1872

19. Jan K 320 13/17
3174.

Scientific American

1872

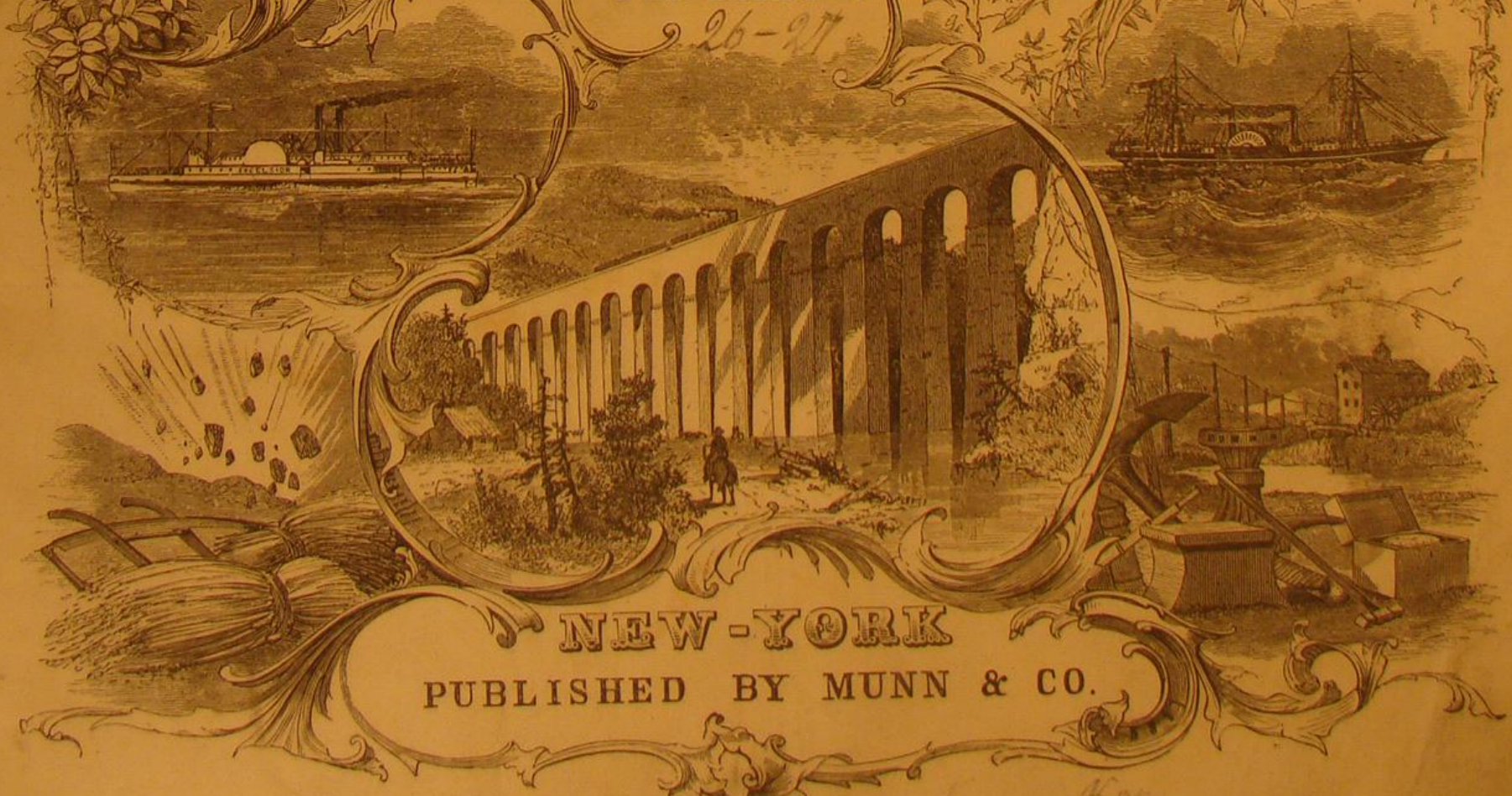


AN ILLUSTRATED

JOURNAL OF ART, SCIENCE & MECHANICS

Vol. XXVI.

26-27



NEW-YORK
PUBLISHED BY MUNN & CO.

Kop.

SCIENTIFIC AMERICAN

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

Vol. XXVI.—No. 1. [NEW SERIES.] NEW YORK, JANUARY 1, 1872. $3 per Annum. [IN ADVANCE.]

PROFESSOR LOUIS AGASSIZ.

At the very pinnacle of scientific fame stands the subject of the present article. No living man has studied nature with greater ardor and perseverance, and no living man has contributed more to the solution of natural problems than Professor Agassiz. His life has been intensely laborious, but he has labored in love, and has therefore endured an amount of work that would have wrecked the health of ordinary men.

His portrait, which accompanies this sketch, indicates a man of great mental and physical power, intense tenacity of purpose, and keen observation. He has a large brain, but a body that can nourish and carry it.

Louis Agassiz was born in the parish of Mottier, Switzerland, May 28, 1807, his father being the Protestant clergyman in charge of the parish. Up to the age of eleven years his education was in sole charge of his mother, a most intelligent and in every way superior woman. At eleven he commenced a regular course of study at the gymnasium of Bienne.

At a very early age he evinced a taste for and ability in the prosecution of scientific researches that gave large promise of future usefulness; but we have not space to follow him through the various steps which prepared him for the position he has filled in the world of science in later life.

The New York *Tribune* has recently published two incidents, in the life of this great man, which are so well narrated and are so characteristic that we reproduce them here. One is an event that took place in his youth, another relates to riper years; both demonstrate the fact that to this investigator the love of Nature and the study of her works have been the sources of his single minded devotion to a life of study. The first story is as follows. It is "of a poor Swiss lad, who, refusing to learn how to turn a penny by his father's trade, began alone and unaided to spell out the alphabet of Nature in rocks, and birds, and beasts. The knowledge did not promise to help him on one whit among his neighbors, did not put shoes on his feet, or salt in his porridge; a comfortable home and successful business waited for him, but he chose to go wandering through the Alps, hatchet in hand, and often but a *sou* in pocket, 'a sum so little,' he said, 'when my hunger was so big!' So, hungry and half clothed, he followed for years the half effaced signs of this unknown language, which he fancied God had spoken and not men, as a child might trace the footsteps of a lost mother. At last he made his way to London, to Sir Roderick Murchison, who, he thought, could help him.

'Well, sir, what do you know?' demanded the great naturalist, noting his beardless chin and ruddy cheeks. 'I think—' hesitated the lad, 'a little about fishes.' That night, at a meeting of the Royal Society, Sir Roderick held up a covered package. 'I have here,' he said, 'a fish, which existed in such an era'—some time long before Adam was born, and proceeded to state the exact conditions and position in which it was found. 'Can our young friend, who knows something about fishes, tell us anything about it?' Whereupon the Swiss boy promptly drew upon the blackboard a skeleton monster, of which the real one, when uncovered, proved to be the exact duplicate, and then the old graybeards present recognized him as one of themselves, and gave him place, very much as the kings in Hades rose to receive Napoleon."

The second is shorter. "There is a story of a shrewd agent who tried vainly to buy the great naturalist for a winter's lectures. 'Why, sir, you will make more money than by ten years of this work,' he reasoned. 'But I have not the time to make money,' said Agassiz. When will that generation of Americans be born who will not have time to make money, and who will prefer deep sea dredging to building houses of sand on the shore?"

Professor Agassiz, now at the age of sixty-four years, is about to engage in the conduct of a deep sea exploring expedition, which will involve arduous labor and care for a considerable period. We trust, however, that the vitality which has hitherto sustained him, will not fail him, nor become so impaired, by his zeal in the cause of science, as to break him down at the end of his self-assumed task.

In a recent letter to Professor Pierce, Professor Agassiz states what results he expects from the expedition in question. We have room for only an abstract of this letter, much of which, indeed, is too scientific and technical for the general reader. He writes:

"My Dear Friend: On the point of starting for the deep sea dredging expedition, for which you have so fully provided, and which I trust may prove to be one of the best rewards for your devotion to the interests of the Coast Survey, I am desirous to leave in your hands a document which may be very compromising for me, but which I nevertheless am determined to write, in the hope of showing within what limits natural history has advanced towards that point of maturity when science may anticipate the discovery of facts. If there is, as I believe to be the case, a plan, according to which the affinities among animals and the order of their succession in time were determined from the beginning, and if the plan is reflected in the mode of growth, and in the geographical distribution of all living beings: or, in other words, if this world of ours is the work of intelligence, and not merely the product of force and matter, the human mind, as a part of the whole, should so chime with it, that, from what is known, it may reach the unknown; and if this be so, the amount of information thus far gathered should, within the limits of errors which the imperfection of our knowledge renders unavoidable, be sufficient to foretell what we are likely to find in the deepest abysses of the sea from which, thus far, nothing has been secured. I will not undertake to lay down the line of argument upon which I base my statement, beyond what is suggested in the few words preceding, namely, that there is a correlation between the gradation of animals in the complication of their structure, their order of succession in geological times, their mode of development from the egg, and their geographical distribution upon the surface of the globe. If that be so, and if the animal world designed from the beginning has been the motive for the physical changes which our globe has undergone, and if, as I also believe to be the case, these changes have not been the cause of the diversity now observed among organized beings, then we may expect, from the greater depth of the ocean, representatives resembling those types of animals which were prominent in earlier geological periods, or bear a closer resemblance to younger stages of the higher members of the same types, or to the lower forms which take their place nowadays.



PROFESSOR LOUIS AGASSIZ.

And to leave no doubt that I have a distinct perception ofwhat I may anticipate, I make the following specific statement:

"It lies in the very nature of these animals that, among vertebrates, neither mammalia nor birds can exist in deep waters; and if any reptiles exist there, it could only be such as are related to the extinct types of the jurassic periods, the ichthyosauri, plesiosauri, and pterodactyles, but even of these there is very little probability that any of their representatives are still alive. Among the fishes, however, I expect to discover some marine representatives of the order of ganoids of both the principal types known from the secondary zoological period, such as lepidoids, sauroids, pycnodonts, coelacanthes, and amioids, and glyptolepis-like species may even be looked for. (These are families of fishes.) Among selachians some new representatives of cestraciontes or hybodontes may be forthcoming, connecting the latter more closely to odontaspis. (These are families of sharks.) I also look forward to finding species allied to corax, or connecting this genus with notidanus, perhaps also jurassic-like forms. Among chimæroids (a genus of fishes) we may expect some new genera more closely related to the extinct types of that family than those now living. Among ordinary fishes I take it for granted that beryx genera may be added to our list, approaching perhaps acanus, or rather sphenocephalus; also types allied to istieus, to anenchelum, and to osmeroides, elops, and argentina. Dercetis and blochius may also come up. (These are all names of families of living fishes.) Species of all classes of the animal kingdom, which have been very rarely met with by fishermen and naturalists, are likely to be found in the deepest waters, in which neither hooks nor nets are generally lowered. Nothing is known concerning the greatest depth at which fishes may live. Upon this point I hope to obtain positive data."

Professor Agassiz then proceeds to enumerate a long list of genera and species, to which he expects to add novel specimens, and adds:

"With the monograph of Pourtalés, assistant in the United States Coast Survey, upon the deep sea corals it would be sheer pretence to say anything concerning the prospect of discovering new representatives of this or that type. His tables point them out already.

"But there is a subject of great interest likely to be elucidated by our investigations—the contrast of the deep sea faunæ of the northern with those of the southern hemisphere. Judging from what Australia has already brought us, we may expect to find that the animal world of the southern hemisphere has a more antique character, in the same way as North America may be contrasted with Europe, on the ground of the occurrence, in the United States, of animals and plants now living here, the types of which are only found fossil in Europe.

"A few more words upon another subject. During the first three decades of this century, the scientific world believed that the erratic boulders, which form so prominent a feature of the surface geology of Europe, had been transported by currents arising from the rupture of the barriers of great lakes among the Alps, or started from the north by earthquake waves.

"Shepherds first started the idea that, within the valleys of Switzerland, these huge boulders had been carried forward by glaciers, and Swiss geologists, Venetz and Charpentier foremost among them, very soon proved that this had been the case. This view, however, remained confined to the vicinity of the Alps in its application, until I suggested that the phenemenon might have a cosmic importance, which was proved when I discovered, in 1840, unmistakable traces of glaciers in Scotland, England, and Ireland, in regions which could have had no connection whatever with the elevation of the Alps. Since that time the glacial period has been considered by geologists as a fixed fact, whatever may have been the discrepancies among them as to the extent of these continental masses of ice, their origin, and their mode of action.

"There is, however, one kind of evidence wanting to remove every possible doubt that the greater extension of glaciers in former ages was connected with cosmic changes in the physical condition of our globe. All the phenomena related to the glacial period must be found in the southern hemisphere with the same characteristic features as in the north, with this essential difference, that everything must be reversed; that is, the trend of the glacial abrasion must be from the south northward; the lee side of abraded rocks must be on the north side of hills and mountain ranges, and the boulders must have been derived from rocky exposures lying to the south of their present position. Whether this is so or not, has not yet been ascertained by direct observation. I expect to find it so throughout the temperate and cold zones of the southern hemisphere, with the sole exception of the present glaciers of Tierra del Fuego and Patagonia, which may have transported boulders in every direction. Even in Europe, geologists have not yet sufficiently discriminated between local glaciers and the phenomena connected with their different degrees of successive retreat on one hand, and the facts indicating the action of an expansive and continuous sheet of ice moving over the whole continent from north to south. Unquestionably, the abrasion of the summits of the mountains of Great Britain, especially noticeable upon Schiehallion, is owing to the action of the great European ice sheet during the maximum extension of the glacial phenomena in Europe, and has nothing to do with the local glaciers of the British Isles.

"Among the facts already known from the southern hemisphere are the so-called rivers of stone, of the Falkland Islands, which attracted the attention of Darwin during his cruise with Captain Fitzroy, and which have remained an enigma to this day. I believe it will not be difficult to explain their origin in the light of the glacial theory, and I fancy now they may turn out to be nothing but ground moraines, similar to the "Horsebacks" of Maine.

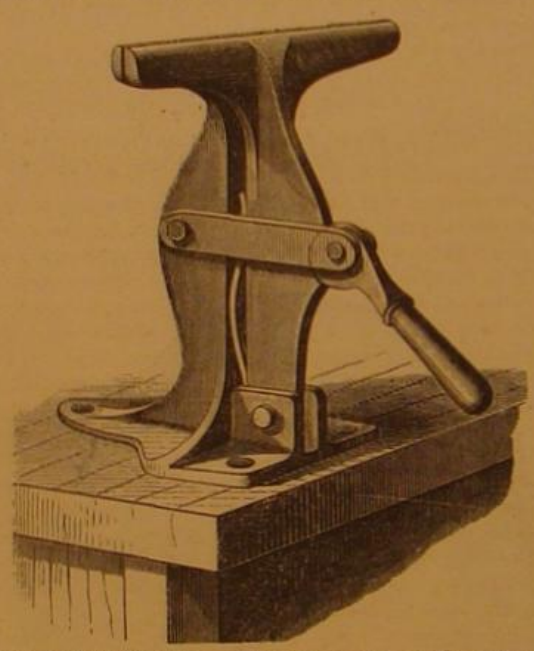
"You may ask what the question of drift has to do with deep sea dredging? The connection is closer than may at first appear. If drift is not of glacial origin, but the product of marine currents, its formation at once becomes a matter for the Coast Survey to investigate, and, I believe, it will be found in the end that, so far from being accumulated by the sea, the drift of the lowlands of Patagonia has been worn away to its present extent by the continued encroachment of the ocean in the same manner as the northern shores of South America and Brazil. * * * * * * * * *

"Hoping some at least of my anticipations may prove true, I remain, ever truly yours."

And so this old man, still thirsting for knowledge, scorning wealth, luxury, and even the ease and comfort usually so longed for by people of his years, is to dare the dangers of the deep, to suffer exposure and risk the health of his declining years, that the world may be enriched by his additions to its lore, and to gratify his unquenchable love for science. Instead of being morally deformed by avarice, and clutching for dollars as though all depended upon accumulation, "he has no time to make money," and will die a poor man, as the world counts wealth, but rich in all that is noble and worthy, rich in the respect of his fellow men, and, let us hope, rich in the assurance that the splendid, well stored mind, which still shines with unabated luster, will find an unlimited expansion beyond the dark valley.

ECCENTRIC SPRING VISE.

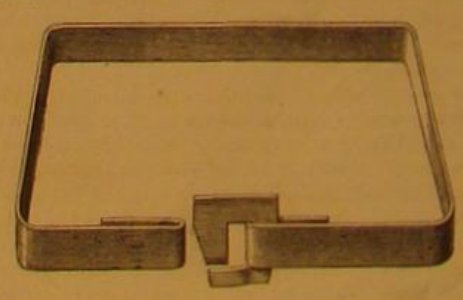
This is a handy implement, of English origin, very convenient for pattern makers' and saw filers' use, the principle of which is obvious from an inspection of the engraving. Instead of the usual screw, an eccentric and link movement



forces the jaws together. When released from the action of the lever eccentric, the jaws are separated by a spring. It would be easy to connect a treadle and rod attachment to the vise, so as to operate it wholly by the foot, in work where both hands are needed in placing the article to be held.

SHEPPARD'S COTTON TIE.

This is an improvement in the tie or buckle used in fastening together the ends of iron bands employed in baling cotton. The tie is made of a piece of flat wrought iron, and is so constructed that a lip covers the place of entrance of the band, thus making it impossible to disengage the band through any accident arising from the sudden relaxation of the same, caused by the rough handling to which cotton is constantly subjected.



The advantages of this tie are security, strength, simplicity, and ease of appliance. In using it, the band is passed around the bale, and, having been drawn tight, the ends are formed into loops, on one of which the tie is hooked, as shown in our engraving. The loose end or loop is then attached to the larger lip or arm of the tie by simply turning the tie slightly and inserting the band in the opening between the lips. This opening may be formed by beveling off the edges of the lips or by bending them in opposite directions. The corner of the lip on which the band rests is rounded off to throw the strain on the shank, as this adds to the strength of the tie.

This tie is simple in construction and can be very cheaply manufactured. Patented August 22, 1871, by J. L. Sheppard, of Charleston, S. C., who may be addressed for further information.

SCIENCE RECORD FOR 1872.

We have in press, to be issued shortly, a new and valuable book of 350 pages octavo, entitled as above, which, we think, will be read everywhere with interest. It is a compendium of scientific progress of the past year, and is profusely illustrated with steel plate and wood engravings.

The following is a partial outline of the general contents of the *Science Record:*

Notices and descriptions of the leading discoveries and improvements invented or introduced during the past year, pertaining to Engineering, Mechanics, Chemistry, Philosophy, Natural History, Agriculture, Architecture, Domestic Economy, and the various Arts and Sciences, with many engravings.

Biographical notices of prominent men of science, with portraits.

Descriptions of the most important public works, began or completed during the past year, with illustrations.

Notes of the progress and extension of railways, telegraphs, and other means of communication.

Descriptions of the new applications of steam, electricity, and other motive powers, with engravings.

Almanac for the present year, and a chronological table of notable scientific events and phenomena.

Reports of Patent Office proceedings. Classification of inventions at the Patent Office, with the names of all examiners, officials and employees.

Portrait and biographical sketch of the Hon. M. D. Leggett, Commissioner of Patents.

Description of that great engineering work, the Mount Cenis Tunnel through the Alps, with engravings of the tunneling machinery, portraits of the chief engineers of the work, and other illustrations.

Description of the great Government works at Hell Gate, New York, with many illustrations, showing the wonderful galleries now being cut in the rocks under the bed of the East River, preparatory to removal of these obstructions by explosion, the drilling machinery, the electric apparatus, and other interesting objects.

Description of the great Suspension Bridge between New York and Brooklyn, now in process of erection, with interesting engravings.

Steel plate engravings of the celebrated Gatling Gun or Mitrailleur, showing its construction and use in various forms, upon wheels, horseback, camels, boats, etc.

Illustrations of recent improvements in cannon, fire arms, etc.

Recent applications of science to the construction of steam and sailing vessels, with illustrations.

Reports of the important law trials, and decisions pertaining to inventions and scientific matters.

Proceedings of scientific bodies, with notes of interesting papers.

Illustrations of late improvements in all the leading departments of mechanics and science.

Useful tables and practical recipes pertaining to the principal branches of industry.

The whole forming a convenient and popular SCIENCE RECORD of the past year, of permanent value and importance necessary for reference and interesting to everybody. It should have a place in every library.

350 pages octavo. Handsomely bound. Price $1.50. Extra binding, half calf, $2. Sent post free on receipt of the price. Published by Munn & Co., 37 Park Row, N. Y. Office of the SCIENTIFIC AMERICAN.

One copy of the SCIENTIFIC AMERICAN for one year and a copy of the Science Record, $4.

CHLORAL IN TOOTHACHE.—Dr. Page, in a letter to the Brittsh *Medical Journal*, states, that for some time past he has employed chloral hydrate, not only as an internal sedative in dental neuralgia and caries, but also as a local applicarious tooth. A few grains of the solid hydrate placed on a quill point introduced into the dental cavity, speedily dissolved, and the pain was either deadened or effectively allayed. A second or third application of the remedy may be necessary.

CHLORAL HYDRATE has had a great run, and even young men are known to be purchasing it at the drug stores, to be used in promoting sleep; it should never be taken unless advised by the family physician, for the medical journals are constantly publishing cases where serious harm and even fatal results attend its habitual use.—*Journal of Health.*

A NEW STYPTIC.—Collodion, 100 parts; carbolic acid, 10 parts; Pelouse's tannin, 6 parts; benzoic acid (from gum) 5 parts. Mix the ingredients in the order above written, and agitate until perfect solution is effected. This preparation has a brown color, and leaves on evaporation, a strongly adherent pellicle. It instantly coagulates blood, forming a consistent clot, and a wound rapidly cicatrizes under its protection.

