785.

Baird's Scientific Book Catalogues.

JUST READY---NEW EDITIONS.

Catalogue of Practical and Scientific Books, published by H. C. Baird & Co. 96 pages, 8vo.

Catalogue of a Choice Collection of Practical, Scientific, and Economic Books. 4to.

List of Books on Steam and the Steam Engine, Mechanics, Machinery, and Engineering. 4to.

List of Important Books on Metallurgy, Metals, Strength of Materials, Chemical Analysis, Assaying, etc. 4to.

List of Books on Dyeing, Calico Printing, Cotton and Woolen Manufacture. 4to.

List of Books and Pamphlets on the Currency, the Finances, Political Economy, and Kindred Subjects. 4to.

☞ Any or all of the above Catalogues will be sent *gratis, and by mail, free of postage*, on application.

☞ We are now receiving the most important new English and American Scientific Books as published, and *are prepared to furnish all American and foreign scientific books which are to be had, as well as information regarding all scientific publications* whatsoever and wheresoever published.

HENRY CAREY BAIRD & CO.,
INDUSTRIAL PUBLISHERS, BOOKSELLERS AND IMPORTERS,
810 WALNUT STREET, Philadelphia.



THIS MOUSTACHE produced by the use of DYKES BEARD ELIXIR without injury, or will forfeit $100. Safe and sure. With full direc'ns postpaid, 25c. A. L. SMITH & Co., Ag'ts, Palatine Ill. N. B. For a HEAVY GROWTH use this preparation. Mention this paper.

Tornado Windmill Co.,

Elba, N. Y. Cheap and steady power. Send for cut.

$42 A WEEK.—Agents wanted everywhere. Business permanent and first-class. For further particulars, address
J. KENNEDY & CO., Richmond, Ind.



1876 DREER'S GARDEN CALENDER, 1876
Contains descriptive and price list of Vegetable, Flower and Grass Seeds, Plants, Bulbs, Novelties, and every GARDEN REQUISITE. Beautifully illustrated. Send two 3 ct. stamps for postage.
HENRY A. DREER, 714 Chestnut St., Philadelphia.

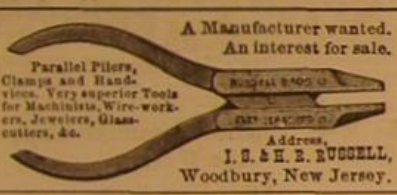
BORAX.

We beg to offer to the trade our own brand of guaranteed strength and purity at the lowest market rate.
CHAS. PFIZER & CO., 81 Maiden Lane, N. Y.

A WANT SUPPLIED.

AUSTIN'S PATENT RULER, MEASURE, PAPER CUTTER AND BLOTTER COMBINED. Sold by Agents, at the trifling cost of 25 cents, and free by mail on receipt of price by the "AUSTIN MAN'F'G CO.," No. 50 N. Fifth St., Phila. Agents wanted.

PRICE REDUCED—Door Name Plate (Glass), Rubber Hand Stamps. Full instructions in manufacturing. Price 50c. each (no circular). J. W. PRATT, Box 191, Rondout, N. Y.



A Manufacturer wanted.
An interest for sale.
Parallel Pliers, Clamps and Handvices. Very superior Tools for Machinists, Wire-workers, Jewelers, Glasscutters, &c.
Address,
J. G. & H. B. RUSSELL,
Woodbury, New Jersey.

STAVE, SHINGLE, HANDLE AND CABINET Maker's Machinery, etc. etc. Address
T. B. BAILEY & VAIL, Lockport, N. Y.

Best Mill Spindles and Steps, MILL GEARING, Shafting, Pulleys & Hangers.
Address T. B. WOOD & CO., Chambersburgh, Pa.

A GOOD HEATER FOR THE WEST.
"The Gothic Furnace I bought of you works to my entire satisfaction."
W. S. BENTON, Anamosa, Iowa.
To ALEX. M. LESLEY, 226 West 23d St., New York.
☞ Catalogues sent by request.

An deutsche Erfinder.

Diese große und thätige Classe unsrer Bevölkerung machen wir besonders darauf aufmerksam, daß unsre Firma durch ihre Verbindung mit Washington und den europäischen Hauptstädten, besondere Vortheile zur Erlangung von in- und ausländischen Patenten bietet.

Jeder Erfinder, gleichviel welcher Nationalität angehörig, ist durch die liberalen Patentgesetze der Vereinigten Staaten zum Patentschutz für Erfindungen berechtigt. Unsre Firma ist bereit, gestützt auf 26jährige Erfahrung, deutsche Erfinder jeder Zeit zu berathen und zu mäßigen Preisen rasch und pünktlich Patente zu erlangen.