MR. RAYMOND, the United States Commissionar of Mining Statistics, estimates the total product of gold and silver in the United States, during the year 1870, at $86,000,000. Of this amount California yielded $25,000,000, and Nevada $16,000,000. Gold, to the value of from $9,000,000 to $13,000,000, is used every year in the arts, by jewelers and others.

MANUFACTURERS of governors of steam engines may be interested in knowing that a suit brought by Junius Judson against A. P. Brown and others, for infringing his patent for a *graduated opening* in governor valves, and which has been pending three or four years, has been discontinued, without costs against either party as against the other. Any licencees of James Watt, if such there be, may now rest at ease concerning the principle of *graduated openings.*

GOUX'S IMPROVEMENTS IN EARTH CLOSETS.

We recently had occasion to notice the issue of patents in this country for the above invention, and we now have the pleasure of presenting engravings thereof, with additional particulars.

The earth closet, as heretofore made, consists of a tub or holding vessel, to receive the excreta, and above it another vessel or holder, containing dry earth; there is also a lever and valve arrangement, so connected with the earth chamber that, when the lever is operated, a small quantity of earth is thrown down upon the excreta, which are thus deodorized. This plan, although valuable, is, in practical use, attended with some trouble, as the machinery and the chambers must be frequently looked after, the contents of one, when full, removed, and the other chamber filled when empty. It requires some little intelligence to keep these machines in proper order; hence, for general use, they are not quite the thing.

The improvement of Goux consists in lining the interior wall of the tub or excreta holder with earth or any other suitable deodorizing absorbent; and thus prepared it is ready for use, requiring no further attention until it becomes filled, when its contents are removed to the manure heap, and a fresh earth lining substituted. The earth lining absorbs the noxious effluvia and liquids, and the closet thus made is odorless. There is no machinery about it. It is admirably fitted for family use; and it presents this striking advantage, that its products form a manure of the highest value, which may be collected and transported without nuisance to anybody. The product is, in fact, odorless, although it is a rich fertilizer.

This form of earth closet has been extensively introduced in London, where a corporation, known as the "Sanitary Improvement and Manure Manufacturing Company" has been formed, and a large and profitable business inaugurated. The company employs a large number of drays and men, who go around to regular customers, removing the filled tubs and

Fig. 1.



substituting fresh ones, a work of only a minute in each case, with nothing disagreeable about it. The fertilizer thus produced and collected brings the highest prices, and the demand is much greater than the supply.

Referring to our engravings, Fig. 1 represents one of the excreta holders. A is the lining of absorbent materials, such as earth and other matters. The absorbent lining is placed and formed within the holder by means of a band mold of the form shown in Fig. 2, the earthy material being lightly packed between the walls of the holder and the exterior surface of the mold; the latter is then withdrawn, leaving the lined holder ready for use, as shown in Fig. 1.

Fig. 3 shows a special application of the invention to urinals, the interior of the ornamental holder being wholly or partially filled with the absorbent earths, A, as shown, the liquid being conducted from the receiving urn, B, down through a pipe, C, which is perforated at its lower parts to permit the absorption of the liquids by the earth. These simple devices are most effective, and may be used in the apartments of dwellings with advantage.

Fig. 2



The urinal fluids, it is well known, are among the most precious fertilizing agents, and by this excellent apparatus they are not only saved, but converted into an article of great commercial value, ready for immediate use.

The Goux system possesses all the advantages of the dry earth system without its disadvantages; it is economical, deodorizing, and self-acting. The whole refuse of every house, as excreta, liquid or solid, ashes, and sweepings, are disposed of and turned to account, and it is applicable in individual cases, dwellings, and in large communities. The alterations to the ordinary closets, to adapt them to the dry system, are less costly in the Goux process than in any other, and it is applicable to the best description of houses, as well as to the dwellings of the poor.

By the adoption of this simple process in cities, all communications between the sewers and the interior of houses are effectually stopped, and all danger of infection from the

Fig. 3.



neighborhood avoided; every case of epidemic disease can be at once isolated and dealt with separately; and in course of time the sewers themselves, no longer contaminated by the human excreta, will become comparatively harmless, while their contents will then be allowed to run into the rivers without poisoning the water.

After a protracted trial made at Aldershot during last season, the British War Department, on the recommendation of several sanitary commissioners specially appointed, has determined to adopt the system, and the London company has taken a contract for the whole of the North Camp. As a proof of the adaptability of the system to large bodies of men, it may be observed that, although the contract was made and arrangements prepared for about 4,000 men, yet the service has been extended without difficulty or inconvenience to about 11,000 or 12,000 men, and no complaints have been made of any nuisance; and the official certificates show that the Goux closets gave perfect satisfaction. No foul odors were observable under their long continued use by this large body of troops. A more severe test could not well be suggested.

The large town of Halifax, Eng., has also adopted the system, and will soon be entirely fitted. The towns of Bradford and of Wakefield, after a close examination of the results obtained at Halifax, have decided on adopting the system, and the company is in treaty with several other corporations for the same purpose. For hospital purposes the system is unrivalled. When it is considered that this is the progress made in the course of one year, it will appear that the process must have some considerable merit.

The Goux system is now being introduced in this country, and its practical operation may be seen at the establishment of A. L. Osborn & Co., 424 West Canal street, New York, where further information can be obtained.

Creuse's Stable and Tasteless Medical Compound of Iodide of Iron.

The iodide of iron is one of the most important and useful curative agents known in pharmacy; but, as heretofore made, its compounds have a harsh, inky, disagreeable taste, so bad that many patients are unable to use them. They also blacken the teeth, and, in some cases, produce constipation.

The object of Mr. Creuse's invention is to provide a stable and tasteless medical compound of iodide of iron, by combining the sesqui-iodide of iron with a vegetable salt.

The sesqui-iodide of iron, though very unpleasant and even caustic in taste, has the property of combining with various vegetable salts, forming compounds almost tasteless, which may, it is claimed, practically be kept unaltered any length of time.

The vegetable salts found to have such an effect are the citrates, the tartrates, and the oxalates of potassa, soda, ammonia, and lithia, or any mixture of these different salts. Of all these, the combination of sesqui-iodide of iron with citrate of potassa has been selected as the best suited for medicinal purposes though the right to use any is allowed in the patent.

The solutions of the iodide of iron thus obtained must be kept from direct sunlight, and protected by either sixteen per cent of alcohol or a quantity of sugar sufficient to make an officinal sirup.

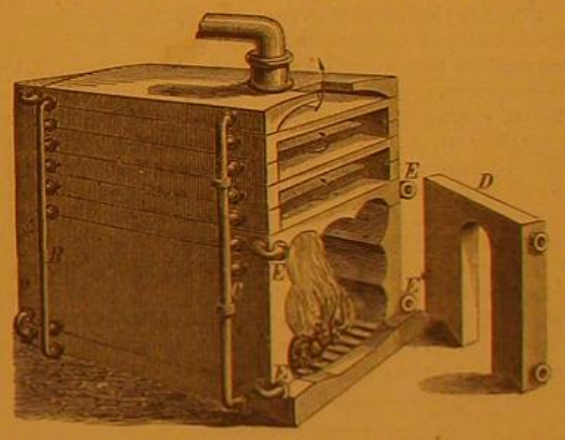
The usual preparations of Peruvian bark may be made with this compound, and are claimed to keep indefinitely under the conditions specified. This preparation, an iodide by the combination of sesqui-oxide of iron with vegetable salts, was patented through the Scientific American Patent Agency, November 28, 1871, by Jules Augustus Creuse, of Brooklyn, N. Y.

Motors for Tremolos of Musical Instruments.

John R. Lomas, of New Haven, Conn., assignor to B. Shoninger, has secured a patent for an invention which has for its object to provide a steady and economical mechanism for operating tremolos of organs or other musical instruments; and consists in the use for that purpose of a wind engine, which acts directly on the crank of the tremolo. Various means have ere this been proposed for the working of tremolos in musical instruments; but all were objectionable either on account of uncertainty of action, or because they wasted more power than was required, or were finally too apt to get out of order and difficult to retain in action. In this invention, a tremolo of prismatic or other suitable form is hung in a fixed frame, by means of projecting pins at the ends, so that it will readily revolve in its bearings. One of the pins is extended, and bent to form a crank, which is, by a pitman, connected with the operating mechanism of a wind engine. This engine consists of a hollow case or box, containing within its cavity a flexible diaphragm or partition, which divides it into two chambers. The diaphragm is directly, or by means of a rod, connected with the pitman. Air for operating the engine is let into the chambers through proper apertures, and exhausted through other apertures. A slide, which is connected with the crank pin, and set by the same at every half revolution of the tremolo, has suitable posts, and serves to regulate the inlet and outlet of air to and from the chambers alternately, in the same manner substantially as the slide valve in a steam engine regulates the admission and exhaust of steam. The air is, by suitable mechanism, either forced into or sucked from the engine. Instead of the diaphragm a sliding piston may be used, the former being preferable, as it requires less friction to operate.

HOT WATER HEATER FOR GREENHOUSES.

A want of means of heating greenhouses more perfectly than the appliances hitherto at command, has been long felt. The accompanying engraving illustrates an English invention, which is stated by a cotemporary to have given excellent results in all respects, being very economical of fuel, and maintaining the heat with great uniformity, on account of the free circulation it secures. It is sectional, the sections having hollow water spaces between which the heated gases of combustion pass, as indicated by the arrows. The sections all connect through the pipes, B C, and the front and back sections are joined to the others, as indicated at E. The water flows through the upper elbowed pipe to supply the system of heating pipes, and returns to the lower part of the boiler



in the usual manner. A large amount of heating surface is thus secured in small space, a matter of much importance in city greenhouses.

[From the Boston Journal of Chemistry.]

ENCKE'S COMET.

BY PROFESSOR C. A. YOUNG, OF DARTMOUTH COLLEGE.

This comet, now in its most favorable position for observation, and faintly visible even by the naked eye in the early evening, derives its name from the distinguished astronomer who first in 1819, determined its orbit, and afterwards through his whole life expended great labor upon the investigation of its motions.

In itself a very insignificant object, it derives its interest mainly from the fact that its average distance from the sun, and of course its period also, is less than that of any other comet. It completes its course in a little less than three years and four months, at aphelion receding to a distance of nearly 380 millions of miles from the sun, a distance as great as that of the remoter asteroids, while at perihelion it approaches within 31 millions of miles, or nearer than the planet Mercury.

Another circumstance has added to its celebrity. Since its first discovery there has been noticed a gradual shortening of its periods, which according to the calculations of Encke, cannot be accounted for by any known action of the planets. He inferred, therefore, and maintained with great ability, the existence of a resisting medium filling the interplanetary spaces. This conclusion, however, is by no means acquiesced in by all astronomers, because the other comets as yet show



nothing similar, and it is thought quite possible that a new computation from the more accurate modern observations of the last five or six returns might show the presumed acceleration to be due to the disturbance of the planets, or even to a collision with some flock of such meteors as cause our November star showers. The question cannot be settled without a re-investigation of the whole matter. This would be exceedingly laborious, and thus far no one seems to have inherited Encke's paternal interest in the "little stranger."

As seen in the telescope at present, it is a rounded mass

of nebulous matter some 5′ in diameter, with no definite outline and without a distinct nucleus, although it is considerably brighter in the center. Last evening (Dec. 5) I detected for the first time a tail about half a degree in length.

The diameter of the comet is between 40,000 and 50,000 miles, and yet so transparent is it that when on December 1st at 6.04 P. M. (Hanover time), it passed centrally over a little star of the 9th magnitude, it did not in the least dim the star's brightness. For a minute or two, even with a power of 200, it looked as if it had simply acquired a nucleus. Similar observations have been often made before, and show that the substance of comets is inconceivably rare.

But the spectroscope speaks still more distinctly. It indicates that the material is gaseous, and, so far as my observation goes, gaseous only; for there is no trace of any continuous spectrum such as must result from the presence of solid or liquid dust, in a state of however fine division. The annexed diagram represents this spectrum, as observed here on December 1st, 2d, and 5th. It consists of three bright bands, the central of which is far the brightest. The wave lengths of the less refrangible edges of these bands are respectively 557·5, 517·5, and 470·4 millionths of a millimeter. The spectrum seems to correspond exactly with that of Comet II., 1868, which was investigated by Huggins and by him identified as due to carbon.

ENGLISH OBSERVATIONS OF ENCKE'S COMET.

At the meeting of the Royal Astronomical Society of England, on the 17th of November, Dr. Huggins stated that he had succeeded in obtaining the spectrum of the comet, which as in the case of that of Comet II. of 1868, consisted of three bands, apparently identical with the bands in the spectrum of the vapor of carbon. The middle band, "near b," was much brighter than the other two, and he was quite satisfied as to its identity with the middle bands of carbon vapor, but the outer bands were so faint that he could not speak confidently concerning them. It will be perceived that this report from Dr. Huggins confirms the observations made by Professor Young, though in the early part of November the comet was too faint to permit the former to determine the position of the outer bands of the spectrum.

At the meeting just mentioned, the Astronomer Royal called attention to the fact that the longer axis of the comet was directed almost exactly towards the sun, and that its head and nucleus were turned away from that luminary. This, he remarked, appears to be the rule with nearly all the class of comets. "Unlike the sheep of little Bo Peep, they carry their tails before them, and not until their smaller fan shaped appendages have been well warmed by the sun's rays do they begin to shoot out large tails in the other direction." The aspect of the comet, according to a drawing made by Mr. Carpenter of Greenwich, was that of "a somewhat shuttlecock shaped nebulous haze, with two wings of much fainter light, extending on either side, giving a flattened appearance to the head of the comet." A drawing, made by Dr. Huggins agreed quite closely with the above. He thought he had detected a minute but distinctly marked nucleus in the head of the "shuttlecock."

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of October, 1871:

During the month 794 visits of inspection were made, by which 1712 boilers were examined—1597 externally, and 516 internally—while 170 were tested by hydraulic pressure. The number of defects in all discovered were 1023, of which 110 were regarded as dangerous. These defects in detail are as follows:

Furnaces out of shape, 64—4 dangerous; fractures, 59—21 dangerous; burned plates, 36—7 dangerous; blistered plates, 146—8 dahgerous; sediment and deposit, 207—7 dangerous; incrustation and scale, 169—5 dangerous; external corrosion, 61—8 dangerous; internal grooving, 21—6 dangerous; internal grooving, 20—3 dangerous; water gages defective, 54—8 dangerous; blow out defective, 22—3 dangerous; safety valves overloaded and out of order, 41—11 dangerous; pressure gages defective, 104—6 dangerous, varying from — 15 to + 4; boilers without gages, 2; cases of deficiency of water, 4—1 dangerous; cases of broken braces and stays, 39—20 dangerous; boilers condemned, as in an unsafe condition, 20. There were 5 boiler explosions during the month, by which 3 persons were killed, and 13 badly injured. These exploded boilers were not under the care of this company.

Hardening Iron and Steel.

The inventor, John McDonald, of Kankakee, Ill., forms a compound of six substances in certain properties. The iron to be hardened—mold boards, plow points, cultivator teeth, etc.—is smoothed off by grinding in the usual manner, and then heated to a temperature a little above a cherry red color. It is then immersed in the compound and allowed to remain until nearly cooled. Then the articles are removed and plunged into cold brine—salt and water—when they are ready for use. When the mold boards or other articles of iron are treated in this manner, it is claimed, they are not liable to spring, and are thoroughly hardened, so that their durability is greatly increased. Edge tools and other articles of steel may be hardened in a similar manner, but the process must be varied according to the temper required.

Iron Window Shutters.

A correspondent, X. X. X., of Cincinnati, Ohio, writes to recommend the use of iron shutters as a preventive of the spreading of fire and the depredations of burglars. He points out, moreover, the desirability of introducing a new design, which should afford the same opportunity for an ornamental and decorative pattern, and at the same time be as difficult to burn or to open surreptitiously, as a solid cast iron shutter. He states that such a shutter might be made of bronze or any material other than iron, to conform to the architectural style of the building; and asks whether it "should slide back into cases in the wall, or how it should be arranged?" There is an opening in this direction, says X. X. X., for some one to enrich himself and benefit his fellows.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Testing Turbine Wheels.

To the Editor of the Scientific American:

Having had two of my new turbine water wheels, a 24 and a 36 inch, tested, this season, at the Lowell, Mass., testing flume, and thinking that it might be interesting to some of the many readers of your excellent paper, I offer the following statement, which is based on my own observations. The testing flume is built of wood, and is decked down about ten feet below the head of the water in the forebay. The length of the shaft in the water wheel is about seven feet, and it passes up through a box on the top of the deck, above which, on the upper end of the shaft, is attached the dynamometer. The tank, which receives the water discharged by the wheel, is about thirty feet long, fourteen feet wide and four feet deep, at the lower end of which is a weir seven feet long, the bottom immediately above the weir being two and a half feet below the breast of the weir. The edges of the weir are faced with iron bars one half inch thick, and three inches wide. The rim and two of the arms of the dynamometer are hollow, and so arranged that a half inch stream of cold water passes through them when in motion. The friction band surrounding the rim of the dynamometer is likewise hollow, and has a similar stream passing through it. On one side of this friction band there is an arm, which is connected to the scale beam by a link; on the top of the dynamometer is a dial, which is laid off in 100 equal parts. There are two hands on this dial, which are attached to arbors, so that each can be held at zero, until the word is given to start. One of these hands makes one revolution whilst the water wheel makes 100; the other makes one revolution whilst the water wheel makes 1,000. The testing of the thirty-six inch wheel commenced with the gate full drawn, and continued about an hour and a half, all things connected with the dynamometer working satisfactorily. I find, by referring to the report furnished me, that the testing was commenced by putting 600 pounds on the scales, and drawing up the friction band until the scale beam became level. After running the wheel with this weight for five minutes, the revolutions were noted, also the depth of water on the weir, the working head, etc.; after which the weight on the scales was increased, every time after running five minutes, by ten pounds, until the whole weight was 730 pounds. The best results from these tests with the thirty-six inch wheel, were when it made 140 revolutions per minute under 15·425 feet head, with 680 pounds on the scales; discharging 1,873·78 cubic feet of water per minute, and yielding 43·27 horse power. The testing of the wheel with seven eighths, three fourths and one half discharge of water was carried through in a similar way as with full discharge. Experience, I think, teaches that buyers would do well if they were to insist, on those having water wheels for sale, to have them examined and properly tested by competent parties at some public place, that they may know whether a wheel will fully answer the purpose for which it is intended; nor can I see that such a requirement would do any injustice to the builder.

York, Pa. A. F. BURNHAM.

[We most heartily approve of the suggestions of our correspondent, that water wheels be rated according to the power they develop by actual test. To rate wheels, made as they are ordinarily, by the power developed with similar sized wheels finished in the highest style possible to mechanical skill, is a trick which imposes upon buyers who have not the knowledge of the way such tests are conducted. We have before called attention to this matter, and we now again insist upon the importance of practical tests with practical wheels, not with wheels constructed specially for the purpose with highly polished bearings, such as are never offered for sale; and which, if put into actual use, would soon have their polished surfaces so roughened as to lose a considerable percentage of power. We are informed our correspondent's wheels were such as are regularly made for sale, and that they developed 79·20 per cent. of the power of the water. We should be glad to see an impartial test of various wheels such as are offered in the general market, and which would be really valuable in establishing the relative merits of different turbines.—EDS.]

It Moves.

To the Editor of the Scientific American:

The crucial experiment, proposed by Mr. J. A. Solliday (Dec. 9), to illustrate and to demonstrate the reality and universality of the psychic force, has proved with me a perfect success. I balanced a delicate slip of paper upon the point of a needle thrust through a cork, and, holding my hand as directed, the paper commenced moving round and round at the rate of 15 or 20 revolutions per minute. Turning aside to cough, it came to a dead halt and would not start again till I directed my face towards it. Presently, a malicious fly sailed past it, and set the thing whirling in a contrary direction, which shows that flies possess the psychic force as well as men,—another argument in favor of Darwinism. Soon after, feeling an irresistible inclination to sneeze (and I am a hard sneezer) the paper leaped 4 feet into the air, while the cork bounded like a shot against the window; the candle went out, and stars darted about the room like the bursting of a meteor. The experiment was getting interesting. But I thought of witches, and fearing possible consequences if I should sneeze again (as I only half sneezed before), I desisted, fully satisfied with my experiment. Mr. Solliday is undoubtedly correct in his conclusion, that any one can succeed with this experiment who has *breath*. What mysteries there are in Nature!

JONES.

[The experience of Mr. Jones has been verified by a large number of our correspondents. In our experiments, we took special care to provide against aiding psychic force by ascending currents of air, being accustomed to attempt accuracy in experiments. We are glad to learn that the majority of the readers of the SCIENTIFIC AMERICAN "can tell a hawk from a handsaw when the wind is southerly." Psychic force stock appears to be declining in the scientific market. Yet let us go slow. Some things may be done as well as others. A new sensation is wanted. EDS.]

To Prevent the Burning of Chimneys.

To the Editor of the Scientific American:

The burning out of chimneys, like house cleaning, generally occurs once a year, and, in like manner, without previous warning; and the risk of losing one's property by the burning is not less than that of losing one's papers or patience by the cleaning.

To prevent the former, (the latter cannot be prevented) take the stove handle or any convenient knocker, and rap the pipe smartly on all sides, from the elbow down to its junction with the stove. Repeat the operation as often as once a month during the winter. It will help to drive the rats out of the house, besides adding to the heating power of the pipe. After each of these pipe cleanings, the stove, of course, will need cleaning. This is readily done with an instrument shaped somewhat like a hoe, made by fastening a piece of hoop iron 4 or 5 inches long to the end of a light stick 3 feet long, by means of a couple of nails or a screw. With such an implement, the ashes and soot, deposited on the bottom and sides of the air passages of the stove, can all be drawn out, which will greatly increase the heat generating capacity of the stove. Stove pipes should be taken down once a year and thoroughly cleaned, especially the horizontal parts; the upright parts, together with the stove, can be cleaned as described. J. H. P.

The Pigeon's Flight.