Die Deutsche Section ist in den Händen fähiger deutscher Ingenieure, welche in der Office persönlich mit Erfindern verkehren werden.

Der „Scientific American" wird in seinen Spalten die bedeutenderen Erfindungen besprechen.

Correspondenz erbeten und prompt beantwortet. Pamphlete in deutscher Sprache werden auf Verlangen franco zugesandt.

Adressire:

Munn & Co.,
„Scientific American" Patent Agentur
37 Park Row,
New York City

CLARK & COMPANY'S
PATENT SELF-COILING, REVOLVING STEEL SHUTTERS

Can be readily fitted to Store Fronts, Rear Windows or other openings, making them FIRE AND BURGLAR PROOF, and affording absolute protection; also, **WOOD SHUTTERS** in various kinds of wood, suitable for Store Fronts, Private Houses, Offices, and School Partitions. Clark's shutters are self-acting require no machinery or balance weights, and cannot get out of order. They are handsome in appearance, and are the best and cheapest shutters in the world. Are fitted to the new *Tribune* Building, Delaware and Hudson Canal Building, Manhattan Building, Lenox Library Building. Have been for years in daily use in every principal city throughout Europe, and are endorsed by the leading architects of the world.
JAMES G. WILSON, Manager, 218 West 26th St., New York, and at London, Paris, Vienna, Berlin, Melbourne, &c., &c.
AGENTS WANTED.

The TOLL-GATE! Prize Picture sent free! An ingenious gem! 50 objects to find! Address with stamp, E. C. ABBEY, Buffalo, N. Y.

WILLIAM HENRY KING—ALBUMEN MANUFACTURER, 78 & 80 St. Andrew Street, Liverpool, Eng.



BRADFORD MILL CO.
Successors to Jas. Bradford & Co.
MANUFACTURERS OF
French Buhr Millstones, Portable Corn & Flour Mills, Smut Machines, etc.
Also, dealers in Bolting Cloths and General Mill Furnishing.
Office & Factory, 158 W. 2d St.
CINCINNATI, O.
J. R. Stewart, Pres. W. R. Dunlap, Sec.
☞ PRICE-LISTS SENT ON APPLICATION.

Planing & Matching,

Moulding, Re-sawing and Tenoning Machines. Scroll Saws and General Wood-Working Machinery.
JOHN B. SCHENCK'S SONS' { Matteawan, N. Y.
Send for Catalogue. { 118 Liberty St., N. Y. city.

PATENT
Planing and Matching

and Molding Machines, Gray and Wood's Planers, Self-oiling Saw Arbors, and other wood-working machinery.
S. A. WOOD'S MACHINE CO., { 91 Liberty St., N. Y.
Send for Circulars, etc. { 67 Sudbury St., Boston.

OTIS' SAFETY HOISTING Machinery.

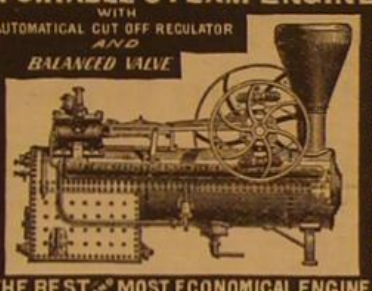
OTIS, BROS. & CO.,
No. 348 BROADWAY, NEW YORK.

OPIUM

and Morphine habit absolutely and speedily cured. Painless; no publicity. Send stamp for particulars. Dr. Carleton. 187 Washington St., Chicago, Ill.

THE CENTENNIAL INTERNATIONAL EXHIBITION OF 1876.—The full History and Progress of the Exhibition, maps of the grounds, engravings of the buildings, news and accounts of all the most notable objects, are given weekly in the SCIENTIFIC AMERICAN SUPPLEMENT. Terms, $5 for the year; single copies 10 cts. To be had at this office, and of all news agents. All the back numbers, from the commencement on January 1, 1876, can be had. Those who desire to possess a complete and splendid Illustrated Record of the Centennial Exposition, should have the SCIENTIFIC AMERICAN SUPPLEMENT.

The HOADLEY PORTABLE STEAM ENGINE.
WITH
AUTOMATICAL CUT OFF REGULATOR
AND
BALANCED VALVE



STATE WHERE YOU SAW THIS
THE BEST & MOST ECONOMICAL ENGINE MADE
SEND FOR CIRCULAR.
THE J.C. HOADLEY CO. LAWRENCE, MASS.

THE BASTET MAGNETIC ENGINE AND BATTERY, for running Sewing Machines, Dentists' and Jewelers' Lathes, Printing Presses, Pumps, Blowing Parlor and Church Organs or working any Machinery that can be moved by Hand or Foot. SIMPLE—DURABLE—ECONOMICAL. Local Agents wanted in every town and county. For circulars and price list address, with stamp, THE BASTET MAGNETIC ENGINE CO., 1113 Chestnut Street, Philadelphia, Pa.

PUNCHING AND DROP PRESSES. For the **Best** and **Cheapest**, address THE STILES & PARKER PRESS CO., MIDDLETOWN, CONN.

$77 A WEEK to Agents, Old & Young, Male & Female, in their locality. Terms & OUTFIT FREE. Address P. O. VICKERY & CO., Augusta, Me.

Gardiner's Pat. Centring & Squaring Attachment FOR LATHES.



R. GARDINER STATE & CO., Springfield, Ohio.

COMPRESSED AIR MOTIVE POWER.—For particulars of the most recent practice, send 20 cents for SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 1 and 2, containing 5 engravings of the "Compressed Air" Locomotives now in use at St. Gothard Tunnel Works, with dimensions, etc.

CELEBRATED FOOT LATHES.



Foot Power Back-geared Screw Lathes, Small Hand and Power Planers for Metal, Small Gear Cutters, Slide-rests, Ball Machines for Lathes, Foot Scroll Saws, light and heavy, Foot Circular Saws. **Just the thing for amateurs and artisans.** Selling everywhere. Send for Illustrated Catalogues
N. H. BALDWIN, Laconia, N. H.

HOME-MADE TELESCOPES.—Directions for their construction, with engravings showing the proper arrangement of lenses and tubes. By Prof Van Der Weyde. Price 10 cts. Contained in No. 1 of SCIENTIFIC AMERICAN SUPPLEMENT, to be had at this office, and of all news agents.

PLANING AND MATCHING MACHINES
UNIVERSAL WOOD WORKERS
TRADE MARK
WOOD WORKING MACHINERY.
BENTEL, MARGEDANT & CO.
HAMILTON, OHIO.
Send for Catalogue and Price List.

THE IMPROVED
NIAGARA STEAM PUMP,



93 to 97 Pearl St., Brooklyn, N. Y.
Agency at 40 John St., New York.
Hubbard & Aller,
SOLE MANUFACTURERS,
ENGINES AND BOILERS,
Pulleys, Shafting and Hangers a Specialty.

The Myers Portable Engine, 4, 5, 6, 8 h.p. Something new. Best for price. Circulars.
SECOND-HAND IRON AND WOOD WORKING MACHINERY.
CHAS. PLACE, 103 Reade Street, New York.

$12 a day at home. Agents wanted. Outfit and terms free. TRUE & CO., Augusta, Maine.

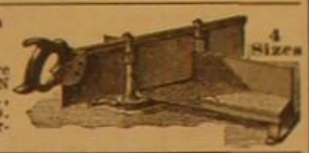


BLAKE'S PATENT
Stone and Ore Breaker
Crushes all hard and brittle substances to **any required size.** Also, any kind of STONE for ROADS and for CONCRETE, &c.
Address BLAKE CRUSHER CO., New Haven, Conn.

WITHERBY, RUGG & RICHARDSON, Manufacturers of Woodworth Planing, Tongueing, and Grooving Machines, Daniel's Planers, Richardson's Patent Improved Tenon Machines, Mortising, Moulding, and Re-Saw Machines, and Wood-Working Machinery generally, 26 Salisbury Street, Worcester, Mass. (Shop formerly occupied by R. BALL & CO.)
L. B. WITHERBY, G. J. RUGG, S. M. RICHARDSON.

FOOT POWER TENONING MACHINES FOR SALE, By S. C. HILLS, 51 Cortlandt St., New York.

With Disston's Saws.



Sold by Hardware Trade. LANGDON MITRE BOX CO., Millers Falls, Mass.
☞ Send for Circular.

PATENT SCROLL SAWS.

Our specialty is Scroll and Band Saws. Over 500 Machines in use. SUPERIOR TO ALL AND LESS PRICE. CORDESMAN, EGAN & CO., Cor. 2nd & Central Ave., Cincinnati, O.

ICE BOATS—THEIR CONSTRUCTION AND MANAGEMENT. For working drawings and full particulars, send 10 cents for SCIENTIFIC AMERICAN SUPPLEMENT, No. 1.

EAGLE FOOT LATHES,



With Scroll and Circular Saw Attachments, Slide Rest, Tools, &c.; also Small Engine Lathes, Metal Hand Planers, &c. Neatest designs, superior finish. **Low Prices.** Our new Catalogue describes these and every tool necessary for the Amateur or Artizan. Send for it.
WM. L. CHASE & CO.,
95 & 97 Liberty St., New York.

ELLIPTICAL GEARING. By Prof. C. W. MacCord, of the Stevens Institute of Technology. With Eight Engravings. A most clear and excellent exposition of the subject. Price 10 cents. Contained in "Scientific American Supplement," No. 2. To be had at this office, and of all news agents.