To the Editor of the Scientific American:

Your European readers will be amazed at your admission of the Montclair pigeon flying *canard* into your issue of the 25th ult., which makes the absurd declaration that carriers, tossed one and two thousand miles at sea, returned; and, as if that would not sufficiently test public credulity, at an average speed of over 200 miles an hour, or double that of the most devastating tornado, in which buildings and forests are scattered like chaff!

This audacious assertion, unchallenged by you, evinces a singular credulity and misapprehension in regard to the powers of homing pigeons. As one of the antagonisms to excessive application, I have bred and flown for recreation the most celebrated types of flyers, and have in my cotes probably the largest trained flight in America of wild and spirited Antwerps, the best and boldest flyers the world has ever known. No homing pigeon, however sedulously trained, has yet returned, even over a familiarized land route of a thousand miles, nor from two hundred at sea. These birds do not return by any instinct like the migratory, or the nest building, but by the exercise of the perceptive faculties, the recognition of familiar objects and configurations of land. When birds are thrown at sea they seem bewildered, and if they cannot descry land in a brief flight, they return and cannot be forced to leave the rigging. They can only be trained by gradually increasing stages, till they get familiar with the features of the country and acquire confidence in their capacity. When these stages are too rapidly increased, the birds are lost.

Pigeon races constitute the great national pastime of Belgium, and it is believed that there are in that little kingdom 20,000 trained birds, the poorest of which would return within one or two hundred miles, and the most expert within four, five and perhaps six hundred. The longest flight (900 miles) ever attempted, was that from Rome, in 1868, when 200 long trained and skillful birds competed, all of which had been practiced to the confines of Italy. Only twenty ever returned, and the first, not till more than two weeks had elapsed from the tossing at Rome.

Their velocity of flight is greatly modified by the state of the atmosphere, the force and direction of the wind, condition of the bird, and also by its familiarity with the route.

In the record of about four hundred authenticated flights, when expert and carefully trained birds were flown over well known ground, the average velocity was less than forty miles an hour. The most rapid flight of old, tough, trained Antwerps, in finest racing condition, over routes with which they are perfectly familiar, never has exceeded sixty miles an hour. O. S. HUBBELL.

Philadelphia, Pa.

Zinc Amalgamation for Extracting Gold and Silver.

To the Editor of the Scientific American:

A recent communication in the SCIENTIFIC AMERICAN states that gold and silver can be extracted from pulverized ore, by amalgamation with melted zinc, in a greater degree than with mercury. Permit me to ask if this is a new discovery, or if it is practically used in any place on a large scale? Col

orado cannot be said to have gone so much in the beaten track, in extracting the precious metals from the ore, as the writer suggests. It has suffered much from experimenting on new processes." Still, while we receive new ideas with caution, Colorado is open to improvements, and always ready to adopt them. The communication referred to is highly plausible, and appears worthy of consideration, especially as it comes through the SCIENTIFIC AMERICAN without comment.

Any further information on the subject would perhaps tend to remove an incubus long felt, crushing one of the great interests of our country. If, by passing sulphuretted finely pulverized ore through a volume of melted zinc, the gold and silver will be retained in the zinc, without the ore being previously roasted (which last is at best but an imperfect, expensive, and skill-requiring process), the expense of reduction works would be so much reduced that it might truly be said to be a poor man's process; and, if generally adopted (which it would be, if no objection other than appears in the communication referred to above intervened), Colorado would next year add millions to her shipments of both gold and silver. EDWARD BUTLER.

Gold Run, Colorado.

Psychic Force.

To the Editor of the Scientific American:

The following is my experience in making various experiments with a slip of paper like that mentioned by Mr. Solliday, on page 372 of your last volume:

Whenever the paper is not warped, no person's hands nor the heated air from a stove or lamp will cause it to rotate. Whenever the near approach of any one's hands will make it revolve, an upward current of air from any source will also move it, and in the same direction as when influenced by the hands. Other conditions remaining unchanged, the direction of rotation depends on the direction of the warp and the velocity on the amount of warp. The warmer the hands, whether of the same or of different individuals, the more rapid the motion of the paper. Hands that will not affect it in a warm room will readily cause a rotation in an atmosphere much colder. In encircling it with both hands, it matters not the slightest whether the fingers point in the same or in opposite directions. A warm cylinder (a lamp chimney is a good article) lowered over the slip of paper will cause it to rotate precisely as do warm hands, while a chimney much colder than the surrounding air will reverse the motion. I have repeated all these experiments several times and with entirely harmonious results.

Now, as Mr. Solliday knows that heat is not the cause of this motion, and I know that it is not attributable to the man in the moon, it is perfectly plain that this wonderful (?) movement is produced by the gyrations of the spirit of Demosthenes! How is it possible for any one to think differently? J. E. SMITH.

Easton, Pa.

Mud.

To the Editor of the Scientific American:

Mud is generally thought to be an unmitigated nuisance, without one redeeming quality; but it forms a much safer alighting place for a gentleman and lady thrown from a runaway carriage than either frozen hubs or jagged boulders. Mud when dried is very hard, and in some respects resembles lime mortar.

A year ago, wishing to make my stone pig pen warmer, I collected a quantity of mud from the road; and, with a mason's trowel, applied it to the walls. The mud plaster soon froze, and remained without change till spring. The spring thaws and rains caused the surface of the plastering to scale off; but the mud in the interstices, between the stones and beyond the reach of storms, still remains and the wall is nearly as tight as when it was first plastered. Wishing to experiment still further with road mud, in October last I plastered two sides of my cellar wall with the same material. The mud plaster, on the side covered by a wing, is now entirely dry and very hard. There are a few small surface cracks, but no air appears to circulate through them. That on the side exposed to the drippings from the eaves is still moist but firm; and in rain storms, water trickles through in places, but the mud shows no signs of clearing off. What effect freezing and thawing may have upon it, I cannot tell; but thus far mud has proved itself to be a tolerable substitute for lime mortar, and it has the double advantage of being easily obtained after a rain in any quantity, without money and without price. J. H. P.

A Remedy for Cancer.

To the Editor of the Scientific American:

I wish to speak, through your widely circulated medium, to the many suffering with cancer. In 1863, a cancer came on my left hand; after much suffering, all remedies having failed, I had it burned with caustics. In 1864, it came in my right arm, this being more troublesome than the other. I nearly suffered death again with caustics. Next it came in my right hand. In the spring of 1871, the hand, growing very bad, became helpless, and I carried it in a sling. All remedies and caustics failed; I feared that my hand must be taken off. Hearing of several cancers cured by drinking wild tea and poulticing with the grounds, I used wild tea in earnest. In four weeks my hand was entirely well. For the sake of many suffering with cancer, I give these facts. Wild tea grows in most of the States, and can be had for gathering. This remedy should have a widespread publicity.

Alleghany City, Pa. J. B. WILLIAMS, Health Officer.

Incidents in Engineering.

To the Editor of the Scientific American:

On page 325, current volume, is an article headed "Incidents in Engineering" by F. West, who would like to see it commented on.

I have had a considerable experience with steam, having designed, built, and run several styles of engines and boilers. When experimenting, I have several times evaporated every particle of water out of a boiler without any injurious effects, except perhaps to make the boiler leak a little. In case of F. West's boiler, the flaw where the water leaked out must have been very much weaker than the parts immediately joining it. The pressure it received being a little more than usual, it quietly tore open the weak spot to the sounder portions in the boiler, causing no other damage. Of the boiler explosions throughout the country, one half the verdicts rendered assign the cause to low water. But simply low water will not cause explosion. The following incident will confirm this statement. An engineer of my acquaintance, who runs a propeller engine, was at one time on Lake Michigan in sight of Milwaukee when the pumps stopped working. It being very rough weather, it was considered dangerous to stop the engine. The captain became much excited and thought the boat would be lost. The engineer told the captain that he would run the engine as far as Milwaukee without any additional water, if he would be responsible for the boiler. "Go ahead," says the captain, "I don't care a fig for the boiler, if we can get the boat and crew safe into port." The pumps were shut off, so that, if they got to working, no water could possibly enter the boiler. They arrived safely in port with a boiler one third full of water; the upper flues were red hot and considerably sprung, but the furnace doors were closed tight, all air drafts being stopped with ashes. The fire on the grate was allowed to die out and the boiler gradually cooled off. Strange as it may appear, the flues became straight again, and no perceptible injury to the boiler was afterwards discovered.

Cleveland, O. E. NICHOLSON.

Facing Oil Stones.

To the Editor of the Scientific American:

I have in the course of my life spent a good deal of time in facing off my oil stones. I have used sand on a board, wet and dry, or an old millstone, or a hard brick. If the oil stone was soft, it could be cut or rubbed down in a short time; but if a hard one, it was a serious job. The thought struck me about two years ago that emery would be the thing to quickly cut a hard stone which I have. I dressed off a white pine board, put a thin coat of glue on it, when dry put on and another, sprinkled coarse emery on the glue, rubbed it in well, and when dry put on another coat of glue and emery. I have been using it ever since; it does not take one tenth of the time to face off that stone than it formerly did with sand, etc. This may save somo one some hard rubbing.

Camden, N. J. R. J. MCCREIGHT.

To Smoke or not to Smoke.

To the Editor of the Scientific American:

I wonder if V. B. thinks himself competent to advise people upon the important subject of tobacco using. About as much so, probably, as in relation to drinking; and his competency, in this direction, may be measured as accurately as with a carpenter's rule, by his declaration that "potatoes, cereals, and, in fact, nearly all vegetables, contain alcohol." That is enough for a man who sets himself up as a teacher.

N. D.

Screw Threads.

To the Editor of the Scientific American:

It may be interesting to your readers who are machinists, to note the fact that all simple lead lathes with United States standard lead screws will cut threads to the pitch of one millimeter, by using, upon the lead screw a, wheel of 127 teeth, and upon the spindle, a pinion having 5 times as many teeth as there are threads to the inch in the lead screw.

Where the lead is compound, multiply also by the ratio in which it is compounded; for instance, if the lead screw has 6 threads to the inch, and the lathe makes 3 revolutions to 2 revolutions of the pinion spindle, then $6\times5\times\frac{3}{2}=45$ number of teeth in pinion, the constant number for the wheel teeth being 127.

Binghamton. JOSEPH P. NOYES.

The Evaporative Power of Steam Boilers.

To the Editor of the Scientific American:

May I remind your readers that the boiler test, used by the Committee of Judges on the steam engines and boilers in the American Institute Fair, is substantially the same as the one proposed in your journal, page 313 of Volume XXIV? Your article of Dec. 2, makes no allusion to the fact that the system adopted is nothing but the steam hygrometer of Mr. Leicester Allen, on an enlarged scale; and it is strange that the judges have not given the inventor the credit.

D. B.

New York City.

To Fly or not to Fly.

To the Editor of the Scientific American:

As to your flying machine man, I wonder if he knows that birds support the entire weight of their bodies in the air, by the power of their pectoral muscles acting upon their wings. They fly in the air as men swim in the water, except that men are supported by the water, and their pectoral muscles are only used as propellers. For a man to be able to fly, the first requisite is to be able to support the entire weight of the body by the extended arms. The experiment can easily be tried. Let him make parallel bars, such as are used in the gymnasium, so far apart that, in standing between them, each will come under the elbow, with extended arms. Now take away all other support, and if he can sustain the weight of the body in that position, for an indefinite time, perhaps he may have strength enough to sustain his body on wings;—if not, *not!* N. D.

[For the Scientific American.]

LATENT HEAT OF VAPORS AND GASES.

BY P. H. VANDER WEYDE.

The change, in the physical condition, which a substance undergoes by heat, is much greater when a liquid is converted into a vapor or gas (is evaporated), than when a solid is converted into a liquid, or melted. In the latter case, there is scarcely any change in density or volume, while in the former case this change is enormous; the density is reduced, and the volume accordingly increased, many hundred times. It may, therefore, be expected that the amount of latent heat required to produce this greater change, from a liquid into a gas, will surpass many times that sufficient to produce the lesser change, namely, from the solid into a liquid; and this is indeed always found to be the case.

Ice, when changed by heat into water, does contract slightly, namely, one eleventh part of its bulk; while the water, when changed by heat into steam, expands 1700 times. At the same time, it will absorb as much as 962 units of heat; that means, that when one pound of water, boiling under the common atmospheric pressure—that is, heated to 212°—is, by the addition of more heat, changed into one pound of steam of the same pressure, it will absorb, or make latent, as much heat as would suffice to heat 962 lbs. of water one degree, or 96·2 lbs. water 10 degrees, or 9·62 lbs. water 100 degrees; but we cannot well say 0·962 lbs., 1,000 degrees, as this is practically impossible. There is an absurd statement in some text books on chemistry, which still persist in calling the latent heat of steam 962°, or, in round numbers, approximately 1,000° Fahr., in place of units of heat. As, unfortunately, many text books are only products of compilation by persons neither possessing the latest information nor competent for their labor, this incorrect or rather erroneous expression is kept up, even by many teachers, causing misconception and confusion in the mind of the students.

One of the methods of finding the latent heat of gases, or heat of evaporation, is similar to that, explained on page 405 of the last volume, for finding the latent heat of liquids, or heat of fusion. If, for instance, we take a vessel containing one pound of ice cold water, and place it over a constant source of heat, which, for instance, will raise the temperature of this water 10 degrees every minute, then in 10 minutes we will have $32+(10\times10)$, or 132°; and in 18 minutes, $32+(10\times18)$, or 212°, when the water will commence to boil. Suppose, now, we keep this boiling up till all the water is boiled away, that is, converted into vapor; then we must conclude, as our constant source of heat supplied every minute 10 units, that $\frac{1}{10}$ minute, or 6 seconds, will be a fair approximate measure for one unit of heat; if, then, it takes 1 hour and 36 minutes, or 96 minutes, for the water to boil all away, we must conclude that 10×96, or 960 units of heat, have been consumed in this operation.

A second method of investigating this subject is exactly the reverse of the above method. A certain quantity of water, say 1 lb., or 27 cubic inches, is being converted into 1 lb., or 27 cubic feet of steam: this is, approximately, a correct supposition, as every cubic inch of water produces nearly one cubic foot of steam at 212°. This steam, when escaping from a proper orifice, may be conducted into cold water, and be condensed in the same, giving, during this condensation, its latent heat to the water. Suppose we use 10 lbs. water of 60°, and by blowing into it all the steam produced from one lb. water, and thus condensing the same, taking proper precautions against loss of heat, we shall find that we have 11 lb. of water of 156°; the 10 lb. water has thus, by the condensation of the steam, obtained a rise in temperature of 96°, which is equal to 10×96, or 960 units; this was heat, as it were, hidden in the steam, and only coming out during its condensation.

It is clear that, in this method, it is necessary to take in account the amount of heat absorbed by the metals, or other material of which the apparatus is made; which may be easily done by finding their weight, and applying the knowledge of the specific heat of the same (see page 372, last volume), so as to obtain the necessary corrections.

By means of an apparatus, arranged on the principles just explained, Brix determined the latent heat of water, alcohol, ether, and oil of turpentine; and I did the same of ammonia, carbonic acid, and chymogene or petroleum ether, used by me for the artificial production of ice. I give here a table containing the same, and also the boiling point and specific gravity of these bodies, as well in the liquid as in the gaseous condition.

TABLE OF LATENT HEAT, ETC., OF VAPORS.

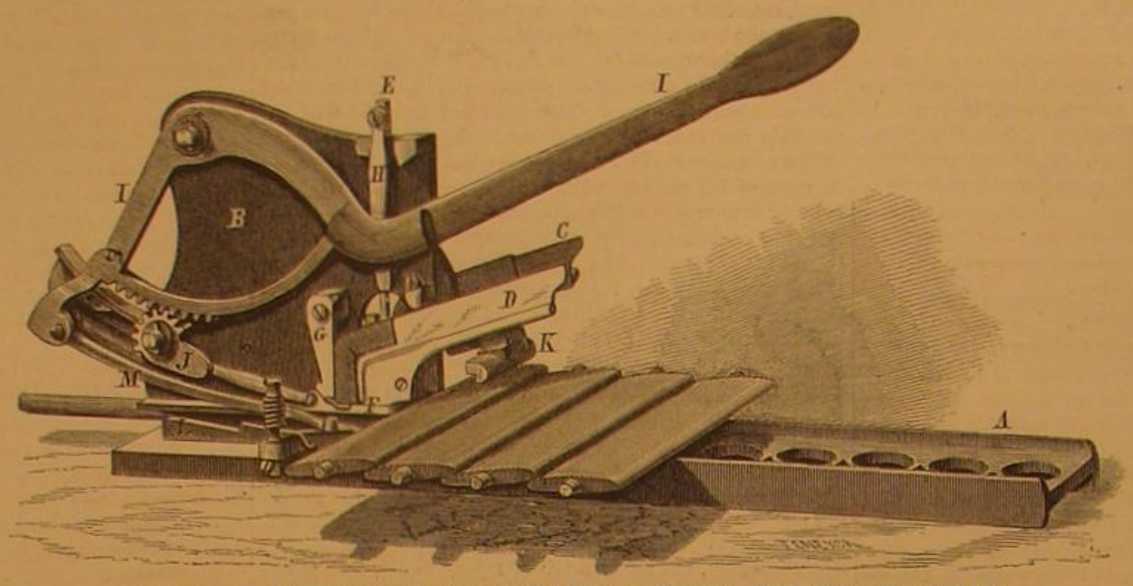
Name.	Units of latent heat of vapor.	Spec. grav. of vapor. (Air=1.)	Spec. grav. of liquid. (Water=1.)	Boiling point of liquid.
Water	962	0·45	1·00	212° Fah.
Alcohol	385	1·25	0.80	176° "
Ether	162	2·26	0·71	95° "
Oil of Turpentine.	133	3·21	0·00	311° "
Bisulphide of Carbon	210	2·60	1·27	112° "
Ammonia	900	0·59	0·76	— 30° "
Carbonic Acid	300	1·53	0·80	—112° "
Chymogene	170	4·00	0·60	+ 28° "

FATHER SECCHI intends experimenting in the Mont Cenis Tunnel, to ascertain if any variations in the magnetic influences and in gravitation occur.

Blind Wiring Machine.

This is an ingenious and valuable improvement in blind wiring machines, whereby the staples are inserted both in the slats and the rod at the same time and in a single operation. The machine thus does the work hitherto requiring two machines for its performance. Its simplicity is a marked feature of the invention, and we have no doubt it will come largely into use by blind manufacturers.

The bed plate, A, sustains a vertical plate, B, which carries the working parts of the apparatus. The staples are carried on the rails or staple holders, C and D. The staple holder, C, is on the back side of the plate, but turns and passes through an aperture to bring its staples successively under the vertical punch, E. The rail, D, delivers its staples, one by one, to the punch, F, the cut-off, G, operated by the punch, F, causing them to descend properly. A similar cut-off, not shown, is operated by the vertical punch, E, which moves in guides on the plate, B, and is actuated by a connecting link, H, pivoted to it and the lever, I. The punch, F, is actuated by a connecting rod pivoted to it and the arm of the armed segment, J, the latter being impelled by the toothed arc on the lever.



NELSON & WHITMAN'S COMBINATION BLIND WIRING MACHINE.

The end of the vertical punch, E, is forked so that it straddles, and causes the staple it impels to straddle the staple inserted in the slat.

Suitable devices control the movement of the slats and the rod, and hold them properly. Some of these devices are not distinctly shown in the engraving, a portion of the machine being hidden from view by the vertical plate, B. One of these is a lever attachment which forces down the clamp, K, to hold the slat while the punch, F, is forcing in its staple.

The rod is hooked to the notched feed bar, L. The feed bar, L, is caused to traverse intermittently by the action of the pawl, M, which engages the notches and is pivoted to the lever, I, suitable devices being employed to cause the feed bar and rod to travel in a right line.

We have thus given the general features of a very compact, strong, and effective machine for the purpose intended, in which everything is practical and easily manipulated and adjusted.

The invention was patented through the Scientific American Patent Agency, Oct. 31, 1871, by James H. Nelson, who may be addressed, for further information, Little Falls, N. Y.

Knife Sharpening Machine.

This machine is admirably adapted to sharpening long straight knives with chisel edges, for whatever purpose such knives may be used. The grinding is done without heating or drawing the temper, and a perfectly true bevel and straight edge secured. The machine requires very little attention, is automatic in its action, and supplies a long felt want.

Fig. 1 is a perspective view, and Fig. 2 a side elevation.

A post, A, rises from a suitable pedestal. From the top of the post extends a bracket which supports the carriage, or slide-ways, B. C is the carriage. The carriage carries the knife plate, D. This plate is pivoted at the ends to supports rising from the carriage. The supports, E, are movable to and from the grinding wheel by adjusting screws, F. The knife is attached to the knife plate, D, by bolts, as shown in Fig. 1. The proper bevel is secured by shifting the knife plate on its pivoted bearings, the lever, G, being used to move and support the plate in position, the lever itself being held, by the thumb nut and set nut, at H. The pulley, I, Fig. 1, on the shaft of the grinding wheel, transmits power through a belt to reversible feed gear, which causes the carriage to traverse from end to end, and carries the knife edge in a straight line as it is applied to the wheel.

The principle of the feed gear is the same as that used on metal planers, pins on the carriage actuating a belt shifter, J, which controls the feed belt and the gearing impelled by it.

The grinding wheel is of emery and may be of any kind in market. The ones used are, however, those made by the Union Stone Company, of Boston. The simplicity of the machine and the accuracy of its performance must, we think, secure for it an extended sale.

Patent pending through the Scientific American Patent Agency. Address, for further information, Union Stone Company, 29 Kilby street, Boston, Mass.