DO YOU WANT MONEY Male or female. Send your address and get something that will bring you in honorably over $150 a month sure. **Inventor's Union,** 173 Greenwich Street, New York.

THE
Bigelow Engine,



The Cheapest and Best Portable Engine offered to the Public.

Price, 4 Horse Power			$300
" 6 "	"		400
" 7 "	"		475
" 8½ "	"		540
" 12 "	"		725
" 15 "	"		800

Price of Stationary Engines: Without Boilers.

4 Horse Power	$150
6 " "	175
7 to 8½ Horse Power	225
12 to 15 " "	300

Send for Illustrated Circular and Price List.
H. B. BIGELOW & CO., New Haven, Conn.

FOREIGN PATENTS AND *THE CENTENNIAL.*

There is no doubt that our Centennial Exposition will attract to our shores multitudes of representative people from all parts of the world, and they will take home with them many of our best improvements to introduce into their own manufactures.

An unusual opportunity will be offered for selling to these people such foreign patents as have been secured on good American inventions in the respective countries from which these visitors come.

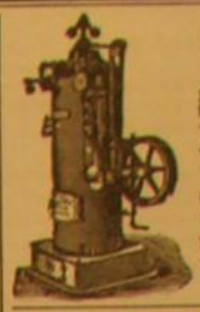
At the reduced prices for which patents are obtained abroad, our people will lose a chance not likely to occur again, if they do not avail themselves of the opportunity of securing their inventions in foreign countries at once, so as to have their patents ready to negotiate the coming summer.

For cost of patents in the different countries and the conditions on which they are granted, send for pamphlet containing full information.
Address MUNN & CO.,
37 Park Row, New York.
BRANCH OFFICE, cor. F and 7th Sts.,
Washington, D. C.

SCREW PROPELLERS, THEIR SHAFTS AND FITTINGS. By Hamilton W. Pendred, M.E. An able treatise, showing the present practice, its advantages and defects. With 25 figures. Price 10 cents. Contained in No. 4 of SCIENTIFIC AMERICAN SUPPLEMENT. To be had at this office, and of all news agents.

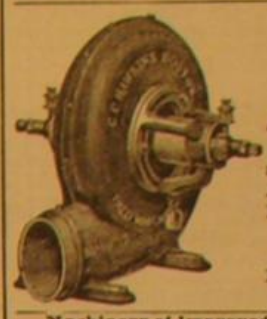
$250 A MONTH—Agents wanted everywhere. Business honorable and first class. Particulars sent free. Address J. WORTH & CO., St. Louis, Mo.

THE
TRADE ENGINE.



Noiseless in operation—Perfect in workmanship—all light parts of Cast Steel.
Every Engine indicated, and valve corrected to give the highest attainable results.
Warranted superior to any semi-portable Engine in the market.
Send for Price List and Circular.
HERRMAN & HERCHEL-RODE M'F'G. CO.,
Dayton, Ohio.

INDIA RUBBER,
For Inventors and the Trade, made into any pattern at short notice, by F. H. HOLTON, 45 Gold St., New York. Established in 1860.



Blowers
FOR
All Purposes
The CHEAPEST and BEST now in use.
ALL WARRANTED.
EXETER MACHINE WORKS,
Sole Makers,
140 Congress St.,
Boston, Mass.

Machinery of Improved Styles for making
SHINGLES, HEADING AND STAVES.
Sole makers of the well known IMPROVED LAW'S PATENT SHINGLE AND HEADING SAWING MACHINE. For circulars, address TREVOR & CO., Lockport, N. Y.

PATENT DOUBLE ECCENTRIC CORNICE BRAKE. Manufactured by THOMAS & ROBINSON, Cincinnati, O. Send for Circulars.

MACHINERY.

IRON & WOOD WORKING MACHINERY OF EVERY DESCRIPTION.

Cold Rolled Shafting.

HANGERS, PULLEYS, COUPLINGS, BELTING, &c. Send for Illustrated Catalogue and Price List.
GEORGE PLACE,
121 Chambers & 103 Reade Sts. N. Y. City.

Machinists' Tools,

All sizes at low prices. E. GOULD, Newark, N. J.

Munn & Co's. Patent Offices.

Established 1846.

The Oldest Agency for Soliciting Patents in the United States.

TWENTY-NINE YEARS' EXPERIENCE.

MORE PATENTS have been secured through this agency, at home and abroad, than through any other in the world.

They employ as their assistants a corps of the most experienced men as examiners, specification writers and draftsmen that can be found, many of whom have been selected from the ranks of the Patent Office.

SIXTY THOUSAND inventors have availed themselves of Munn & Co.'s services in examining their inventions, and procuring their patents.

MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine inventions confer with inventors, prepare drawings, specifications, and assignments, attend to filing applications in the Patent Office, paying the government fees, and watch each case step by step while pending before the examiner. This is done through their branch office, corner F and 7th streets, Washington. They also prepare and file caveats, procure design patents, trademarks, and reissues, attend to rejected cases (prepared by the inventor or other attorneys), procure copyrights, attend to interferences, give written opinions on matters of infringement, furnish copies of patents, and, in fact, attend to every branch of patent business both in this and in foreign countries.

A special notice is made in the SCIENTIFIC AMERICAN of all inventions patented through this Agency, with the name and residence of the patentee. Patents are often sold, in part or whole, to persons attracted to the invention by such notice.

Patents obtained in Canada, England, France, Belgium, Germany, Russia, Prussia, Spain, Portugal, the British Colonies, and all other countries where patents are granted at prices greatly reduced from former rates. Send for pamphlet pertaining specially to foreign patents which states the cost, time granted, and the requirement for each country

Copies of Patents.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a 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 the laws and 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 handbook of reference for everybody. Price 25 cents, mailed free. Address

MUNN & CO.,
Publishers SCIENTIFIC AMERICAN
37 Park Row, N. Y.
BRANCH OFFICE—Corner **F and 7th Streets,**
Washington, D. C.

Advertisements.

Back Page - - - - - $1.00 a line.
Inside Page - - - - - 75 cents 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 Friday morning to appear in next issue.

Shaefler & Budenberg, Magdeburg, Germany.—Steam-Hydraulic Gauges, etc. Sole depot, W. BEUERMANN, 4 Cedar St., N. Y.

IRON—NORWAY, SWEDISH & AMERICAN IRON, all descriptions. ALBERT POTTS, 236 North Front St., Philadelphia, Pa.

WILLIAMSON'S
TANNATE of SODA
Prevents Scale in Boilers. 25 lb. boxes, $6.25, C. O. D. D. D. WILLIAMSON, 203 West St., New York.



Upright Stationary Engines,
Strong, Simple, Safe, and Serviceable!
4, 6, and 8 Horse Power.
GRIFFITH & WEDGE, Zanesville, Ohio.

MILL STONE DIAMOND DRESSING MACHINES. Simple, effective, and durable. Also, diamond-pointed tools for truening Emery Wheels, Grindstones, Chilled Iron, and Paper Calender Rolls, and other mechanical purposes. J. DICKINSON, 64 Nassau Street, New York.

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



Boult's Patent
Reverse Motion Paneling, Variety Moulding and Dovetailing Machine,
cuts Panels of any design or style of mould in the solid wood with neatness and dispatch. Is a first class Shaper, Edge and Scroll Moulder; Does general Dovetailing with thick or thin stuffs. *Simple Durable, and Efficient.*



☞ Send for Pamphlet and Sample of work.
Improved Solid Steel Cutters for all kinds of Variety Moulders made to order, and warranted by the
B. C. MACHINERY CO., Battle Creek, Mich

NOTICE.
The undersigned has assumed the Personal Property, including accounts, finished and unfinished Machinery, good will, &c., connected with the manufacture of MACHINIST'S TOOLS as conducted by Mr. Lucius W. Pond since 1847, and will continue the said business at the old stand, cor. Union and Exchange Sts., Worcester, Mass., under the name of DAVID W. POND, Successor to Lucius W. Pond.
CARD.—Having assumed the business mentioned above, I solicit Inquiry and Patronage with guarantee that present standard of Workmanship, and quality of Machinery shall be maintained. A large quantity of NEW AND SECOND-HAND TOOLS, ALL STYLES AND SIZES, for Sale at Low Prices. Send for list of second hand tools. Store at 98 Liberty St., New York, will be discontinued from Feb. 1, 1876, and all sales made from manufactory.
Respectfully, DAVID W. POND, Successor to LUCIUS W. POND.



Water Wheels.
More than four times as many of Jas. Leffel's Improved Double Turbine Water Wheels in operation than any other kind. 24 sizes made, ranging from 5¾ to 96 in. diam., under heads from 1 to 240 ft. Successful for every purpose. Large new pamphlet, the finest ever published, containing over 30 fine illustrations, sent free to parties interested in waterpower
JAS. LEFFEL & CO., Springfield, O., & 109 Liberty St., New York City.

RICHARDSON, MERIAM & CO., Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and Molding, Tenoning, Mortising, Boring, Shaping, Vertical and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-Off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty Street New York.