Fig. 1

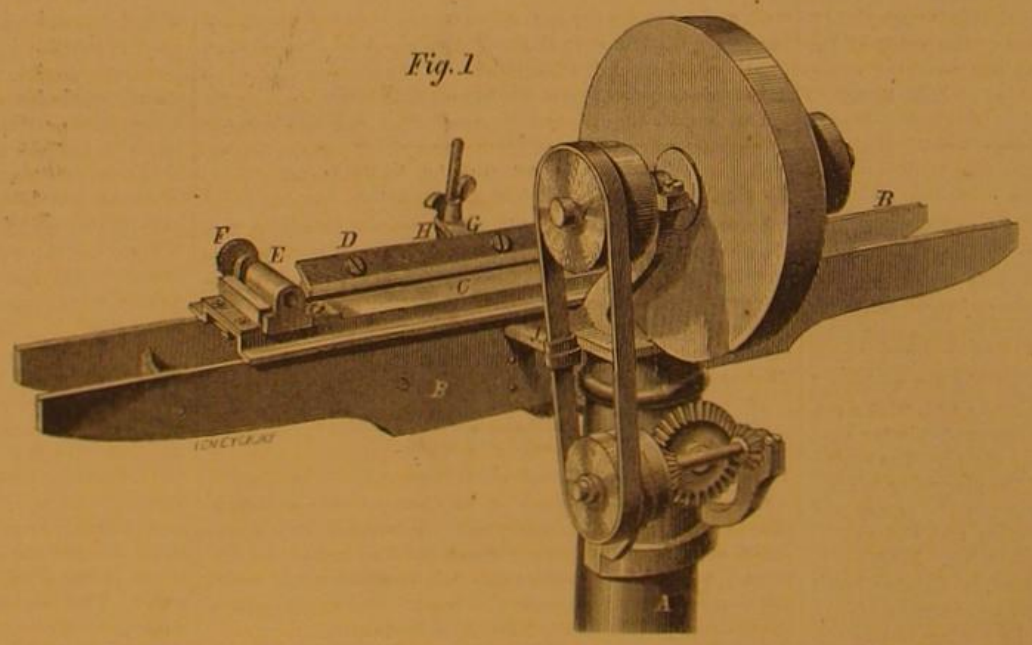
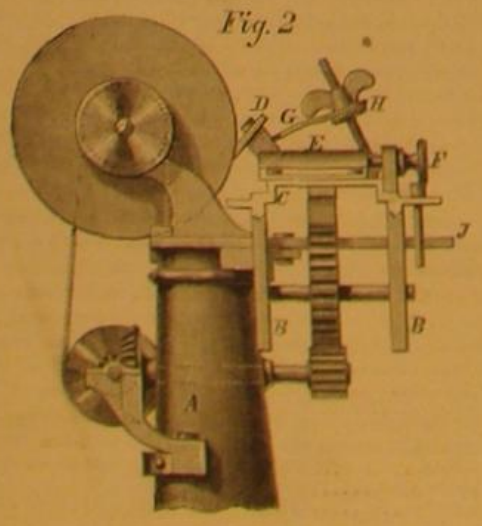


Fig. 2



HILL & PROCTOR'S MACHINE FOR SHARPENING KNIVES OF PLANERS, TOBACCO CUTTERS, PAPER CUTTING MACHINES, Etc.

Life Detector for Coffins.

This invention is an improvement in means for detecting the recurrence of life in persons that have been buried in a state of trance or apparent death; and relates particularly to that class of appliances whose main feature is a tube leading down into the ground. Heretofore such tubes have had signal attachments, in the form of bells or analogous devices, arranged to be operated by a cord extending down into the coffin. In this invention the tube is so shaped or curved at its upper end, and the lid so applied, as to allow it to open by its own gravity when released from engagement with a spring catch placed within the tube. Thus the lid will be instantaneously opened without any exertion or movement, on the part of the person buried, other than the slight one required to operate the delicate catch by aid of a cord or electrical appliances, giving instant admission of air, at the moment of recurrence of symptoms of life, and reducing the physical exertion requisite to effect it to a minimum.

The lid of the tube is not only adapted to open, as it were, automatically, but to constitute or display a signal, so as to give timely warning of the need of assistance. By this invention, it is thought, the timely exhumation of the unfortunate person alluded to will be effected, much misery avoided, and precious lives restored to useful activity. The connecting apparatus, with the lid, may vary in its construction. It may be mechanical or electrical, and in either case admits of numerous modifications. The inventors consider the use of the lid, closed as long as life is not detected but opened as quick as life appears, of great importance. It prevents the escape of noxious gases from actual corpses, and the consequent deterioration of the outer atmosphere, but causes a supply of wholesome fresh air to reach the person entombed when waking to life, and at the same time produces the signal, as stated.

Should the lid remain closed for three or more days after burial the tube is withdrawn and the aperature closed with earth. The invention has been patented by Dr. Theodore A Schroeder and Herman Wuest, of Hoboken, N. J.

Holmes' Electric Indicator for Elevators.

This invention is a combination, of an elevator in hotels and other buildings, with stationary electrical apparatus, to cause the production of visible and audible signals within the elevator by electrical impulses given by the closing of circuits on the several floors. The persons controlling the elevator can thus be informed on which floor the elevator may be wanted.

The invention consists in combining the movable elevator, which contains a suitable indicating instrument, with a flexible or movable series of conductors leading to the several floors, and thence to the operating battery. As the elevator moves up or down, the flexible or movable conductors retain the metallic connection between the parts of the indicator and the stationary conductors that extend from the battery.

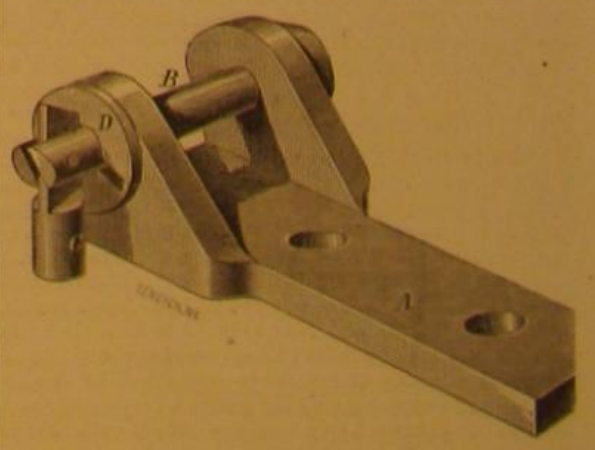
Mr. Edwin Holmes, manufacturer of the celebrated Holmes' Burglar Alarm Telegraph for protecting houses from burglars, office No. 7, Murray street, New York, is the inventor and patentee of this improvement.

BRIDGMAN'S THILL COUPLING.

Our engraving illustrates a very simple method of locking the pins of thill couplings, patented through the Scientific American Patent Agency, September 26, 1871, by Mr. C. Bridgman, of St. Cloud, Minn.

A, in the engraving, represents the coupling iron, through the ears of which passes in the usual manner the coupling pin or bolt, B. Instead of being held by a nut, as in the old style of coupling, the pin is slotted in the end, and to it is fitted and pivoted the piece, C, forming a rule joint as shown, which can be straightened, when the pin is turned, so that the tenon of the piece, C, can enter a slot in the ear of the coupling iron. In ordinary use the weight of the piece, C, prevents its ever assuming the proper position for unlocking which can only be done by intentionally turning the piece till its tenon corresponds with the slot. When this is done, the piece, C, is at once straightened into line with the shaft of the coupling pin, and the whole is then thrust out, thus obviating the use of a wrench, and enabling the coupling or uncoupling to be performed in a mere fraction of the time necessary for the same operation with the old style of coupling.

A slotted washer, D, may be used if desired, between the piece, C, and the ear of the coupling iron. The device is cheap, simple, secure and extremely convenient. It is one of a numerous class of improvements in carriage construction which have been made during the past year, and which demonstrate that, even in the oldest appliances, modern inventive genius finds scope for its labors.



Further information may be obtained by addressing the patentee.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING) NEW YORK.

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

☞"The American News Co.," Agents, 121 Nassau street, New York.

☞"The New York News Co.," 8 Spruce street, New York.

☞A. Asher & Co., 20 Unter den Linden, Berlin, Prussia, are Agents for the German States.

VOL. XXVI., No. 1. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, JANUARY 1, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

A New Styptic	2	Latent Heat of Vapors and Gases	5
Answers to Correspondents	9	Life Detector for Coffins	6
Applications for the Extension of Patents	12	Meteorology, its Capabilities and its Future	7
A Remedy for Cancer	5	Motors for Tremolos of Musical Instruments	3
Artificial Stone and Fireproof Buildings	1	Mud	5
*Blind Wiring Machine	6	Official List of Patents	12
*Bridgman's Thill Coupling	6	Precious Metals in the United States	2
Business and Personal	9	*Professor Louis Agassiz	1
Chloral Hydrate	2	Psychic Force	5
Chloral in Toothache	2	Queries	9
Creuse s Stable and Tasteless Iodide of Iron	3	Recent American and Foreign Patents	10
Declined	10	Science Record for 1872	2
*Eccentric Spring Vise	2	Scientific Intelligence	8
Education of the Ear	1	*Sheppard's Cotton Tie	2
*Encke's Comet	3	Screw Threads	5
Facing Oil Stones	5	Testing Turbine Wheels	4
*Goux's Improvement in Earth Closets	3	The Evaporative Power of Steam Boilers	5
Hardening Iron and Steel	4	The Hartford Steam Boiler Inspection and Insurance Company	4
Holmes' Electric Indicator for Elevators	6	The Last Six Months of Chemistry	8
*Hot Water Heater for Greenhouses	3	The Pigeon's Flight	4
Incidents in Engineering	5	To Fly or not to Fly	5
Inventions Patented in England by Americans	12	To Prevent the Burning of Chimneys	4
Iron Window Shutters	4	To Smoke or not to Smoke	5
It Moves	4	Zinc Amalgamation for Extracting Gold and Silver	4
*Knife Sharpening Machine	6		

ARTIFICIAL STONE AND FIREPROOF BUILDINGS.

We have hitherto neglected no opportunity of informing our readers of the modes of manufacture, materials, and uses of the various artificial stones now in use. The Ransome patent, the Victoria stone, the Sorel process, the *Béton-Coignet*, and others, are now all before the world; and have, with more or less success, stood the tests and investigations of practical men and experts. But the two crucial experiments, to which these materials must be subjected before they can be considered to have earned the popularity they claim, are time and fire; and we must wait patiently for the result of the effects of the first of these. Unhappily the test of fire is likely to be soon applied, to one or other of the new materials, in any city where it has been introduced. We have not yet heard of any of these substances being used in Chicago, and cannot therefore find any record of the behavior of artificial stone under the fierce heat which has lately done such appalling destruction to buildings of iron and natural stone, to say nothing of materials without any reputation for permanence and durability. But we read, in our London exchanges, of the burning of a large manufactory in that city; and this conflagration gives us some valuable information on the resisting power of certain concretes to fire, an experience which we believe is new to the American public.

Such of our readers as are acquainted with the vexed question of houses for working men in the large cities in Europe will be familiar with the houses built in London, by Baroness Burdett Coutts, by the trustees under the will of the late Mr. George Peabody, and by a public joint stock company. There are many points of similarity in these buildings, but the particular characteristic which calls for our notice is the courageous and original spirit with which the most recent improvements in construction and material are used. Of the last named owners, the large houses are finished with dressings of artificial stone, made according to a discovery by Mr. Matthew Allen, a London builder. We have had an opportunity of inspecting sills and steps made of this material, and can give testimony as to its durability under great friction and heavy traffic. But it has recently been tried in a fire, and has not been found wanting.

In the construction of the factory before alluded to, which has been destroyed, Mr. Allen's concrete was used for many of the purposes for which natural stone is usually employed, and was, in this building, placed side by side with the best building stones in use in London; an excellent comparison was thus afforded to the builder, the proprietor, and the public. In almost every case, says a contemporary, where the fire reached the natural stone, the latter shivered and split to pieces, or altogether gave way. "In every instance where the artificial stone has been subjected to the ordeal it remains intact, and with its outline as sharp as on the day it was fixed in its place. In the windows of the building, the dressings were of the artificial material, and on them were bedded sills of natural stone. The latter is in fragments, the former unbroken, and in most cases uninjured in the slightest degree. It is, indeed, the only material used in the construction of the building that has stood the fire. Even the brick walls are rent and shattered, and girders and stays, where unprotected, are distorted or fractured." The inventor states that the resistance of his concrete to fire surpassed his own good opinion of it, and he intends to use it much more largely than heretofore. He announces a new method of building which deserves trial in this country. He looks to iron for strength in construction, but proposes to clothe it with this fire resisting stone, to use his own words, "as the bones on which the human body depends for strength are clothed and protected by the flesh and muscles." A brick building in which no lath and plaster partitions were used, with floors and stairs of this artificial stone, and with every girder and stay surrounded with the same material, would be, he says, as nearly as possible absolutely fireproof.

While rival claimants for popular favor are doing their best to introduce their materials to the notice of owners and builders, there is little doubt but that the people most interested will be well informed as to the claims of each compound; but the one which induced the writing of this article is anybody's property, and every builder may make it and try it for himself. The hardness and impenetrability of Mr. Allen's concrete is due to the admixture of "breeze" (coke dust or fine ashes) in its composition, good Portland cement being the chief constituent. One part of the former mixed with five or six of the latter will provide any one with a specimen, and the effect of friction and wear on it can be easily observed. Its cost in London is about one fourth that of cut stone, and from the difference in the value of labor for working the natural product, the saving by the use of Mr. Allen's concrete will be in this country proportionately larger; so that the inducement of a considerable economy will be added to those of accessible material and ease and simplicity of working.

EDUCATION OF THE EAR.

Standing in the weaving room of any of our large cotton mills, a stranger is often surprised to see the attention of an operative at some distance suddenly attracted to the "boss." The deafening rattle of the machinery precludes the possibility of communication by speech. The loudest shout would add so little to the general din as to be wholly inappreciable at a little distance. Some mysterious signal, however, has passed. No gesture has been made, no message has been sent; yet suddenly a lad in some part of the room starts and turns with expectant look for some further sign from his superior. The "boss" is asked for an explanation, and the inquirer learns the following lesson in acoustics.

Only by making a sound radically different from any of the hummings, batterings and clashings which combined make up the confused and scarcely varying din of the room, can the ear be impressed with the sense of a new sound; and if the sound thus made, even if not very loud, does so differ from the prevailing clang, it requires but little effort on the part of the listener to hear it, if he has once heard and recognized it. So when the overseer of a weaving room forces his breath between his teeth with a sharp hiss, this hiss may be heard yards away, distinctly over the din of the machinery, this being a method commonly employed to attract the attention of any one in the room.

Perhaps the reader has at some time visited the Board Room of the New York Stock Exchange at a time when business was lively. He found there a modern Babel. A hundred men shouting at the top of their lungs, each vociferating something different from any other, begets a scene of apparent confusion which, to the uninitiated, seems the last place where any serious business can be transacted. Yet a member of the Board has told us he could go into the room, and, with his eyes shut, could distinguish the bid of any man in it with whose voice he was acquainted. Notwithstanding the apparent difficulty of following with accuracy the multifarious transactions in this room, a record is kept, and very few mistakes occur.

The ear early learns to follow and unravel the intricacies of sound in common speech; no easy matter, as it found by those who attempt to learn a new language.

The sound of machines is often the best guide by which to judge of the accuracy of their performance. An experienced clock maker will tell at once whether the works of a clock are properly leveled by the beat of the pendulum. The carpenter tapping lightly with his hammer upon a plastered wall, determines easily where are the underlying timbers. A practical woodman can tell, by striking a tree with his ax, whether the timber is sound, shaky, or hollow. Huntsmen also become skilled in detecting various sounds by which they trace their game. Old fishermen, seeking to beguile some wily trout by a more tempting bait than the one he has rejected, place their ears upon the side of a decaying log. If a wood grub be present, they soon detect the sound of his teeth as he works his way through the wood. A few blows of a hatchet reveals the success of their auscultation. The rat-tat-tat of the telegraphic instrument speaks as plainly as a human tongue to the experienced telegraph operator. But we forbear to multiply instances in which the ear is educated to other than ordinary uses.

How far this education might be carried, and what useful purposes, at present unknown, might be subserved by it, it is impossible to say. At present, all the systematic education of the ear is confined to perfecting its accuracy in distinguishing musical sounds and intervals. Once in a while there is found an ear with sensibility so refined as to be able to determine and distinguish any isolated sound of the diatonic or chromatic scales. "Blind Tom," the negro pianist, possesses this faculty, and it is said Jenny Lind could do the same thing. Our own opinion is that almost any fine musical ear can be educated to this degree of refinement. There seems no natural reason why absolute pitch of sounds should not be discriminated as well as quality, if the proper training were employed to produce such a result.

In conclusion, we will remark that few are conscious how far the ear aids in the accomplishment of many nice operations, usually regarded as strictly manual. As with the eye, we are so accustomed to its constant employment, that we become unconscious of any effort in its use, or of the true importance of the sense of hearing compared to the other senses.

METEOROLOGY, ITS CAPABILITIES AND ITS FUTURE.

Of all the sciences now engrossing public attention, and lending aid to the benefit of mankind, there is none deserving of more minute study than that of meteorology. It is a late birth into the world of knowledge; it is within the memory of persons now living that its phenomena have been demonstrated to be reducible to a system. And our fathers could not, had they wished, and had they possessed the requisite information, have utilized their discoveries and observations. The comparison of facts and data in different and far apart localities is the means by which the value of the science is chiefly known to the world, and it is by the electric telegraph alone that such statistics can be collected. Indeed, we shall probably find that, of the many invaluable benefits that electric communication has conferred upon us the establishment of the science of meteorology, on a firm and intelligible basis, will be not the least valuable and the least important. The diffusion of such knowledge affects the condition of agriculture all over the world, and so long as our national prosperity consists largely in agricultural wealth, the people of the United States must be considered to be vitally interested in the establishment and success of a proper system of meteorological observation.

While it must be admitted that the results of such investigations as have hitherto been made, have already been of great practical use to the world, the principles of the science can scarcely as yet be considered settled, and the ideas of most persons on the subject are still very vague. In inquiring into the history of this branch of knowledge, we find that the earliest mention of the study is found in the history of the Egyptians, who regarded it as part of astronomy. Aristotle was the first writer to gather the scattered ideas and traditions, preserved to his time only by the hieroglyphics of the more ancient race, into a book; and his friend and disciple Theophrastus did much to promulgate the scanty information then obtained. The writings of the latter dealt only with the popular ideas of the changes of the weather, and made no attempt to account for facts so exceedingly multiform and capricious. And perhaps, even in our day, it is not possible to form a complete concrete and codified set of laws of a science which deals with elements so vast, various, and mobile as air and water, to which qualities the infinity and complexity of the phenomena must mainly be attributed.

Of the almost inconceivable distance of some of the influences which affect the temperature of the atmosphere and seas, and thus create or regulate winds, ocean currents, evaporation, and rain, we may form some idea by reflecting on a few astronomical facts. It is certain that if a line be extended through space in any direction, it will sooner or later come in contact with a stellar body, radiating both light and heat; and thus every point in the universe must be constantly influenced by innumerable heat rays, modifying more or less its temperature. There is no star so remote from us as not to alter the condition of the atmosphere of the world we live on; for the diminution of heat by distance is a question of degree, and the vanishing point of the heat is situated only at the infinity of distance. And although it may seem, to many minds, trifling to talk of the heat communicated to our planet by stars scarcely within the field of vision of the most powerful telescope, it must be remembered that, while the distances of these bodies are almost incalculable and their heat radiation can only be an imaginable quantity, their number is equally inconceivable; and if a lifetime would not suffice to calculate the proportion of heat received by us from the more distant stars, it is equally impossible to ascertain their numbers; and thus the aggregate heat of all space is increased by bodies at once inconceivably numerous and remote. The researches of Pouillet served to show that the normal temperature of the earth's surface, leaving the heat of the sun and the stars and the internal fires of the earth out of the question, is 254 degrees below the freezing point of water. The heat given us by all the stellar influences was found, by the same eminent physicist, to be 94 degrees; leaving, at a temperature of 32 degrees, 160 degrees attributable to the sun and earth itself.

Another complication of the question of heat, which is the prime creator and motor of clouds, rains, winds and currents is the inclination of the actual axis of the earth to the direction of its revolution. By this the two poles are alternately directed towards and away from the sun, thus making summer and winter, and all the changes of season; and it is also by this that the slightly higher average temperature of the northern hemisphere, and the consequent excess of ice in the regions of the south pole, are caused. But it has been calculated, we believe by Sir John Herschel, that the ellipsis of the earth's orbit is gradually changing its situation, and that a period of about five thousand years will suffice to reverse this order; and that then the nations of the southern hemisphere will enjoy the more genial climates, and the arctic circle will be as difficult of access as the antarctic now is. Of radiation by atmospheric influences, and other causes which affect the earth's heat, and, by it, the ever varying appearance of earth and sky, there is no need to speak, enough having been said to show how various and complex are the powers which create the aerial changes, the chronicling, cataloguing and describing of which is the peculiar province of meteorology, a field as yet little trodden by the foot of the investigator. It invites earnest and capable laborers at once to enter into the harvest, for there is at present demanding public attention no science which promises so ample a reward to students, and such valuable results to society as this of the phenomena of earth, sky, and sea, and their effect on the products of the soil, scattered everywhere over our planet by the Infinite Wisdom and Goodness.

THE LAST SIX MONTHS OF CHEMISTRY.

The attentive reader of the SCIENTIFIC AMERICAN has had an opportunity of acquiring a knowledge of the most important chemical discoveries and inventions of the last half year; and, although nothing startling has crossed his path, he cannot fail to have discerned that the same restless activity has obtained in this department of science as in all others. Unquestionably great progress has been made; and the condition of mankind is ameliorated, and the severity of toil softened, as a result of all this exertion. It may be well to recapitulate a few of the most important researches of the last half of the year that has just closed upon us. Take first, for example, the department of photography. The number of improvements in this art have been great and important.

One of the most startling was the proposed deposition of metal, directly upon the thin gelatin film obtained in the Woodburytype, and of using it at once as an electrotype. If this proposition is carried out, it will simply be necessary to take a photograph in the usual way, to print with chromatized gelatin, and to convert the print into an electrotype for immediate use. Improvements have been noticed in developers, in artificial illumination for night work, in dry processes, in the use of cryolite glass as a substitute for porous porcelain, in printing paper, in retouching, in the chemicals employed, and, in fact, in all branches of the photographic art.