WROUGHT IRON BEAMS & GIRDERS
THE UNION IRON MILLS, Pittsburgh, Pa.—The attention of Engineers and Architects is called to our improved Wrought-Iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, are entirely avoided. We are prepared to furnish all sizes at terms as favorable as can be obtained elsewhere. For descriptive lithograph, address Carnegie Brothers & Co., Union Iron Mills, Pittsburgh, Pa.

PERFECT
NEWSPAPER FILE.
The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1 50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription, "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address MUNN & CO., Publishers "SCIENTIFIC AMERICAN."

$5 to $20 per day at home. Samples worth $1 free. STINSON & Co. Portland, Me.

An Unprecedented Success.
THOUSANDS ALREADY SOLD.
Wrinkles and Recipes
Pronounced, by the best Scientific and Mechanical Authorities, the most valuable Handbook ever compiled for Engineers and Mechanics of every class.
Contains the CREAM of the Practical Mechanism Series by Joshua Rose, which has appeared during the past year in the SCIENTIFIC AMERICAN—Useful new papers on mechanical operations by distinguished experts—Hundreds of knotty points in Mechanics and Engineering fully explained in terms that every one can understand. No high mathematics or intricate formulæ. Recipes of all kinds for industrial processes, for cements, for making simple instruments, etc. Hints for farmers and for housekeepers. The whole is a collection of the very best practical hints and suggestions which, for several years, have been sent to the SCIENTIFIC AMERICAN by its correspondents and contributors, together with an immense variety of new material.
☞ Price $1.50, post paid. Handsomely bound; 250 pages. Large pocket-book size.
Wrinkles and Recipes and Scientific American for one year $4.50.
Address H. N. MUNN, Publisher, P. O. Box 772. 37 Park Row, New York.

PATENT COLD ROLLED SHAFTING.
The fact that this shafting has 25 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS' PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price list mailed on application to JONES & LAUGHLINS, Try Street, 2nd and 3rd Avenues, Pittsburgh, Pa. 190 S. Canal Street, Chicago, Ill.
☞ Stocks of this Shafting in store and for sale by FULLER, DANA, & FITZ, Boston, Mass. GEO. PLACE & CO., 121 Chambers St., N.Y. PIERCE & WHALING, Milwaukee, Wis.



"Lowest Priced and BEST."
Do Your Own Printing!
$3 Press for cards, labels, envelopes, etc. Larger sizes for larger work.
Business Men do their printing and advertising, save money and increase trade. Pleasure and profit in Amateur Printing. The Girls or Boys have great fun and make money fast at printing. Send two stamps for full catalogue of presses, type, etc., to the Manufacturers,
KELSEY & CO., Meriden, Conn.

FOR CHARLIE'S PRESENT.
Get the TOM THUMB TELEGRAPH, put up in neat little boxes containing working sounder, telegraph apparatus, battery, key, wires, and chemicals, complete, ready for operation. Price $3.50, with full directions. Can be seen in practical operation at the "Scientific American" office, 37 Park Row; at Packard's Business College, 805 Broadway; and many other places. Besides telegraphing, many beautiful experiments can be made, such as the magnetic curves, electric light, lifting weights, making compasses, magnetizing knives, electro-plating, &c. F. C. BEACH & CO., makers, 246 Canal St., near Center St., New York.

ROGERS' TANNATE OF SODA BOILER SCALE PREVENTIVE. JOS. G. ROGERS & CO., Madison, Ind.
☞ Send for book on Boiler Incrustation.

The NILES ENGINE.
The LATEST and the BEST. Engine independent from boiler on the same base. 3, 4, 6, 8, and 10 Horse Power. Warranted the best Semi-Portable Engine in the United States.
Send for illustrated Price List.
Niles Tool Works,
Hamilton, Ohio.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.
HARTFORD, CONN.



Niagara Steam Pump Works
ESTABLISHED 1862.
CHARLES B. HARDICK,
No. 23 Adams Street,
BROOKLYN, N. Y.

IRON PLANERS,
ENGINE LATHES, DRILLS, &c. Send for Price List.
NEW HAVEN MANUFACTURING CO., New Haven, Conn.

BUILDERS Send for Catalogue of Books' BICKNELL & CO., 27 Warren, N.Y.

TOULMIN'S ELLIPSOGRAPH—Draws ellipses in ink from 6-10 to 8 inches. See Scientific American, Oct. 9, 1875. Boxed, with lock and key, for $12.50. Larger sizes to order. TOULMIN & CO., Lock Box 152, Washington, D. C.

TRADE MARK. CONCORD (USE) N.H. **GENUINE CONCORD AXLES**
The Standard—Best Stock—Finest Finish.
MANUFACTURED ONLY BY
D. ARTHUR BROWN & CO., Fisherville, N.H.

W. C. DUYCKINCK,
IMPORTER, MANUFACTURER, AND DEALER IN
Railway, Machinists' and Engineers' Supplies,
50 AND 52 JOHN STREET,
P. O. Box 4101. NEW YORK.