The proposition to make chlorine directly from hydrochloric acid in the soda ash manufactories, which was started a year ago, has been thoroughly tested within a few months. The hydrochloric acid is taken at once from the condensing towers, is passed over the floor of a reverberatory furnace, where it is decomposed through the agency of copper salts, which, it is said, can be regenerated, and used any number of times. This process dispenses with the use of manganese, and must greatly reduce the cost of bleaching powders, the economical production of which depends upon cheap chlorine. Parallel with the direct use of hydrochloric acid, has been matured the plan of regenerating the manganese salts of the chlorine process, so as to use them an indefinite number of times; between the two improvements, we are likely to have our paper stock and cotton goods bleached at a much lower rate than formerly.

The economical preparation of oxygen, from the atmosphere by its absorption in water, according to Mallet's invention, is one of the latest chemical contributions; but is even yet so new as to require further experiment before full confidence can be reposed in its economy. In the meantime, the uses of oxygen have been extending, and there is greater need than ever of some cheap method of its manufacture. Nickel plating, we have spoken *of* at length; it has surmounted the state of skepticism and mistrust, and become a truly valuable contribution to the arts. We wish we could say the same of manganese and aluminum, but we are not in possession of accurate information in reference to the electro-deposition of these metals. The employment of manganese and aluminum in alloys has, however, made considerable progress. The artificial production of alizarine, one of the madder colors, which was announced as having been accomplished, was received with considerable doubt; but, during the past six months, several manufacturers have succeeded in making it, and it now appears to be a fixed fact. We are so accustomed to important announcements that we take very little note of them, but it is nevertheless a fact that few inventions, of equal value to that of the artificial production of the magnificent alizarine dye, have been made in many years. In general, synthetical chemistry in the characteristic feature of the present age. Berzelius believed "that chemical forces alone could not effect organic synthesis, and that when such changes occurred, they were due to the agency of vital force." All of this has been overthrown, and such men as Wöhler and Berthelot have made for us urea, alcohol, fatty bodies, and numerous other organic compounds; and the bold man of science has gone far beyond mere matter, even into the realms of thought, and we are told "that chemistry teaches us that thought-force, like muscle-force, comes from the food, and demonstrates that the force evolved by the brain, like that produced by the muscle, comes not from the disintegration of its own tissue, but is the converted energy of burning carbon." From all this it follows that the brain is a machine for the conversion of energy, and we have only to lubricate it well and supply it with fuel to accomplish great things. It is evident that we live on the borders of important discoveries, and it is never safe to laugh at anything, as the ridicule may be turned against ourselves.

Modifications of nitro-glycerin, in the forms of dynamite and dualin, have been given to the engineer and miner; and gun cotton has been rendered more manageable as an explosive. Beet sugar has received large attention in this country, and it now looks as if we might hope to see it become an established industry before many years. Extracting gold and silver by means of zinc, if not a recent application, is still one that the last half year has seen worked out more accurately and economically than ever before. The manufacture of artificial stone has received fresh impetus since the Chicago fire; and more attention is devoted to the study of hydraulic cements. In glass and porcelain, in glycerin and glue, in tanning and dyeing, in artificial heat and cold, in antiseptics and disinfectants, in pharmacy and medicine, whichever way we turn, we find progress everywhere, and constantly something new. The past *has been* rich in execution; the future is still richer in promise.

IN the oxyhydrogen light, the use of cylinders of burnt dolomite, in place of ordinary lime, is recommended as increasing the regularity of the light.

SCIENCE RECORD FOR 1872.

The announcement of this new book is everywhere approved, and the publishers are already in receipt of numerous orders. The notice of its contents, published in another column, gives an outline of its character; but it is only an outline. In value and interest the book will, we think, exceed what is there said of it, and we are confident that every reader will enjoy its possession.

Among the orders received, some, for considerable numbers of copies, are from prominent firms, who intend to make a present of the book to esteemed and deserving employees. We commend this example to others. As a gift for the New Year, it would be difficult to select anything of more useful and permanent value than the SCIENCE RECORD, 350 pages octavo, profusely illustrated with engravings, elegantly printed and bound: in muslin, $1.50; extra binding, half calf, 50 cents additional. Sent to any address, post free, on receipt of price. One copy of the SCIENTIFIC AMERICAN for a year, and one copy of SCIENCE RECORD, $4. Munn & Co., Publishers, 37 Park Row, N. Y.

SCIENTIFIC INTELLIGENCE.

MANUFACTURE AND PROPERTIES OF GLYCERIN.

P. Champion has been experimenting upon the properties of pure nitro-glycerin, and the best methods of its manufacture. As only a few seconds are necessary for the complete action of nitro-sulphuric acid upon glycerin, it is important to have the mixture made as rapidly as possible, in order to cool it down by immersion in cold *water*. This is accomplished by a blast of air, through the vessel in which the reduction is performed, and a contrivance for rapidly emptying the converter into a reservoir of water. On a large scale, the proper proportions to take are as follows: 380 parts of glycerin of 31°, 1,000 parts of fuming nitric acid of 50°, and 2,000 parts of oil of vitriol. The yield will be 760 parts of nitro-glycerin, or 200 per cent.

To free the product of acid, it is necessary to subject it to repeated washing in pure water, and finally to add carbonate of soda. It can be freed of water by chloride of calcium.

The presence of water in nitro-glycerin diminishes its explosive force and prevents the infusorial silica from absorbing a large quantity, in the process of the manufacture of dynamite. Pure nitro-glycerin is an oily, colorless, inodorous liquid, of at first a sweet taste, and a subsequent burning taste; specific gravity, 1·60. It is insoluble in water, miscible in all proportions with ether and methyl alcohol, slightly soluble in cold, but readily in warm alcohol. When pure, it does not undergo spontaneous decomposition; at —15° C., it thickens without solidifying; at —20° C. it crystallizes in a short time. It is dissolved and decomposed by nitric and sulphuric acids, and hence the loss in its manufacture, if the mixture is not rapidly thrown into water. *Aqua regia* also destroys it. The following list exhibits the relations of nitro-glycerin to heat: At 185° C., it boils and evolves yellow vapors; 194° C., slow volatilization; 218° C., lively combustion; 257° C., violent detonation.

At a red heat, nitro-glycerin assumes the spheroidal condition, and vaporizes without detonation. By percussion, it detonates violently, but the electric spark does not explode it.

TEST FOR HUMAN BLOOD.

Dr. Day confirms the discovery of Neumann, that the pattern or network, which human blood exhibits when evaporated on the slide of a microscope, will serve to distinguish it from the blood of any other animal. The blood to be examined is spread on a glass plate, put on the stage of the microscope, and the stain observed until coagulation has taken place. Human blood shows a pattern of small network; the blood of other animals, the calf, pig, etc., requires more time for coagulation and yields a much larger pattern; in fact, every animal appears to furnish a blood of a characteristic and peculiar form. Not only is this the fact, but blood from different functions of the body is peculiar and capable of comparison and distinction. Scientific men have carried this investigation so far that blood stains can be traced to *their* source, and murder often discovered.

GASES FROM THE EXPLOSION OF NITRO-GLYCERIN.

The analysis of nitro-glycerin is accomplished in an eudiometer. A mixture of hydrogen and oxygen is first introduced into the eudiometer; and afterwards, a weighed and a minute quantity of nitro-glycerin. By passing the electric spark through the gas the mixture explodes, and the percussion detonates the nitro-glycerin, and the analysis of the results is conducted in the usual way. The gases produced by the explosion, of a small quantity of nitro-glycerin, were found to be

Carbonic acid	45·72
Binoxide of nitrogen	20·36
Nitrogen	33·92
	100·00

DECOMPOSITION OF WATER BY HEAT.

Grove has shown that when melted platinum is poured into water, the elements are dissociated, and a mixture of hydrogen and oxygen produced, in the same way as by electrolysis. The experiment must be performed with caution, as an explosion may be occasioned by the ignition of the liberated gases. The discovery was recently made, at some steel works in Germany, that a few pounds of melted steel will also decompose water with explosive violence. Five pounds of fused metal were poured into a cast iron trough filled with water, and the fragments of the trough were blown about the foundry, doing considerable damage and seriously injuring some of the workmen. The water was dissociated by the melted steel, and the gases fired by the heat.

TO PRESERVE ANATOMICAL SPECIMENS.—The simplest means of preserving anatomical and pathological preparations is the use of the following solution: Saturated solution of alum, 100 grammes; saltpeter, 2 grammes. The article to be preserved is immersed in the solution, when it becomes decolorized; but in a few days the color returns, when it is taken out of the solution, and kept in a saturated solution of alum and water *only*.—*American Journal of Pharmacy.*

PATENT DECISION.

United States Circuit Court, before Judge Blatchford.—Moritz Mahler *vs.* William Ettinger. Injunction granted against the defendant, William Ettinger, enjoining him from making or selling muffs in infringement of the Letters Patent of Moritz Mahler. In this suit, it appeared in evidence that a combination had been formed to oppose the Mahler patent, and that Ettinger had participated in getting it up, and was Secretary of it. The Court in its remarks severely condemned combinations gotten up to oppose patents.

TO CITY SUBSCRIBERS.

The SCIENTIFIC AMERICAN will hereafter be served to our city subscribers, either at their residences or places of business, at $3·50 a year, through the post office by mail carriers. The newsdealers throughout this city, Brooklyn, Jersey City, and Hoboken keep the SCIENTIFIC AMERICAN on sale, and supply subscribers regularly. Many prefer to receive their papers of dealers in their neighborhood. We recommend persons to patronize the local dealers if they wish the SCIENTIFIC AMERICAN or any other paper or magazine.

TIMELY SUGGESTIONS.

Agents who receive their weekly supply of the SCIENTIFIC AMERICAN through news companies are urged to canvass their localities. By a little effort among intelligent mechanics and manufacturers, they can add largely to their lists. We will send specimen numbers, when desired, for that purpose.

What more valuable present can be made to young mechanics than a year's subscription to the SCIENTIFIC AMERICAN? Employers will be doing their employés a great service by acting on this hint, and we feel sure that at the end of the year they will consider the investment a good one.

Subscribers who wish to have their volumes bound can send them to this office. The charge for binding is $1.50 per volume. The amount should be remitted with the numbers, and the volumes will be sent as soon as they are bound.

Every Employer should present his workmen and apprentices with a subscription to the SCIENTIFIC AMERICAN for the coming year.

Every Mechanic and Artisan whose employer does not take the SCIENTIFIC AMERICAN should solicit him to subscribe for 1872.

Now is the Time for old subscribers, whose subscriptions expire with the year, to renew.

Now is the Time for new subscribers to send $3 and commence with the new year.

Now is the Time for forming clubs for the new year.

It will pay any one to invest $3 for himself, his sons, or his workmen, for one year's subscription to the SCIENTIFIC AMERICAN.

It is easy for any one to get ten subscribers at $2·50 each, and for his trouble obtain the splendid large steel plate engraving, worth $10.

It is easy for any old subscriber to get a new one *to join* in taking the paper. Those who do will receive a bound volume of the "Science Record" for 1872. See description of this work in another column.

It is no more trouble to remit $6 for two subscribers than $3 for one.

If any mechanic whom you ask to subscribe says he cannot afford it, tell him he cannot afford not to.

If any one wishes specimens of the paper to examine before subscribing, tell him to write to the publishers and they will cheerfully mail them.

If any one wishes an illuminated Calendar for 1872, to hang in his office or shop, he can have it sent free on sending a request to this office.

If handsome illustrated posters and prospectuses are wanted to assist in obtaining subscribers, send to the publishers of this paper.

It is the intention of the publishers of the SCIENTIFIC AMERICAN to make the paper this year better and handsomer than any previous year during the last quarter century it has been published.

It is the intention of the publishers to illustrate, by superb engravings, all new and practical inventions and discoveries that may be developed during the year.

For Prospectus and terms to Clubs see last page.

Examples for the Ladies.

Mrs. E. E. Norton, Newcastle, Pa., has used her Wheeler & Wilson Machine almost constantly since 1863; has earned and made the clothing of her family (nine children) with it, earning $2.50 a day the year round, besides attending to her household duties; has done every description of sewing, even to piecing quilts; has made three fine shirts a day, or three pairs of pantaloons in a day; and used the same needle a year at a time; and the machine now is as good as new.

Burnett's Cocoaine is the best hair-dressing.

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.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 17c. a line.

Chard & Howe's machinery oils, the best—try them—134 Maiden Lane, New York.

"B." The Oil Cups and Lubricators of Broughton's Patents are the most reliable and perfect. Manufactured by H. Moore, 41 Center Street, New York. Send to him for Circulars.

A practical Machinist, having first class Machinery for Iron Work, would like to hear of power, with inducement to settle in Virginia, Kansas, or intervening States. Address, J. D. A., Lock Box 91, Boston, Mass.

448,000 quarts of Strawberries brought into New York city in a single day, 1870. Two desirable Box or Basket Patents for sale or license. Address J. S., Box 237, Bristol, Conn.

We will remove and prevent Scale in any Steam Boiler, or make no charge. Geo. W. Lord, 107 Girard ave., Philadelphia, Pa.

Rubber Valves—Finest quality, cut at once for delivery; or moulded to order. Address, Gutta Percha & Rubber Mf'g Co., 9 & 11 Park Place, New York.

Engineering and Scientific Books. Catalogues mailed free. E. & F. N. Spon, 446 Broome St., New York, and Charing Cross, London.

Francis Schleicher, Consulting, Analytical and Man'fg Chemist. Laboratory, Newark St., bet. Jackson and Harrison, Box 172, Hoboken, N. J.

Wanted, a Second Hand Boring Mill—6 ft. to 7 ft. Table—Bement or Sellers make preferred. Address P. O. Box 2459, Phila., Pa.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

Williamson's Road Steamer and Steam Plow, with Thomson's Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

For Hand Fire Engines, address Rumsey & Co., Seneca Falls, N.Y.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca, Falls, N.Y.

Scale in Steam Boilers—To remove or prevent scale, use Allen's Patent Anti-Lamina. In use over Five Years. J. J. Allen, 4 South Delaware Avenue, Philadelphia, Pa.

Presents—A Doty Washing Machine and Universal Clothes Wringer—warranted satisfactory. R. C. Browning, 32 Cortlandt St., N.Y.

Improved Mode of Graining Wood, pat. July 5, '70, by J. J. Callow, of Cleveland, O., enabling inexperienced grainers ("without the long required study and practice of heretofore") to produce the most beautiful and Natural Graining with speed and facility. Send stamp for circular.

3 Hydraulic Presses for sale on reasonable terms. Apply to Whitneyville Armory, Conn.

Metallic Molding Letters, for Pattern Makers to put on patterns of Castings, all sizes, etc. H. W. Knight, Seneca Falls, N.Y.

Portable Farm Engines, new and beautiful design, mounted on Springs. Compact, light, and efficient. Send for descriptive circular Mansfield Machine Works, Mansfield, Ohio.

Stencil Tools & Steel Letters. J.C.Hilton, 66 W. Lake st. Chicago,

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus Address Portable Bath Co., Sag Harbor, N.Y. Send for Circular.

Shoe Peg Machinery. Address A. Gauntt, Chagrin Fall, Ohio

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

The best lubricating oil in the world is Winter pressed Sperm. Sold in bottles, cans, and barrels, by Wm. F. Nye, New Bedford, Mass.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

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

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Safety Store Elevators. Provision against Rope, Bolt, and Engine breaking. One third the cost of others claiming to be safe. Andrews Bro., 414 Water Street, New York.

For Best Galvanized Iron Cornice Machines in the United States, for both straight and circular work, address Calvin Carr & Co., 26 Merwin St., Cleveland, Ohio.

Boiler and Pipe Covering manufactured by the Chalmers Spence Non-Conductor Co. In use in the principal mills and factories Claims—Economy, Safety, and Durability. Offices and Manufactories, foot E. 9th street, New York, and 1202 N. 2d street, St. Louis, Mo.

Diamonds and Carbon turned and shaped for Philosophical and Mechanical purposes, also Glazier's Diamonds, manufactured and reset by J. Dickinson, 64 Nassau st., New York.

Power Punching and Shearing Machines.

For car builders, smith shops, rail mills, boiler makers, etc. Greenleaf Machine Works, Indianapolis, Ind.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Photographs.—Rockwood, 845 Broadway, will make 8x10 negative and six photographs of machinery, in any part of the city, for $10.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Lowell, Mass., December 16, 1871.

To O. E. MERRILL & CO.
Beloit, Wis.

Gentlemen,—In answer to yours, as well as many other inquirers, as to when and in what Journal my Report of Turbine Tests will be published, I would state, in reply, that I yet have seven wheels to test, and am waiting for suitable weather to close up for the season. As soon as completed, a full Report will be published in the Journal of the Franklin Institute.

Yours, truly,
JAMES EMERSON.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—TEST FOR CALOMEL.—Is there any simple, chemical means for detecting the presence of calomel in a medical compound?—F. D. H.

2.—BÉTON-COIGNET.—What are the ingredients, proportions and exact method of forming the Béton-Coignet stone?—J. H.

3.—GUN SCATTERING SHOT.—I have a shot gun that scatters too much. Can some one inform me how I can make it throw the shot closer together?—H. W.

4.—CEMENT FOR LEATHER AND IRON.—Can any of your correspondents give me a recipe for a cement with which I can fasten strips of leather to a rough cast iron surface?—E. A.

5.—CLEANING PAINT BRUSHES.—Can any one inform me through your columns of some process or method for cleaning or rotting the paint off old brushes, without injuring the bristles?—J. G. M.

6.—BRONZE PAINT.—I am anxious to know a cheap process for bronzing iron; something that can be applied with the brush—I think there is such a process. Any subscriber who knows of above will confer a great favor on me by answering.—J. G. H.

7.—FRICTIONAL ELECTRICITY.—Can this, by the ordinary means, be used for telegraphing? Also, is it as good for producing the electric light as chemical electricity?—E. N.

8.—TINNED IRON.—I wish to know the simplest and most expeditious method of preparing common iron castings, that they may be coated with tin, zinc or other material, in order to protect from rust by contact with water. Also, an outline of the process for tinning or coating as above.—R. B.

9.—COMBINATION OF SHELLAC AND OIL, ETC.—How can I make gum shellac combine or intimately mix with boiled linseed oil and mutton tallow, so that the gum shellac will not separate from the oil and tallow upon cooling?—E. L.

10.—CASTING HOLED PATTERNS.—What is the best method of making a casting which requires to have a hole 10 or 12 inches long in it ⅛ x ⅛ in. cross section, there being no chance of supporting a core except at each end? I have tried turning dies the proper length, and immersing them in coal tar, and also immersing in clay wash, but blows or bubbles are apt to occur, spoiling the casting.—D. W. W.

11.—FLUX FOR BRASS.—Does any one know of any flux which, in melting down brass turnings, borings, etc., will cause the iron contained therein to unite and fall to the bottom in a body, or else prevent it from melting? This flux, if I could obtain it, would be of very great advantage to me.—J. A. S.

12.—CEMENT FOR RUBBER.—Can any one inform me if a cement has been discovered capable of uniting india rubber surfaces in such a way as to prevent their subsequent separation by the contact of a liquid? I have just broken the tip of my rubber fountain pen, and am too remote from New York to get it mended by the maker. Does any one know of a cement for uniting rubber and glass (for a hypodermic syringe) and keeping them so under similar conditions? Will such a one give myself and others the benefit of it in "Answers to Correspondents?"—J. A. B., M. D.

13.—INVENTION WANTED.—I have been trying for the last six months to construct an article, which would be wanted in almost every store, but have tried in vain to find machinery to revolve the said article. I want some one to suggest what movements are most suitable to attach to a vertical shaft (which will be attached to a glass case) the weight of which will vary from 50 to 80 pounds, to work on a pointed pivot, and to revolve for twelve or fifteen hours at the rate of about three revolutions per minute. I have tried clock work and a coffee roaster; neither are powerful enough. A spring is the most suitable way of working it, I think, something like a clock movement on a large scale.—W. T. V.

14.—PLOW HANDLES—HOW TO STEAM AND BEND.—Will some of your many readers inform me how to steam plow handles best to bend them without breaking the wood? I have a kettle which holds about 100 gallons, and I have a steam (wooden) box over it about 10 feet long, and connected to the kettle by a square (wooden) box or tube. Some of my handles bend very well, and some will not bend at all without breaking. Will wood bend best when seasoned, green, or half seasoned? Some one of your many readers will confer a favor by giving me all the necessary information to enable me to bend plow handles successfully.—A. C. S.

15.—CLEANING CASTINGS.—Will some reader of the SCIENTIFIC AMERICAN please tell me how to clean the core sand out of small brass castings? In reaming or boring out, the sand soon wears off the cutting edges of my tools. Also, what will clean brass castings to make them ready for lacquering? And where can I have small malleable iron castings made?—L. V. B.

16.—CUTTING TIMBER.—What is the best time to cut spruce, pine, hemlock, fir, juniper, ash, and birch, for fencing, building, or any other purpose, for which durability is required?—J. S.

17.—OILS IN WINTER.—Is there anything that could be mixed with seal oil or sweet oil, to keep it from getting stiff in winter, without hurting its lubricating quality?—J. S.

18.—CLEANSING OILY LINEN.—What will effectually cleanse linen that has been greased with a mixture of kerosene and sperm oils, the latter having been used on machinery?—V.

19.—ETCHING CHARACTERS ON GLASS.—How can I etch characters on glass lantern globes or similar spherical articles?—F. H.

20.—ROTARY ENGINES.—I wish to learn, through the SCIENTIFIC AMERICAN something in regard to rotary engines. Are there any yet made which have proved really practical and durable machines? If not, what is the practical difficulty found in the way by those who have had experience with them? Is there any really good practical engine of this class yet invented? I, and many of your readers, would like to know of it; and if there is not, I am firmly convinced that our inventive fraternity are fully equal to the task of producing such; and will do so, whenever they see fully its importance, and learn in what particular direction to devote their energies. This can best be learned from plain statements of the individual experience of intelligent engineers who have used them. I have used steam engines frequently for twelve years, and found the subject of rotary engines one of the most difficult upon which to get information. I have a situation now in view where a rotary would suit much the best, if there are any really reliable ones. Please let us have light—not unproved theories, but the results of practical tests.—T. H.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

SOFTENING LEAD.—C. W. L. can prevent his lead from hardening, or soften what has already hardened, by melting a little tallow with it.—T. H. B., of Mass.

PREVENTION OF FERMENTATION.—To F. S. C., query No. 8, November 18: Wine or cider made by thorough air fermentation, and then sweetened to suit by refined sugar, is not subject to after fermentation. R. d'H.

E. F. G., of Mass.—Of the minerals that you send, No. 1 is sulphuret of copper in quartz rock, valuable if abundant; No. 2, quartz crystals of no value; No. 3, iron ore.

BEES IN WINTER.—If J. E. R. leaves his bees where they will be covered with snow all the winter, as he says in his query (No. 6 in the SCIENTIFIC AMERICAN of December 2d), he may expect they will all be smothered. An ordinary colony (say 20,000 bees) will consume about twenty-five pounds of honey during an ordinary winter.—J. M. C., of Ill.

LAND AND SEA BREEZES.—B. R. Jr. (query 16, December 16), is informed that the breezes at morning and evening are caused by the different heat radiating powers of land and water. When the sun has set, the earth cools more rapidly than the sea, and a breeze off shore is the consequence, and the reverse occurs at sunrise.—D. B., of N. Y.

REVOLUTION OF BODIES.—To R. O. H. (query 18, December 16). It is certain that the man goes round the squirrel. As the squirrel is always within a circle a few inches in diameter larger than the tree, and as the man goes round that circle, he goes round the squirrel.—D. B., of N. Y.

C. T. McM., of Florida, says: "Inclosed you will find a stone which my wife picked up in my field. Please tell us what it is." Answer: It is a silicified fragment of a coral, common on the coast of Florida. It belongs to the genus *Astræa*, so named from the star shaped spots, each of which represents an individual polyp.

BATTERY POWER.—In reply to query 10, page 395, Vol. XXV.: If the sounders have helices of No. 23 copper wire, and a gas or water pipe is used for a ground connection at each end of the line, five cups of Daniell's battery will work the sounder through 650 feet of No. 16 copper wire, and give a strength equal to an ordinary local circuit of two cups. With less perfect ground connections or a wire coarser than No. 23 on the sounders, a somewhat large battery would be required.—F. L. P., of N. Y.

J. W. W., of Mo.—The exact way in which water is converted into steam by heat, and whether any portion is instantly converted, are matters of dispute. In ordinary boilers the water must be heated to the proper degree before working steam can be obtained. Steam can be generated very quickly by the projection of water upon heated surfaces, but the surfaces must not be too hot for this purpose, as then the spheroidal state of water is formed. We make a distinction between the vaporization of water which proceeds at low temperatures, and the production of steam as done in boilers. There are various theories upon this subject, which you will find elucidated in "Heat as a Mode of Motion," Tyndall, "A Practical Treatise on Heat," Box, the works of C. Wye Williams, and in the transactions of various learned societies.

LEATHER BELTING.—Some one inquires, in your paper, whether a belt is tightest in dry or wet weather. I answer, in wet weather, always. Ten years' experience in the use of belts satisfies me that they should be thrown off the pulleys every night and allowed to relax, or, as I term it, "to let the belts rest." They will last much longer than if allowed to remain on the pulleys continually day and night. To prevent a belt slipping, there is nothing better than to keep it clean and apply fish oil occasionally.—S. S. F., of Ind.

BACK PRESSURE IN EXHAUST PIPE.—A building is to be heated by exhaust steam from an engine, 22 inch stroke, 16 inch bore, pressure of steam 75 pounds, cut off at 15 inches. The engine exhausts into a large tank, used for heating the water and filling the boiler. The exhaust pipe from engine to heater is four inches. The outlet in tank is to be stopped, and the exhaust steam forced through 300 feet of five inch pipe with nine elbows. Will the 300 feet of five inch pipe cause any back pressure on the piston? If it will, would a small pipe direct from the boiler be more economical?—R. K.

COMPOUND GEARING ON SCREW CUTTING LATHE.—Answer to query 9, page 395. Take any wheel for the spindle (for fine threads, a small one, and a larger for coarse threads), multiply the number of the teeth in it by the number of threads you wish, and divide by four; the result will be the number of teeth in the wheel wanted for the screw. If the result is fractional, or is a number of teeth for which you have no wheel, try the same rule on another wheel for the spindle until you find a combination that will answer. As four threads are to threads wanted, so is spindle wheel to screw wheel.—J. P. N., of N. Y.

P. J. K. writes to ask whether a pictorial representation, of three abandoned ships, which shows the vessels elevated in the air on icebergs is correct, or whether there is an error in the perspective. Answer: The raising of ships on icebergs is by no means an uncommon occurrence in polar latitudes. There is a larger part of the iceberg below the surface of the water than above it; and if a ship be stranded on ice, and drift into a higher temperature, the melting of the upper part of the iceberg will lift the ship, as the ice will rise to preserve its equilibrium in the water. Ice is also subject to upheavals from other causes. Dr. Kane in his narrative gives an account of what he calls one of these "mysterious pulsations which lifted his vessel so high out of the water that she was in imminent danger of capsizing."

HYGROMETER.—T. M. Jr.'s query (No. 19, December 16), is a puzzle. In a frost, the ordinary means of determining the quantity of water in the air are nearly all useless. One method, that may be of some use, is putting chloride of calcium in a tube, and weighing the tube and its contents; then passing air through, and the chloride of calcium will absorb the moisture. To ascertain the quantity, weigh the tube and salt once more. The ingenious hygrometer of Saussure is good for all temperatures, its indications being given by the expansion and contraction of a hair. A piece of catgut is similarly affected by humidity, and T. M. Jr.'s ingenuity would be well exercised by arranging an apparatus to exhibit the increase or diminution of its length.—D. B., of N. Y.

TWIN BOILERS.—In your issue of December 2d, I read an article headed "Curious Freaks of Twin Steam Boilers," by H. P. S., of Kansas City, Mo. For the information of H. P. S. and others who may think such actions in boilers curious, I will give them my idea. I have experienced the same trouble with boilers similarly connected, and, upon due reflection, came to the following conclusion: That it is a matter of impossibility to keep two fires burning in such a manner that the same quantity of heat will be produced by each at all times. Taking this for granted, more steam will be generated in one boiler than the other. The pressure increases gradually a few pounds per square inch, and the water is gradually forced backwards through the pipe or pipes into the other boiler. As the pressure of the one decreases by receiving not only all of the feed water, but also the water from the other; the motion increases with the pressure of the other. It is my opinion that if the boilers were connected by a four inch pipe, the action would be the same.—P. O. S., of Ga.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

BOILER EXPLOSIONS.—J. H. G.—J. M.—W. E. L.
BRICKS.—J. M. McC.
CAR STOVES.—L. V. B.
CURIOUS FREAK OF STEAM BOILERS.—E. F. C. D.—J. & J. T.—S. T. P.—T. J.—W. G.—W. H.
EXTINGUISHING FIRES.—H. A. H.
FIREPROOF SAFES.—T. W.
IMPROVEMENTS IN THE STEAM ENGINE.—H. L. B.
PSYCHIC FORCE.—A. H. C.—G. L. B.—G. L. Du L.—G. S.—G.T.—H.—H. H. B.—H. W. H.—T. C.—T. J. L.—W. E. A.—W. H. D.—W. T. B.
RECOVERY OF DROWNED BODIES.—J. W. C.
SOLAR INFLUENCE.—J. M. McC.
TEMPERATURE AT THE NORTH POLE.—J. B. P.
WATERWHEELS.—O. J.
ANSWERS TO CORRESPONDENTS.—E. A. S.—E. M. A.—G. L. B. J. C. K. L.—J. M. B.—N.—R.—R. J. McC.—R. L. K—T. H. C.—S. J. W.—T. W. S.—W. H. V.—W. L.—W. M. H.
QUERIES.—C. S. S.—G. S. A.—H. A. S.—H. W. A.—J. F. L. J. J. C.—J. T.—N.—R. & B.—R. C.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

PRINTING TELEGRAPH.—Richard Herring, of Canonbury, Eng.—This invention relates to that class of telegraphic printing apparatus in which the signals are effected by printing or marking dots and dashes or short strokes on a band or strip of paper as it travels through the apparatus. The object of the improvements is to increase the rapidity of transmission of the printed signals, and to simplify and facilitate the manipulation, and to render the signals easier to read and less liable to error. To this end, instead of making the dots and signals run in a line, the dashes or strokes are arranged in a vertical position. By this means the signal can be read with great facility. It takes up less space, and, it is claimed, can be transmitted with greater rapidity than the old style of signal. To effect this object a style or instrument of peculiar construction is employed. As it is composed of separate parts or styles, it may be termed a compound style. One of these parts is made in the form of a blunt, round point, so as to make or print a dot. The other part of the style is made with a long narrow edge, so as to form or print a dash or stroke; or, by means of any combination or construction of the style or styles, any other signs which may be deemed preferable to adopt may be used. In any case, the two parts are operated by separate currents of electricity or by distinct magnets.

CHAIR SEAT FRAME.—Henry Buchter, of Louisville, Ky.—The corner pieces are made of wood or metal, applied to the front corners. They are provided with holes to receive, respectively, the ends of the rounds and the screw by which they are fastened to the posts or legs of the chair frame. By this construction the seat frame may be much more readily and conveniently detached from and attached to the chair frame, and in this modification the invention consists.

EXCAVATING CART.—Jesse King, of Oswego, N. Y.—This invention has for its object to furnish an improved cart for moving earth, designed especially for use in grading roads and grounds, and which is so constructed as to load itself, and which may be conveniently unloaded either at once or gradually, as may be desired. A horizontal paddle wheel is arranged within the upper part of the earth box, and combined with a rotary bucket carrier, discharging the soil over one side of the box by an arrangement of chain and pulleys.

ROAD DRESSER.—Samuel D. Reynolds, of Rochelle, Ill.—This is an improved machine for dressing roads, filling the cuts made by the wagon wheels, and rolling down the dirt, so constructed as to hold itself to its work even upon inclined or sideling roads. It consists in the construction and combination of inclined timbers and plates attached and operated together, and in a scraper platform having a keeper combined with the roller platform frame hinged to the middle thereof, to enable the roller to be adjusted at different angles; also in a combination of the roller and scraper frames, when the former projects over and is attached near the middle of the latter, to enable the driver to bring his weight to bear upon the scraper.

WATER WHEEL.—De Witt C. Teller, of Fort Plains, N. Y.—This invention has for its object to furnish an improved turbine water wheel, simple in construction, easily adjusted, and effective in operation, utilizing a very large per cent of the power of the water; and it consists in the construction and combination of various parts, the nature of which preclude detailed description in this notice, but which seem well adapted to form an effective and compact wheel.

SHINGLE MACHINE.—Elisha Hughes, of Gowie, Canada, assignor to G. Miller Aylesworth, of the same place. A large circular saw is mounted on any suitable frame. A carriage on said frame is adapted to receive the block to be quartered near the center, and carry it up to and away from the saw, the said block setting endwise and being cut to the center by the saw each time it is moved up. A horizontally revolving turntable is mounted on the top of a vertical shaft, which is stepped in the end of the short arm of a lever, and supported in bearings of the frame, so that it can rise and fall, being lifted by the said lever, and falling back by its gravity. The carriage is provided with a large hole in its center—that is, directly over the turntable when it stops at the end of the movement away from the saw—and the block to be sawed is placed over said hole, so that, after each cut and the return of the carriage, the attendant can raise the block on the turn table by forcing the outer end of the lever down by his foot, and then turn the block readily by hand to adjust it for the next cut, after which it is let down on the carriage and moved up to the saw. A forked lever is pivoted to standards on the side of the carriage next to the saw, and provided with dogs or pins for entering the block to hold it, by the pressing of the free end of the lever down, which the attendant does as he pushes the carriage to the saw. These points or dogs are so arranged on the lever that in cutting to the center of the block they pass slightly beyond the cutting edge of the saw, enabling them to engage and hold the last two bolts of a block.

ANIMAL TRAP.—Milton D. Brown, of Newburg, Tenn.—This is one of that class of traps where the animal is dropped into a chamber below by treading on a pivoted door or board. The invention consists in the peculiar arrangement of the bait hook and catch with respect to the pivoted treadle board, and in the construction and combination of the various parts of the trap, which is designed to be placed over and secured to a box of suitable size, the bottom and three sides of which may be made of wood lined with tin, and the other or fourth side should be made of wire, cloth, or other suitable grating. In using the trap a quantity of bait is scattered about in the cage and also attached to a hook. The animal in seeking to reach the bait enters the trap, which seems to be clear and open. He enters without fear, and a slight pull upon the bait disengages a lever catch from the forward end of the fall, which is lifted by the animal's weight, precipitating the animal into the cage. As the animal drops from the fall, the latter is raised to its former position by the recoil of a spring, again setting the trap.

UPRIGHT PIANO.—Charles F. Chickering, of New York city.—This invention has for its object so to improve the construction of upright pianoforte action frames that more room is obtained for the hammers without varying the arrangement of strings or size or shape of instrument. This object is attained by arranging the hammers in a curved line and making the rails in the action frame arched to correspond.

LOOM PICKING MECHANISM.—Elijah D. Gove, of Holyoke, Mass.—This invention consists in an arrangement of the outer ends of the rocker and rocker bed for the application of a block for holding the rocker on the bed in such manner that a rolling contact of the moving parts is obtained when the staff is operated, which saves considerable friction and avoids the necessity of using oil, which is very desirable to prevent the collections of dust and dirt, said arrangement requiring no "finishing" and being cheaper than other arrangements now in use. A part of the arrangement constitutes a weight for throwing the picker staff back.

BUCKLE.—John Buche, of Apple River, Ill.—This is an improvement in breech buckles. A body and ring together constitute the breeching buckle. A tongue is hinged to the side of the buckle and has a pin in the center. The pin passes through a hole in the strap, which passes over the hinged tongue and under each end of buckle. By slipping the strap back the tongue is released, and the strap may be lengthened, shortened, or withdrawn. The side straps are permanently attached to the ring.

WHIFFLETREE CLIP.—William J. McMaster, of Dixmont, Pa.—This invention furnishes an improved whiffletree clip which is claimed to be stronger, better, and less liable to come off the whiffletree than clips made in the ordinary manner. It consists in a clip constructed with a rib upon its outside, a groove upon its inside, and a wing or flange upon one or both of its side edges. When the clip is used for the end of a whiffletree, only one wing or flange need be used; but when the clip is used for the middle part of the whiffletree, a wing or flange should be used upon each side of the body.

LIGHTNING ROD.—Stephen H. Miner, Winona, Minn.—This invention relates to a lightning rod constructed of two sheet metal plates of any suitable material, one of said plates having a longitudinal rib struck along its center line, which plate is placed side by side with the other flat plate, the two together forming a rod with a hollow central triangular chamber, and being connected by bending the edges of the ribbed plate around those of the flat one in the shape of beads.

WASH BOILER.—Maria C. Hubbard, of Troy, N. Y.—The boiler, of the common oval or other form and of any size, has a frame or hoop, made adjustable so as to fit boilers of different sizes, which is suspended in the boiler by means of hooks or supported in the boiler near the top in any other manner. It may be supported on a bead or projections in the boiler; but, to adapt it to boilers already made or in use, hooks are preferred. On the top of this frame, or near the top of the boiler, are placed one or more longitudinal rods and one or more transverse rods, as may be found necessary. The cover of the boiler is made to fit as nearly steam tight as convenient. A small quantity of water is placed in the boiler, and the clothes to be washed are soaped, hung upon the rods, and not allowed to touch the water. The cover is placed on the boiler and the water is made to boil. The clothes will be exposed to the steam only. There will be a slight pressure of steam within the boiler owing to weight and friction. The water, which condenses on the clothes, will drip down by its own gravity. The action of the steam upon the clothes is claimed to very speedily remove the dirt and thoroughly cleanse the clothes, no rubbing being necessary. The time required for cleansing the clothes is also claimed to be much less than when the clothes are immersed and boiled in the usual way, while the steaming thoroughly cleanses them. This result is accounted for by the fact that the clothes are not packed tightly together as in boiling, but hang loosely in the boiler in a temperature somewhat higher than 212°.

PIPE WRENCH.—Henry A. Hyle, of Shamburg, Pa.—This invention relates to that class of pipe wrenches which has one pivoted jaw held on the pipe by spring pressure, and which will bite very well upon pipes slightly varying in circumference, but not on different classes of pipes; and it consists in making the pivoted jaw adjustable so as to gripe a large or small class of pipes, and also in adjusting the throw of the spring impelled jaw so that it cannot bite with so much force as to crush the pipe.

CAKE STIRRER.—Sarah M. Clark, of Beaver Dam, Wis.—A sheet metal vessel or cup holds the dough and other matters to be compounded. It is provided with metal brackets or ears, clamping plate, and screw for attachment to the edge of a table, shelf, or other suitable support. A pinion, mounted on the top of a vertical shaft and gearing with a driving wheel which has a handle or hand crank for turning, gives motion to the stirrer shaft, on which, within the vessel, are arranged concavo-convex arms, on the outer ends of which are mounted vertical blades or plates, also shaped in concavo-convex form. Both the arms and the plates have large holes through them, through which and the spaces between the arms and plates the substance to be stirred or beaten is caused to pass, as the said arms and plates are rapidly rotated against it, thereby beating, mixing, and preparing it as is required.

GOVERNOR FOR STEAM ENGINES.—Aaron A. Kline, of Readington, N. J.—The character of this invention is a modification of the long used ball governor, calculated to cheapen it and render its action more delicate. Without an engraving it is impossible to convey a good idea of its peculiarities in construction.

BINDER FOR SEWING MACHINE.—Bernard Goldsmith, of Newark, N. J., assignor to Jenny Goldsmith, of the same place.—This is a simple and seemingly a neat and effective device for the purpose above set forth. It consists of a nearly circular plate, with two tongues, proceeding tangentially therefrom, and provided with diagonal slots, the plate and tongues being subsequently bent into a peculiar form, to constitute a double hemming binder, to be secured to the bed of the machine by a suitable set screw.

COTTON AND HAY PRESS.—John Day Nix, of Noble, Illinois.—This press accumulates pressure through the agency of a system of pulleys and rope, actuating a toggle joint movement. A combination of catch bars and cross bars, with friction rollers, and also a combination of catch bars, cross bars and catches, constitute the principal features of the invention.

FANNING MILL.—Daniel Collins, of Zanesfield, Ohio.—This consists of a quite novel arrangement of various devices for the separation of chaff and other foreign substances from grain, forming a more compact machine than others in use for the same purpose, and possessing, we judge, advantages over those heretofore employed.

CORN PLANTER.—Jeremiah Matthews, of Lincoln, Illinois.—This invention consists of a frame provided with a bar pivoted to the axle of a corn planter having a friction roll at each end, by which levers are actuated, to give the desired control over the movements of various other parts which constitute a seed planter, the whole forming a simple and compact machine.

REVERSIBLE FLOCK CUTTING MACHINE.—James Pitts, of Millville, Mass., Robert Aldrich, of Slatersville, R. I., and Edwin T. Marble, of Worcester, Mass.—This invention is an improvement in machines for cutting flock; and consists in means for making the cylinder reversible and the blade self sharpening; in the arrangement for feeding in the stock and vibrating the cylinder; and in the mode of holding and adjusting the blades of the bed. By means of the driving belt or belts on the pulleys of the cylinder shaft, the motion of the cylinder is reversed or made to revolve in either direction at will. When a flock cutting cylinder is revolved continually in one direction, the natural consequence is that each of the blades is dulled at one angle or cutting edge and sharpened at the other. The only remedy in such a case is to grind or sharpen the blades, which, of course, consumes much time and involves considerable expense and trouble. By means of this reversible feeding device and arrangement of the discharge orifices, the inventors render their machine self sharpening. Reversing the motion of the cylinder at will, carries the flock in either direction and discharges it at either end of the machine. As the blades of the cylinder wear away, spring plates are adjusted to allow more or less of the blades to be exposed, either to compensate for the wear or govern their action upon the stock. As the blades of the bed wear, they are adjusted from time to time either separately or collectively, as may be desired; but the reversal of the motion of the cylinder renders all the blades in both cylinder and bed self sharpening. The central portion of the blades is iron, covered on each side with a plate of steel, so that the central portion will readily wear away and leave a steel cutting edge on each side.

REVOLVING URN AND SPICE STAND.—William John Evans, New York city.—This is an improved urn stand and urn for use in bar rooms, saloons, private houses, etc., for holding the hot water, spices, sugar, glasses, etc., required for use in mixing and preparing drinks, so as to have the various articles needed conveniently accessible at all times, and which shall be so constructed as to heat the water, keep it hot, and dry the glasses, and at the same time keep the spice stand cool.

HAY AND COTTON PRESS.—John J. Sivley, of Clarksville, Texas.—A strong vertical frame of four posts and suitable cross pieces or ties has a case into which the cotton or other substance is pressed in the top. The follower has a long wood stem, extending into a pit below the base of the frame, passing between guides suitably arranged for maintaining it in a vertical position while allowing it to work up and down. This stem is connected at the lower end to ropes which rise up to and wind over drums having the counter weights suspended on cords working over reduced portions of the drums. These weights are intended to counterbalance the follower, and are suspended from the small part of the drum, so that the follower may be raised sufficiently high while they move to the bottom of the pit. The stem is provided with toothed rack bars, one on each side of two opposite sides, and a lever is provided for each, the levers being suspended in yokes, which admit of their being moved toward and from the bars for the point to pass the teeth of said bars when moving from one to another in operation. A holding pawl is pivoted on any firm base, one in front of each toothed rack, to fall into the notches and hold the follower up when the levers let go for a new hold. Each pawl is connected to its lever by a chain or cord, of suitable length to draw it out of the notches when the lever is pulled back to let the follower down. Of course, the machine may be worked by one lever and rack bar only; but it is preferred to employ two.