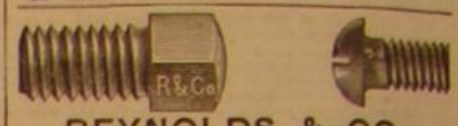
Todd & Rafferty Machine Co.
MANUFACTURERS OF
The celebrated Greene Variable Cut-Off Engine; Lowe's Patent Tubular and Flue Boilers; Plain Slide Valve Stationary, Hoisting, and Portable Engines. Boilers of all kinds. Steam Pumps, Mill Gearing, Shafting, &c., Silk Tow Oakum, Bagging, Rope, Flax, and Hemp Machinery. Agents for the New Haven Manufacturing Co.'s Machinist's Tools; for Judson's Governors and Stop-Valves; Sturtevant Blowers; and Differential Pulley-Blocks. WAREROOMS, 10 BARCLAY STREET, NEW YORK. WORKS PATERSON, NEW JERSEY.

DAMPER REGULATORS **BEST** AND LEVER GAGE COCKS.
MURRILL & KEIZER, 44 Holliday St., Balt.

☞ T. V. Carpenter, Advertising Agent, Address Box 773, New York city.

NOYE'S
Mill Furnishing Works
are the largest in the United States. They make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys and Gearing, specially adapted to flour mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

THE BEST INJECTOR
For Locomotive and Stationary Boilers.
FRIEDMANN'S PATENT.
Over 15,000 Now in Use Here and in Europe
Throws more and hotter water, with less steam, than any others. It has two Waterways, fixed Nozzles, and no movable parts to get out of order
NATHAN & DREYFUS, Sole Manufacturers, 108 Liberty St., New York.
☞ Send for Catalogue.

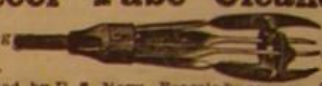


REYNOLDS & CO.,
145 EAST ST., NEW HAVEN, CT.,
MANUFACTURE
Iron and Steel Set Screws, Round, Square, and Hexagon Head; Machine and Cap Screws; Piano, Knob, and Lock Screws; Machine, Bridge, and Roof Bolts, Bolt Ends, Blanks, Nuts, Washers, etc., of every description.
Send for Price List.

Portland Cement.
From the best London Manufacturers. For sale by JAMES BRAND, 55 Cliff St., N.Y.
A Practical Treatise on Cement furnished for 25 cents.

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 Imbacuser & Co., of New York, was decided in my favor, June 18, 1874. Proceedings have been commenced against Imbacuser & Co. for selling, contrary to the order of the Court, and especially the clock with a series of springs in the cover, and marked Pat'd Oct. 20, '74. Persons using these, or any other clocks infringing on my Patent, will be dealt with according to law.

THE NATIONAL
Steel Tube Cleaner.
For Cleaning Boiler Tubes.



PATENTED JULY 2, 1872.
Adopted by U. S. Navy. For sale by dealers. Send for Circular.

NON-COMBUSTIBLE STEAM BOILER & PIPE
COVERING
WITH "AIR SPACE" IMPROVEMENT.
Saves 10 to 20 per cent. CHALMERS SPENCE CO., foot E. 9th St., N.Y.; 1202 N. 2nd St., St. Louis, Mo.

THE
SCIENTIFIC AMERICAN
For 1876.
The Most Popular Scientific Paper in the World.
THIRTY-FIRST YEAR.
Only $3.20 a year including Postage.
☞ Send 10 cents for Specimen copy.
THE SCIENTIFIC AMERICAN, now in its 31st year, enjoys the widest circulation of any weekly newspaper of the kind in the world. A new volume commenced January 1, 1876. Published weekly. Now is the time to subscribe and to form clubs.
THE CONTENTS OF THE SCIENTIFIC AMERICAN embrace the latest and most interesting information pertaining to the Industrial, Mechanical, and Scientific progress of the world; Descriptions, with beautiful Engravings, of New Inventions, New Implements, New Processes, and Improved Industries of all kinds; Useful Notes, Recipes, Suggestions and Advice, by Practical Writers, for Workingmen and Employers, in all the various arts.
EVERY NUMBER contains sixteen large quarto pages, elegantly printed and illustrated with many engravings. The year's issue contains 832 large pages, equal to *four thousand book* pages, at a cost, including postage, of only $3.20 a year to the subscriber.
Engineers, Mechanics, Telegraphers, Inventors, Manufacturers, Chemists, Photographers, Physicians, Lawyers, Clergymen, Teachers, and People of all Professions, will find the SCIENTIFIC AMERICAN most useful and valuable. Its pages teem with interesting subjects for thought, study, and conversation, and are an unfailing source of new and instructive information. As an Instructor and Educator, the SCIENTIFIC AMERICAN has no equal. It is promotive of knowledge and progress in every community where it circulates, It should have a prominent place in every Household, Reading-Room, and Library.
☞ *Specimen copies sent, prepaid, on receipt of 10 cents.*
TERMS OF SUBSCRIPTIONS.—POSTAGE PAID BY US.