MACHINE FOR BLACKING BOOTS AND SHOES.—Nathan Eisenmann, of New York city.—This invention has for its object to furnish an improved apparatus for polishing or blacking boots and shoes, which is simple in construction and effective in operation, whereby the boots may be quickly and thoroughly polished, by means of three brushes, so formed as to fit upon and cover the entire surface of the boot or shoe. The apparatus is operated by a crank. To the outer end of the crank is swiveled a socket, to receive a handle, to enable the apparatus to be conveniently operated by any one desiring to blacken his own boots and shoes. To the upper side of the lid or cover of the box is attached a short pedestal or standard, to rest the foot upon when applying the blacking to the boots or shoes.

APPARATUS FOR FREDING WHITE LEAD, ETC., FROM THE MIXING TUB TO THE MILLSTONES.—James B. Pollock, of Port Richmond, N. Y.—This invention consists of a feeder or conveyor for oily and pasty substances, of which the essential features are a longitudinally grooved cylinder, inclosed in a cylindrical case, and a scraper, arranged in such manner that the paste is forced from the mixer or a hopper into the groove of the cylinder at one side of the case, and carried thereby to the other side, where it is taken out by the scraper, which is caused to drop into the groove, and discharged upon any receiver, preferably a revolving disk, from which it may be discharged by a fixed scraper to any other receiver or conveyor. The case serves as a cut off to remove any excess of the paste, and cause the feed to be regular and even, being the exact quantity the grooves are capable of taking; but the quantity discharged may be varied by varying the speed of the cylinder, or by limiting the dip of the discharging scraper into the groove, so that it will not take out the whole quantity contained in them.

LET OFF MECHANISM FOR LOOM.—Charles Schilling, Auburn, N. Y.—This invention relates to improvements in "let off" apparatus for looms. It consists in a novel arrangement of devices for automatically shifting the weights on the levers of the friction straps as the size of the roll of yarn decreases. Levers, with weights thereon, and friction straps, are caused to act on friction disks of the warp beam. A cord connected to these weights passes over pulleys, one at each side of the loom frame, and thence around a grooved pulley, supported on the loom frame in any suitable way. This cord is crossed between the weights and the pulleys, so that when the cord is moved in one direction by the wheel, the weights will be moved from each other and toward the pivots of the levers, and, when moved the other way they will be moved toward each other.

STUD FASTENER.—Adolph Hartmann, New York city.—This is a new means for fastening studs, sleeve buttons, etc., so that they can be readily applied and removed, and still be properly held in the fabrics. To a stud of suitable style and size are pivoted two levers, which are connected with coiled or other springs, whereby they are spread apart to engage the fabric. The levers can be swung nearly at right angles to the stud, to apply or withdraw the same. The levers are preferably so bent that their ends will meet when they are swung up, and thus facilitate their passage through the button holes.

BELT FASTENER.—Marcellus Olmstead, Alum Creek, Texas.—Two frames are used, each consisting of side bars and cross bars. The two side bars of each are fastened together by a hinge joint. The belt, which corresponds in width to the cross bars, is passed alternately over and under the bars whenever it is discovered to have become slack, while the joint allows the fastener to conform to the direction of the belt. The reader will find an advertisement of this invention in another column.

HOISTING MACHINE.—Samuel L. Lord, of New York city.—The object of this invention is to furnish a convenient portable machine for raising weights—one which shall give a slow motion for raising heavy weights, and a quick motion for raising light weights, or unwinding the rope or chain. This hoisting machine is designed for hoisting stone and other materials, in the erection of buildings, and may be moved from place to place for hoisting weights in all situations. The motion is made slow with greatly increased power, or fast with diminished power, by turning the same crank in opposite directions. The machine is thus adapted to raising heavy or light weights, and for the various purposes for which hoisting machines are required.

FEEDWATER REGULATOR.—Nicholas Nolan, of New York city.—This invention relates to feedwater regulators for steam boilers, and consists in a vertical waterchamber, valve seated, and held fixedly within the water of the boiler, and connected with a valved rod passing therethrough, and also having a float at the upper end thereof, adjusted to the water line of the boiler, for the purpose of automatically feeding water to the boiler.

WRENCH.—Luke Chapman, of Collinsville, Conn.—This invention relates to an improvement in monkey wrenches of that kind in which the upper head or jaw, its shank, and the supporting step of the adjusting screw are all made in one piece, as has been described in the specification which accompanies the Letters Patent of the United States numbered 100,978, granted to the same inventor on the 22d of March, 1870. The present invention consists more particularly in a new mode of manufacturing the wrench by welding the step on the shank after the movable jaw has been applied to the latter; and also in a new manner of sustaining and holding the lower end of the adjusting screw, and supporting the pin on which said screw turns.

WASHING MACHINE.—James Abbot, of Fitchburg, Mass.—A perforated dasher is made of upright and horizontal rods, and is claimed to be very effective, without being the least injurious to the clothes. Being balanced, it can be operated with ease. As the suds will be automatically liberated of sediments, the machine will require less water on a given quantity of clothes, and consequently, it is claimed, less soap than any other machine. The combination of a suds' box having inclined sides and a concave perforated bottom with a longitudinal trough, having a faucet, and the dasher made of longitudinal rods attached between perforated bars, with a balance handle, constitute the invention.

HEMMER FOR SEWING MACHINE.—David Forrest, Eastport, Me., assignor to himself and A. H. Bibber, of the same place.—This is a simple attachment, consisting in a plate of peculiar form, jointed, and having an arm with a stud thereon, combined gage plates, scroll, and a detachable block. Also in a combination with the hemmer scroll of detachable blocks or tongues whereby, it is claimed, a more perfect operation in hemming is secured.

PADDLE WHEEL.—William Thomson, of Madison, Wis.—This wheel is cast or made like a hollow drum, with sections or compartments therein, which may be filled with water when the vessel is light or without freight, so that the water may act as ballast. The propelling buckets consist of a series of notches in the face or periphery of the wheel, the sides of which are at an angle of about forty-five degrees with each other. A channel extends forward from a point beneath the center of the wheel, through which water passes to the wheel. This channel is cut in the filling beneath the guards and forward of the wheel, the filling being flush with the side of the wheel, and circled out in front of the wheel. When the motion of the wheel is reversed, the water carried up by the wheel is discharged through an opening which is provided with a flap valve which closes on the outside. The wheels may be used either with or without the channel.

FIRE SHIELD.—Henry Rieger, of Beaufort, N. C.—This invention is intended to provide convenient and efficient means for preventing the spread of fires in cities and villages; and it consists in a portable adjustable shield screen, formed of fireproof plates or sheets mounted on wheels, so that the same can be transported from place to place and be applied with expedition. A light frame or platform is supported on axles of wheels, but raised above and projecting over the wheels. Two pairs of stanchions, attached at the bottom to the platform and connected at their top ends, have a pulley hanging from the center of each pair. There is an upright rod at each corner, or one for each stanchion, rigidly connected to the platform, and extending up about half way, more or less, to the top of the stanchion. The upper ends of these rods are curved and forked, and each contains a pulley. There is a brace for each of the rods on which horizontal pulley shafts are supported. A horizontal pulley shaft at each corner of the platform is supported by stands. Another horizontal pulley shaft at each corner of the platform is also used. All these shafts are provided with cranks, by means of which they are revolved, and with ratchet wheels and pawls, by which back movement is prevented. Sheets or plates of metal or other incombustible material are suspended from the stanchions and from the rods by means of chains, and are raised and lowered by means of the crank pulley shafts. The plates are so arranged that they work independently of each other, and they may be adjusted in a mass or so as to present two or more thicknesses to the heat or flame of a burning building. The sheets or plates may be of any required thickness and size, and any required number of them may be used. By interposing this shield between buildings, one of which is on fire, it is claimed the fire may be confined to narrow limits and much property saved.

REFRIGERATOR.—John P. Oeth, of Canton, Mo.—This invention consists in a combination of a suspended ice and water receptacle with a perforated cylinder for detaining the impurities from the ice. The case of the refrigerator is made of wood and lined with non-heat-conducting material in suitable manner. From the top of the box in the middle is suspended a sheet metal vessel, open on top and provided with a cover. Ice is placed in the vessel upon a grate therein contained, and serves to cool the entire interior of the case, the vessel being so placed that air can freely circulate around it. Water can also be poured into the vessel to be cooled and drawn off through a faucet, which is applied to the lower part. The faucet connects at its inner end with a perforated cylinder, as shown, said cylinder detaining impure matter that may have adhered to the ice and prevented it from flowing out through the faucet. A sliding drawer is arranged in the lower part of the case. It can be drawn out to catch drippings from the faucet. The front of the case is provided with doors, which, when opened, will disclose an arrangement of shelves within at both sides of the vessel.

LUBRICATOR.—William T. Garratt, of San Francisco, Cal.—This invention consists in the application to the oil chamber of a steam heating coil for conveying steam through it to keep it fluid in cold weather; also, to make it available for using suet and the like substances, which will be rendered by the heat.

CONDENSED STEAM EXHAUST FOR STEAM ENGINE.—William H. Wheatland, of Newark, N. J.—This invention consists in the application to the cylinder heads of an exhaust tube or nozzle, and a valve with a spring behind it to open when the steam pressure is relieved, and let the water of condensation escape at each stroke of the piston, the said valve being closed by the steam pressure when the latter is on.

TICKET HOLDER.—William James Campbell, of St. Louis, Mo.—This invention relates generally to ticket holders, and particularly to that class in which the ticket is ejected from a box by a frictional slide. The slide is moved back in a slot by pulling down upon a handle, when springs yield and allow it to pass the tickets without contact. A cover is then closed down, and the slide pressed forward. The ticket is thus ejected with great facility.

UNWINDER FOR BOOKED TOBACCO.—George Storm, of New York city, assignor to Stralton & Storm, of same place.—This invention relates to a new machine or attachment for unwinding booked tobacco; and has for its object, during the process of unwinding, to moisten the booking apron so that the subsequent booking process can be carried on to greater advantage. The booking of tobacco is done by placing the leaves between the coils or layers of an apron, which is rolled around a drum; thereby the leaves are properly flattened out, the more so if the apron is moist. After having been booked, the tobacco is removed by unwinding the apron from the drum, either on a separate unwinding machine, or directly on the booking machine, a second drum being used for receiving the apron. The combination of the apron, drums, and friction rolls for unwinding booked tobacco with a dampening roll, constitute the claim allowed in the patent.

CHIMNEY TOP.—Thomas Ketchen, of New York city.—The object of this invention is to provide a remedy for smoky chimneys. This chimney top consists of an upper section, covered by a cap and a lower section, which rests upon the top of the chimney, or is confined thereto in any substantial manner. This lower portion corresponds in shape and size with the chimney, and may be divided by vertical partitions arranged to correspond with the separate flues in the chimney. From the four corners of this lower section, wings project, which overhang the lower section. Shutters are hinged to the cap, so as to close down on the wings at each of the four sides, thus making two pairs of shutters. Each two shutters, which stand opposite each other, form one pair, and are connected together by a rod, the rod being of such a length that when one shutter is closed, the other shutter will be pushed open. There is an opening beneath each shutter, through which the current of air will pass when the shutter is closed. By means of these openings the draft of a chimney is greatly increased when the wind is blowing against the closed shutter. When the wind strikes quartering, two of the shutters will be closed and two opened. The current of wind, through the openings and upper sections of the top, carries the smoke with it as it escapes from the other side. After making many efforts to discover a sure cure for smoky chimneys, the inventor finds the above described arrangement to answer the purpose perfectly.

SOUNDING BOARD FOR PIANO.—Edward L. Taylor, of Jersey City Hights, N. J.—This invention has for its object to furnish an improved sounding board for pianos, so constructed and arranged as to increase the tone of the piano. There are three boards, similar in form, the upper and lower ones of which are of equal size, the middle one being made narrower. The ends of the three boards are separated by narrow strips of wood, to which the ends are secured. The side edges of the platform are incased with boards, attached to the edges of the bottom and top boards. The forward edge of the platform is recessed sufficiently to allow space for the pedals to project down in front. By making the central board a little narrower than the top and bottom boards, the central board will be free to vibrate, the air passing in and out through the spaces between the pieces, castings, and the edges of the central board. The piano is placed with its legs standing upon the four corners of the platform described. The legs of the piano should be shortened, to keep the piano at the proper hight. Casters should be placed beneath the four corners of the platform, to enable the piano to be moved about with the same facility as an ordinary piano. The casters or other supports are necessary to raise the platform from the floor to obtain the proper vibrations. The sounding board platform thus constructed is adapted for use with either grand or square pianos, and may be used either with or without the center sounding board.

HORSE POWER.—Marion H. Marmaduke and Benjamin F. Stewart, Santa Fe, Mo.—The invention consists in locating the multiplying mechanism in such relation to other parts that the lower arms are always maintained in a horizontal plane, thus removing the ordinary friction from sagging and reducing the draft some 20 per cent.

MECHANICAL MOVEMENT.—Thomas H. Percival, Harper's Ferry, Va.—This invention consists in a device for rotating a shaft by means of a double lantern wheel working in connection with a double spur gear fixed on the shaft, the arrangement being such that the lantern wheel also operates as a pawl and prevents any backward rotation of the spur gear in either direction.

STEAM PUMP.—Albert Perry, New Philadelphia, and George W. Perry, Mahanoy City, Pa.—This is an improved valve gear for steam pumps, in which the valves are prevented from stopping on the center by the use of springs which supplement the motion imparted to the valves through the movement of the piston.

PLOW.—Justin Malaneen Smith, of Haddam Neck, Conn.—This invention consists in a construction of the share and mold board, calculated to cause the furrow slice to discharge or pass over the mold board more easily than with the common mold boards; also, to be pulverized and disintegrated at the same time, and to be turned over more completely. It also consists in a self sharpening toothed colter, an improvement on that for which letters patent of the United States were allowed the same inventor August 30, 1870. Plows as now made cut the furrow slice flat and level on the bottom, and the mold boards, which are concave in the cross sections, have the effect to compress the upper portion of the furrow slice together, so that it is prevented crumbling and disintegrating, as it is desirable that it should. Another result is, that the furrow slice bears mostly on the surface of the mold board near the upper and lower edges, passing lightly over the center portion, or not touching it at all, whereby the earth clogs thereat and prevents the free action required. In this invention the share is made convex on the bottom, so as to cut the lower side of the slice concave, and to shape the mold board so that it will be convex in the cross section, whereby this compression of the furrow slice will not only be avoided, but the tendency of the concave under surface of the furrow slice resting on the convexity of the mold board, will be to cause the said slice to separate vertically by the overhanging sides, and become disintegrated. The clogging will also be prevented at the center, and there will be no clogging either side of the center, for the slice breaking down will bear on the mold board sufficiently to prevent it. The improvement in the construction of the teeth of the colter consists in forming teeth in the knife edged colter, by means of grooves in the sides, beginning at the edge, extending nearly to the rear, terminating in a point vanishing in the surfaces, being alternately on opposite sides, so that the knife edge of each tooth is subject to wear on both sides alike, by which the edge is preserved as the colter wears away. These grooves are inclined in the transverse direction of the colter, so that when in position they will be nearly vertical, and the earth in passing them will move upward through them to some extent in such manner as to keep them from clogging.

ROTARY VALVE.—Daniel Snowhill and John D. Bown, Spottswood, N. J.—This is a new form of valve within a steam chest, and has for its object to reduce friction and simplify the operation of the valve. The invention consists in the use of an oscillating, cylindrical, or slightly conical valve, containing cross slots for conveying the steam from the top of a chest to the ports, and a cavity for the exhaust. In this manner a simple valve is produced, and the steam chest, as such, actually dispensed with, the steam passing from the pipe directly to and through the valve.

BROOM HEAD.—Cornelius Blom, Jr., and John Aling, Holland, Mich.—This invention relates to the manufacture of brooms; and consists of a metallic broom head and mode of screwing the brush of the broom therein. The advantages are that, when the broom wears out, another brush may be inserted, by simply taking out two screws. The head itself will last for an indefinite length of time.

GRAIN CAR.—Alphonso E. Gordon, New Brunswick, N. J.—The object of this invention is to provide an improved means for moving grain on railroads, namely, a car that shall be cheaper, lighter, more easily filled and readily discharged, and of less hight and weight than those heretofore used for the same purpose. It consists in a railroad car provided with a slide valve opening for delivering the grain, and of a door for securing the valve or valve opening, the car being made of such form or shape that the grain will flow from the same by its own gravity when the valve orifice is open. The labor, time, and expense, attending the discharge of grain from railroad cars, have been serious drawbacks to the transportation of grain on railroads. Shovelers have to be employed, much time is consumed, and much grain is usually wasted. By this improvement the grain is discharged by its own gravity, the conveyer box receives the grain, so that none is wasted, and the contents of the car are conveyed to the proper destination, after the conveyer is attached, by simply opening a valve orifice. The car is provided with a water tight roof, in which is a receiving orifice provided with a tight cover. Thus cars can be made of either wood or metal—preferably the latter—and they may be constructed so as to contain return freight, as bales and bundles of goods. The required weight of grain fills the ordinary car only about half full. These improved cars, being made especially for the transportation of grain, are much lower and lighter than the ordinary car. The advantages to be derived from the use of cars made expressly for the transportation of grain, and in the manner described, are obvious.

WATCH ESCAPEMENT.—Abel Coombs, Burlingame, Kansas.—By this improvement the lever only acts on the roller pin during its vibration in one direction; but the pallet is twice as far from the pivot as it could be if arranged in the common way, and consequently the wheel has twice the leverage to act on the roller pin and throw the balance, thereby making only one escapement to two as heretofore, and avoiding one half the stops of the train. A short pallet throws the lever back against the tappets of the escape wheel which pass it without stopping. The train only stops as the balance swings one way, while in the common arrangement it stops every time the balance swings either way. The less stopping and starting a watch has to perform, the better for the whole machinery; and it is less likely to cease running, as it has only half the stoppings to overcome, and as the cessations occur from failing to start after any of these stops. A spring strikes against the collar pin in the return stroke of the lever and arrests the blow of the pallet on the scape wheel teppet which would otherwise occur. By this arrangement the roller table is constructed with the "banking" notch on one side of the roller pin, and, therefore, the watch can only "overbank" on one side of the same; whereas, in the common way, they may overbank on either side of the pin, owing to the notch being in front of the roller pin. As, by this plan, the lever moves twice as far at one beat, it is more likely to overcome any obstruction in the train. The lever is curved in its side between the pallets, and it is also slotted, so that the escape wheel is set closer to it and economizes space. Power is also gained by getting a wider sweep of the lever, in consequence of which the size of the roller can be increased and the roller pin placed further from the roller axes, thus gaining leverage on the balance. In consequence of this enlargement of the roller, the banking notch may be made much deeper, so that the banking pin will reach into the roller so far that it cannot overbank, which all other watches with detached levers frequently do, and stop immediately or "throw off" and catch the banking pin on the edge of the roller in the line of the balance staff, which also stops the watch. The banking pin, striking into the roller on one side of the roller pin, never gets on the other side, as the lever always stops on one side of the balance staff, while a common lever stops on both sides, and, in passing the line, dips into the roller in front of the pin but slightly, whereby, the sweep being narrow, the roller small, and the banking notch necessarily shallow, the watch is frequently stopped.

APPARATUS FOR SUPPORTING AND LOWERING COFFINS.—Charles A. Thompson and James O. Coleman, Hopkinsville, Ky.—This invention has for its object to furnish an improved apparatus for supporting coffins or burial cases when the deceased is lying in state, and to serve as a bier for carrying the coffin. It is so constructed as to be a convenient means for lowering the coffin into the grave. This apparatus consists mainly of a rectangular frame formed of two longitudinal shafts, connected together by end pieces, supported on folding legs, with adjustable pulleys on the shafts, and a worm gear device by which the shafts are revolved. The legs are held in position when folded and when standing vertical by means of spring buttons, gravity springs, or slides, or in any suitable manner. There are adjustible flanged pulleys on the shafts. These slide on the bars, and are adjusted to suit the length of the coffin. When adjusted they are held in position and prevented from turning on the bars by means of set screws. Belts are attached to the pulleys by means of stirrups. These stirrups are attached to the pulleys, and hold the belt by frictions, the arrangement being such that by raising the stirrup the belt is readily drawn through and detached. Metallic supports for the coffin to rest upon hook over the longitudinal shafts, and are removed before lowering the coffin into the grave. To allow the supports to be removed, the bars are revolved so that the belts are wound around the pulleys sufficiently to raise the coffin. When the apparatus is placed over the grave, and the supports are removed, as above stated, the shafts are turned in opposite directions, by means of a crank and the worm gearing above described, and the coffin is lowered gently and evenly to the bottom of the grave. The belts are withdrawn, and the legs folded up, which allows the apparatus to be placed in the hearse. This is a convenient and complete device for the purposes intended, and its advantages over the awkward contrivances usually employed at funerals are obvious.

ATTACHMENT FOR SEWING MACHINE.—Albert H. Hewitt, Batavia, N. Y.—This invention consists in an arrangement of devices, whereby a gage is provided by which lace or other trimming may be stitched on the cloth at the same time it is hemmed, and on the wrong side. This gage is placed on the machine at the same time the hemmer is used, so that a part will cause the edge of the trimming to be stitched on to the cloth to run under the needle properly. The plate is then set so that a tongue will project about as far as the side of the hemmer. The trimming is then put in over another tongue and under the first and a third tongue, so as to pass close alongside of and gradually work sufficiently under the hemmer to have the piece of the cloth turned over it.

FIFTH WHEEL FOR CARRIAGES.—Amaziah Finley, Bainbridge, Indiana.—This invention, the nature of which cannot be verbally explained with clearness, secures the following advantages: The bolster is locked to a stand plate, thus preventing the detachment of the bolster from the wagon in case of such extreme turning of the front wheels as to throw the box upward on the wheels, or when the wagon is overturned. It also prevents the floating of the bolster off the sand board in fording deep rivers, etc. The large hole required in the common axle when the ordinary bolt is used, is avoided.