One copy Scientific American, one year	$3.20
One copy Scientific American, six months	1.60
One copy Scientific American, three months	1.00
One copy Scientific American and one copy Scientific American Supplement, both for one year, post-paid	7.00
One copy Scientific American, one year, and one copy Science Record	5.20

☞ We make a liberal discount and give advantageous premiums to those who form Clubs or procure Subscriptions. A beautifully illuminated Subscription List, also Prospectus and Rates, *sent free.* Address
MUNN & CO.
37 PARK ROW, NEW YORK.

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



$5 a year by mail, post-paid. Send 10 cents for Specimen Copy.

TO ILLUSTRATE AND DESCRIBE the many interesting themes and objects presented in the GREAT CENTENNIAL INTERNATIONAL EXPOSITION OF 1876, and also to meet the wants of that large class of readers who desire an increased supply of Scientific Information, particularly of the more Technical and Detailed character, we shall issue a SPECIAL PUBLICATION, entitled the SCIENTIFIC AMERICAN SUPPLEMENT, to be printed weekly during the Centennial year of 1876, and, perhaps, permanently thereafter. Each number will have sixteen large quarto pages, issued weekly, printed in the best style, uniform with the SCIENTIFIC AMERICAN, but separately paged.

The SCIENTIFIC AMERICAN SUPPLEMENT, in addition to the special matter pertaining to the International Exposition, will embrace a very wide range of contents, covering the most recent and valuable papers by eminent writers in ALL THE PRINCIPAL DEPARTMENTS OF SCIENCE AND USEFUL KNOWLEDGE, to wit:

1.—**Chemistry and Metallurgy.**—Embracing New Chemical Discoveries, Improvements, and Processes, with engravings. New Processes of Working Iron, Steel, Lead, Copper, Gold, Silver, and the Various Metals, with engravings of New Apparatus, New Information, etc.

2.—**Mechanics and Engineering.**—The latest and best papers upon Steam Engineering, Railway Engineering, Mining, and Civil Engineering, Mill Work, Textile Industry, with engravings and working drawings.

3.—**Electricity, Light, Heat, Sound.**—Latest Improvements in Telegraphy, Telegraph Engineering; Improvements in Galvanic Batteries, Electric Engines, New and Useful applications of Electricity in the Arts, with engravings.

4.—**Architecture.**—Examples of the best New Structures, with details and drawings.

5.—**Technology.**—New and Useful Invention and Discoveries relating to THE ARTS: Improvements in Photography, Printing, New Implements, New Machinery, New Processes, New Recipes, Improvements pertaining to Textile Industry, Weaving, Dyeing, Coloring, New Industrial Products, Animal, Vegetable, and Mineral—with engravings.

6.—**Agriculture, Botany, and Horticulture.**—New and Useful Information in all branches of Agriculture. Descriptions of New Plants, Trees, Shrubs, and Flowers, New, Useful, and Interesting Facts in relation to Cultivation, Propagation—with engravings.

7.—**Rural and Household Economy.**—The Latest Information concerning Building Materials, New and Valuable Recipes, and a great variety of Miscellaneous Information pertaining to Rural and Household affairs—with engravings.

8.—**Materia Medica, Therapeutics, Hygiene.**—Exhibiting the progress of Medical Science in various branches; New Medicinal preparations, New Health Appliances, and much Interesting Information.

9.—**Natural History and Zoology.**—The Latest Investigations, Discoveries, and most Interesting Information in this department of Science.

10 & 11.—**Meteorology, Terrestrial Physics, Geography.**—Accounts of Interesting Atmospheric and Terrestrial Phenomena, Travels, Explorations and Discoveries, etc.

12.—**Geology and Mineralogy.**—The Latest and most Interesting Geological Investigations and Reports, and New Discoveries.

13.—**Astronomy.**—Recent Interesting Discoveries and Information, with Reports of Astronomical Phenomena, Progress, New Instruments, etc.

TERMS:—Scientific American Supplement, One year, post-paid, $5.00; half year, $2.50 three months, $1.25. Three copies, one year, $13.50; five copies, $20.00; ten copies, $38.00. One copy of SCIENTIFIC AMERICAN and one copy of SCIENTIFIC AMERICAN SUPPLEMENT, one year, post-paid, $7.00.

Address MUNN & CO., Publishers, 37 Park Row, New York.