GLOVES.—Edwin V. Whitaker, Gloversville, N. Y.—The object of this invention is to produce a glove, having palm piece lapping on the back, so as to leave seamless sides, with a peculiar curve at the wrist portion to better adapt it to fit the hand, and a minimum waste of material and expenditure of labor in making up.

CLOTHES WASHER.—David P. Sulouff, Milton, Pa.—This invention is an automatic washer and rinser which condenses the steam at its own boiler by a water vessel on top, and by means of the same vessel heats the rinsing water which is afterwards conveyed by a connecting pipe into the bottom of the boiler.

HARVESTER REEL.—George S. Grier, Milford, Del.—This invention is an improvement in harvester reels by which the circumferential sweep of the reel as well as the hight thereof may be changed with great rapidity and ease by the operator.

SPARK ARRESTER FOR LOCOMOTIVE SMOKE STACKS.—David R. Proctor Gloucester, Mass.—This invention is an improvement in spark arresters by which the sparks and cinders are sprayed with water and discharged harmlessly on one side of the locomotive.

FILE FOR NEWSPAPERS, MUSIC, LETTERS, INVOICES, ETC.—Louis Cohn, Montreal, Can.—This invention relates to a file so contrived that papers are held by it side by side in such a manner that the pages may be read in their natural succession; and provided with an expansible frame for holding both sides of the paper open at the same time, and having a rest to support the file and papers upon the knee of the reader, or upon a table.

CHURN.—John A. Jordan, Shelbyville, Tenn.—This invention relates to a churn having an outer and an inner skin with an annular space between for the reception of hot water to warm the cream held within the inner vessel; and having also circular beaters revolving around a perforated stationary plate which gathers butter.

APPARATUS FOR PRESERVING AND FORCING BEER WITH COLD AIR.—Franz Blucher, of Mascoutah, Ill.—This invention consists in injecting cold air into beer barrels through a pipe connected with a cone shaped case or enlargement filled with powdered charcoal or other purifier, and provided with a perforated bottom through which the air is drawn. The pipe is flexible, and is let into the lower part of an ice box or ice receptacle, where the air is coldest. A pump draws the cold air, and discharges it through the pipe into the barrel. The end of the last named pipe is inserted through the bung into the barrel. When beer has been drawn from the barrel in such amount as to require a supply of air on its top for necessary pressure, the crank handle of the pump is turned until the necessary amount of air has been pumped. The air, being taken from the coldest part of the box and further purified in the enlargement, is of the proper quality for preserving the beer, besides applying pressure. Small dealers, or parties who use a barrel for a considerable length of time before entirely emptying it, will by this invention be enabled to always keep the beer fresh and cool, where hitherto it was rapidly destroyed when kept in a barrel but partly filled.

SELF OPERATING GATE.—Albert N. Holmes, of Tyrone, Mich.—This invention relates to an improved latch for gates, used in connection with a gate provided with means for being opened or closed without the necessity of the operator descending from his carriage or horse. It consists in a cord wound around the hinged post of the gate and extending at each side to a lever for actuating it to revolve the post and thereby swing the gate, and an arrangement of the lower hinge or pivot of the gate which causes a lifting action on the free end to raise it up for unlatching previous to swinging it open, also to disengage it from the catches for holding it open, the gate being suspended from an eye at the upper end of the oscillating post.

METHOD OF MAKING HARNESS PADS.—Conrad Gahr, of Newark, N. J.—This invention consists in a peculiar construction of dies, whereby the leather of a harness pad may be shaped and filled under pressure and within the same female die, and whereby a flange may be formed on the edge of the leather to enable it to be riveted conveniently.

CALCULATING MACHINE.—Robinson Teasdale, of Alberton, Ga.—With this remarkably ingenious machine, examples in addition, subtraction, multiplication, division, square and cube root, etc., may be worked out with great rapidity. For addition—stops being set on a plate to the figures to be added in as many of the slots as there are columns to be added—one turn of the crank adjusts faces of disks so that the sum of the amount represented on plate at the said stops and the amount seen on said disks before the operation will be seen on said disks after the turning of the crank. The operation is repeated for as many figures as there are in the columns. The operation for subtraction is precisely the same, except that a cover is shifted so that the faces of said disks, with their figures arranged reversely to those on the faces for addition, are seen. For multiplication—the disks being all adjusted so that the zero or nought of the faces are seen through the cover—the disks are adjusted to represent the multiplier on their faces, and the stops are adjusted for the multiplicand; then the crank is turned as many times as the denomination of the right hand figure of the multiplier; after a simple adjustment, a similar operation is performed for the next figure of the multiplicand, and so on. The multiplication of any two sums together is accomplished by as many turns as the sum of the figures in the multiplier added together. We cannot, without diagrams, give any idea of the way in which division and the extraction of roots are performed. The machine is certainly one of the most able attempts to perform these operations mechanically that we have met with.

LUBRICATOR FOR CAR AXLES.—Joseph Barber, of Bridesburg, Pa., assignor to himself and Richard B. Duncan, of same place.—This invention consists of a spirally ground roller arranged on spring bearings, working in vertical guides, and all mounted on a plate, which is screwed up against the bottom of the axle box. The plate has a large hole to admit the roller and its support into it from the bottom, the plate holding the roller up against the under side of the axle, and made fast by bolts which hold said roller against the axle to be revolved by the contact of it, and cause it to carry the oil up to the axle. The lubricating roller is made large enough, as others have been, to extend from the journal nearly to the bottom of the box, so as to insure the carrying up of the oil to the journal when but little remains in the box.

BURIAL CASE.—Joseph Hackett, of Louisville, Ky.—The sheet metal side of the casket is generally made of zinc. The upper and lower cast metal moldings are cast, in any ornamental form in cross section that may be preferred, being in thin plates fitting the side of the coffin at one edge, and springing away from the side as they extend to the plane of the edge of the said side; in order to make them as tight as possible, they are connected to the side, at or near the edge, by rivets. The lower one is connected, at its lower edge, to the coffin side by a sheet metal flanged plate, soldered to it by one of its edges, and connected to, or bearing against the side by, its outer edge. The upper molding is provided with a recess, in its upper corner fronting the side, which receives the edge of a cast zinc angle bar, the flange of which is soldered to the side at the upper edge. This angle bar serves to straighten the top edge of the side of the body, and to take the strain off the rivets when the top is secured down on the body. This is important, as any strain on the rivets might create a leak, which would ruin the casket.

FOUNTAIN.—Henry Broesel, of Manston, Wis.—This invention is an improvement upon the artificial fountain for which letters patent of the United States were issued to A. P. Yates, May 31, 1870. The improvement consists, mainly, in arranging the flexible or compressible water reservoir in the upper end of a tubular or hollow standard for the purpose of bringing it nearer the place or point of discharge of the water, to avoid taking up the space within the base or pedestal that would be perfectly employed to contain flowers or other ornaments to cause the descent of the fountain top to assist in expelling the water from the flexible reservoir, and to avoid forming rack teeth on the outside of the standard or pillar, where they are constantly exposed to view.

CAR COUPLING.—Theodore B. Tremper, of Rockland Lake, N. Y.—This invention consists of a pair of hooks pivoted in a socketed connecting bar; adapted for connecting with the ordinary socketed draw head by the ordinary connecting pin, to be used in one draw head and couple with a vertical triangular pin in the other head behind the place where the common pin is, which triangular pin opens the hooks when they are pushed in. The hooks are closed behind the triangular pin by springs. The triangular pin has a triangular or wedge shaped part below that which opens the hook, with its apex arranged to open the hooks and uncouple the cars while exposed to the draft, when the pin is raised up so that said part comes between them, and an elbow lever is provided in connection with said pin for so raising it.

PRESERVING EGGS.—William S. Marsh, of Raymond, Wis.—This invention consists in the successive application of alum and sulphur to the surface of eggs as a preservative coating.

SCROLL SAW GUIDE.—Samuel Ide, of Medina, N. Y.—A pair of steel guides are clamped against the sides of the saw at one end and together at the other end behind the saw in such manner as to make a wedge shaped groove corresponding to the saw, which is thinner at the back edge and gradually thickens towards the front. Above these steel guides is a pair of cotton waste and oil holding cups for lubricating the saw and the guides, one on each side of the saw. These are connected to plates somewhat like the plates of the guide, and they are clamped against a thin plate as thick as the thickest saw that will be used, which plate has a V groove in one end which comes against the back edge of the saw and forms a guide therefor, no matter whether the saw be thick or thin. The said oiling cups and thin plates thus serve to hold this guide, besides serving for the essential object for which they are designed.

MODE OF BALANCING PULLEYS.—Ebenezer W. Phelps, of Elizabeth, N. J.—This invention relates to a new and useful mode of balancing pulleys and fly wheels. It consists in an interior flange on the rim containing holes or apertures for attaching weights for balancing the pulleys or other body. This flange corresponds with the arms, and serves to strengthen the rim, and also serves to shorten and consequently strengthen the arms. The weights may be made of lead, each with a stem, so that it can be readily riveted to the flange. The invention is not confined to any particular form of weight or manner of attaching it. The weight may be made with holes, so that two may be placed opposite each other on the flange and both be fastened thereto by a single rivet. Instead of being continuous, the flange may be sectional, but a continuous flange is preferred.

BREASTPIN.—This is a thermometer plate, graduated in the usual manner, with a thermometer suitably attached to the plate. The attaching device consists of a bent pin projecting from the back of the plate, by which the latter may be quickly and conveniently attached to any part of the clothing. The whole is made in an ornamental form and of small size, so as to be suitable for a breastpin, shawl pin, etc.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING DECEMBER 19, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen 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 application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

121,925.—CURING MEAT.—W. G. Bell, Boston, Mass.
121,926.—FRUIT BOX.—C. A. Blair, New Britain, Conn.
121,927.—BOOT, ETC.—M. Bray, Newton Center, Mass.
121,928.—BAGGAGE TRUCK.—W. H. Brown, Bangor, Me.
121,929.—PIPE COUPLING.—C. Burger, Reading, Pa.
121,930.—LIQUID SOAP.—D. Cardullo, Titusville, Pa.
121,931.—ADDRESSING MACHINE.—W. H. Clague, R. B. Randall, Rochester, N. Y.
121,932.—HORSE POWER.—W. Deering, Louisville, Ky.
121,933.—FURNACE.—G. H. Diehl, Chicago, Ill.
121,934.—HEAD BLOCK.—T. Douglass, Warren, O.
121,935.—STEAM ENGINE.—E. Evans, North Tonawanda, N.Y.
121,936.—TOY.—G. W. Fisher, Rochester, N. Y.
121,937.—METER.—V. Fogerty, Boston, Mass.
121,938.—LAMP SIGN.—J. T. Foley, New York city.
121,939.—THRASHER, ETC.—C. S. Hall, Rochester, N. Y.
121,940.—NEEDLE SHARPENER.—T. Harris, Cote St. Paul, Can.
121,941.—CHAIR.—E. W. Hastings, Boston, Mass.
121,942.—AIR REGISTER.—H. F. Hayden, Washington, D. C.
121,943.—COFFIN.—M. M. Hersman, Delavan, Ill.
121,944.—HEMMER.—W. Johnson, Haverhill, Mass.
121,945.—ROCKING HORSE.—E. Kirsch, South Amesbury, Mass.
121,946.—DYED PAPER.—G. La Monte, G. G. Saxe, C. H. Clayton, New York city.
121,947.—ROTARY ENGINE.—R. Leach, Bangor, Me.
121,948.—RECOVERING TIN.—C. Lennig, Phila., Pa.
121,949.—LAWN SPRINKLER.—J. Lessler, Buffalo, N. Y.
121,950.—SAW.—C. V. Littlepage, Austin, Tex.
121,951.—FORMING SAW TEETH.—C. V. Littlepage, Austin, Tex.
121,952.—PIANOFORTE.—L. Matt, Boston, Mass.
121,953.—CLOTHES RACK.—D. Miller, Marietta, O.
121,954.—WHIP STOCK.—W. H. Millikin, Baltimore, Md.
121,955.—MOP.—C. S. Moore, H. P. Boyd, Worcester, Mass.
121,956.—SECURING RAILS.—J. Newton, Marengo, Mich.
121,957.—POTATO PLANTER.—A. E. Payne, Jonesville, Mich.
121,958.—HAY TEDDER.—J. G. Perry, Kingston, R. I.
121,959.—WHIP SOCKET.—G. M. Peters, Columbus, O.
121,960.—WATER CUT OFF.—P. B. Peters, Marietta, O.
121,961.—SUPPORTING CORES.—C. J. C. Petersen, Port Chester, N. Y.
121,962.—STEAM TRAP.—W. E. Prall, Washington, D. C.
121,963.—BELT KNIVES.—B. F. Radford, Hyde Park, Mass.
121,964.—NAIL CUTTERS.—E. Riley, Cleveland, O.
121,965.—SEWING MACHINE.—J. B. Secor, Chicago, Ill.
121,966.—CHECK LEVER.—J. B. Secor, Chicago, Ill.
121,967.—NEEDLE HOLDER.—J. B. Secor, Chicago, Ill.
121,968.—GOVERNOR.—H. F. Shaw, West Roxbury, Mass.
121,969.—CUTTING SOLES.—S. J. Shaw, Marlborough, Mass.
121,970.—PULP ENGINE.—C. Smith, South Windham, Conn.
121,971.—TELEGRAPH.—J. W. Stover, Boston, M. G. Crane, Newton, Mass.
121,972.—FLOWER STAND.—F. W. Test, Chicago, Ill.
121,973.—BOILER.—F. Till, Reading, Pa.
121,974.—HAND PROTECTOR.—J. Turnbull, Simsbury, Conn.
121,975.—ICE MACHINE.—C. Twining, New Haven, Conn.
121,976.—TREADLE.—J. B. Winslow, Charlestown, Mass.
121,977.—INCUBATOR.—E. Woodward, N. J. Millett, Charlestown, Mass.
121,978.—FAUCET.—J. H. Alexander, Geneva, N. Y.
121,979.—STEAM BOILER.—J. H. Ansell, Pontiac, Mich.
121,980.—DOOR SECURER.—D. Arndt, Cleveland, Ohio.
121,981.—DUMPING CAR.—C. Barrett, Boston, Mass.
121,982.—RUBBER ERASER.—W. N. Bartholomew, Newton Center, Mass.
121,983.—BARN FORK.—C. T. Beebe, Jackson, Mich.
121,984.—MEDICAL COMPOUND.—L. Bodenheimer, Paducah, Ky.
121,985.—STAMP GUIDE.—H. Bolthoff, Central City, Col. Ter.
121,986.—STAMP CANCELER.—F. W. Brooks, New York city.
121,987.—SEAL LOCK.—F. W. Brooks, G. A. Everett, New York city.
121,988.—BALE TIE.—F. G. Brown, Brenham, Tex.
121,989.—MEDICAL COMPOUND.—I. Brown, Phila., Pa.
121,990.—BED SPRING.—J. P. Chamberlain, North Abington, Mass.
121,991.—WATERING DEVICE.—D. Cheney, Brookfield, Mo.
121,992.—GARMENT STRAP.—S. L. Clemens, Hartford, Conn.
121,993.—PAPER FILE.—L. Cohn, Montreal, Can.
121,994.—PURIFYING BRINE.—L. R. Cornell, Syracuse, N. Y.
121,995.—HAT VENTILATOR.—W. Dale, New York city.
121,996.—PENCIL SHARPENER.—S. W. Davis, C. P. Elliott, Norristown, Pa.
121,997.—HAIR WEAVING.—N. Demongeot, Washington, D. C.
121,998.—EXTENDING TABLES.—A. Dickinson, New York city.
121,999.—BEE HIVE.—W. W. Dodson, J. B. Bray, Lynnville, Tenn.
122,000.—STEAM RADIATOR.—E. P. Doyen, Portland, Me.
122,001.—FURNITURE SPRING.—J. J. Eagleton, New York city.
122,002.—SAW MILL.—D. A. Edie, Norrisville, Md.
122,003.—GATE.—J. Faussett, Leonardtown, Md.
122,004.—CHURN.—W. Fritts, Flanders, N. J.
122,005.—ALBUM.—W. S. Gavan, Savannah, Ga.
122,006.—BUNG INSERTER.—J. Gillies, Glasgow, Great Britain.
122,007.—HARVESTER REEL.—G. S. Grier, Milford, Del.
122,008.—PINKING MACHINE.—T. Hagerty, Richmond, Va.
122,009.—FRICTION CLUTCH, ETC.—A. W. Hall, Northfield, Vt.
122,010.—BOILER CASING, ETC.—W. P. Hall, Piqua, Ohio.
122,011.—LATCH KEEPER.—W. Harvey, Albany, N. Y.
122,012.—DENTAL FORCEPS.—L. G. Haskins, Newport, N. Y.
122,013.—HASP LOCK.—W. D. Heister, Newton Hamilton, Pa.
122,014.—PROJECTILE.—J. H. Helm, Pittsburg, Pa.
122,015.—MOLDING INSULATOR.—R. Hemingray, Covington, Ky.
122,016.—CASTER.—S. S. Hickock, Methuen, Mass.
122,017.—HUSK SPLITTER.—B. Hollis, Randolph, Ill.
122,018.—PAPER HOLDER.—G. A. Howe, Niles, Mich.
122,019.—STEAM GENERATOR.—D. C. Howell, Goshen, N. Y.
122,020.—COW BELL STRAP.—J. H., A. Hughes, Wautoma, Wis.
122,021.—LINE CONNECTOR.—C. Jarvis, New York city.
122,022.—CHIMNEY CAP.—A. B. Johnson, Washington, Ind.
122,023.—PACKING PAPER.—A. L. Jones, New York city.
122,024.—GAS APPARATUS.—E. Jones, Boston, Mass.
122,025.—GAS APPARATUS.—E. Jones, Boston, Mass.
122,026.—CHURN.—J. A. Jordan, Shelbyville, Tenn.
122,027.—STEAM GENERATOR.—J. J. Jordan, Phila., Pa.
122,028.—HULLING MACHINE.—D. Kahnweiler, New York city.
122,029.—DENTAL GOLD.—E. G., L. Kearsing, Spring Valley, N. Y.
122,030.—BOOT, ETC.—P. Kleheler, J. C. Randlett, Bangor, Me.
122,031.—NEEDLE ELECTRODE.—J. Kidder, New York city.
122,032.—DISTILLING.—Gott-Hard Kleiner, Georgetown, Mo.
122,033.—ROTARY ENGINE.—T. S. La France, Elmira, N. Y.
122,034.—CIGAR MOLD.—J. J. Lahaye, J. M. Lyons, Reading, Pa.
122,035.—MINING TOOL.—I. Lamplugh, Peoria, Ill.
122,036.—LIFTING JACK.—R. B. Little, Providence, R. I.
122,037.—CORNICE.—W. Lloyd, New York city.
122,038.—GARMENT STRAP.—H. C. Lockwood, Baltimore, Md.
122,039.—HAY RAKE.—J. G. Lockwood, West Davenport, N.Y.
122,040.—UTERINE SUPPORTER.—A. Lowe, Nashville, Tenn.
122,041.—POSTAL CARD.—W. I. Ludlow, Cleveland, Ohio.
122,042.—GENERATOR, ETC.—M. N. Lynn, New Albany, Ind.
122,043.—CLOTHES DRYER.—W. C. Maynard, Marathon, N.Y.
122,044.—EMBOSSING FABRICS.—J. W. McKee, Brooklyn, N.Y.
122,045.—FORMING PAN.—F. Meyer, Newark, N. J.
122,046.—PROPELLER.—C. Mickle, Guelph, Canada.
122,047.—PEN CASE.—J. Monaghan, N.Y., T. Flynn, Brooklyn, N.Y.
122,048.—BED BOTTOM.—T. H. B. Morehouse, Lansing, Mich.
122,049.—STEAM ENGINE.—F. Motley, Phœnixville, Pa.
122,050.—GRATE.—D. Pangle, Belmont, Ohio.
122,051.—MEAT CHOPPER.—W. P. Patton, Harrisburgh, Pa.
122,052.—BESSEMER STEEL PLANT.—J. B. Pearse, Swatara, Pa.
122,053.—FLOAT VALVE.—J. Peters, Haverstraw, N. Y.
122,054.—FLOUR BOLT.—H. N. Petersen, Peoria, Ill.
122,055.—LIGHTNING ROD.—M. D. Phelps, Bristolville, Ohio.
122,056.—SHUTTER WORKER.—J. T. Pope, Scranton, Pa.
122,057.—COTTON CHOPPER.—A. G. Powell, Smithfield, N. C.
122,058.—SPARK ARRESTER.—D. R. Proctor, Gloucester, Mass.
122,059.—PUPPET VALVE.—J. E. Prunty, Baltimore, Md.
122,060.—COVER LOCK.—A. Richardson, New Brunswick, N.J.
122,061.—GATE LATCH.—H. W. Robie, Binghampton, N.Y.
122,062.—HARVESTER.—J. L. Rohrer, Upper Leacock, Pa., C. E. Roper, Canton, Ohio.
122,063.—TOP JOINT, ETC.—C. W. Saladee, St. Catharines, Ca.
122,064.—SHARPENING KNIVES.—I. C. Saunder, Trenton, Mich.
122,065.—MEDICAL COMPOUND.—G. W. Scollay, N. Y. city.
122,066.—SWING.—W. H. Scriven, W. K. Taylor, Flatbush, N.Y.
122,067.—FLOOD FENCE.—J. L. Seat, Nashville, Tenn.
122,068.—SASH HOLDER.—R. M. Seldis, New York city.
122,069.—CAR AXLE BOX.—M. Sessions, D. Muzzey, St. Albans, Vt.
122,070.—CAR COUPLING.—W. H. Skidmore, Secor, Ill.
122,071.—CLOTHES DRYER.—W. A. Sleppy, Berwick, Pa.
122,072.—PORCELAIN KNOB, ETC.—T. J. Sloan, Bronxville, N.Y.
122,073.—Not issued.
122,074.—AXLE.—W. H. Sparks, Absecom, N. Y.
122,075.—CHURN DASHER.—A. T. Still, Baldwin City, Kan.
122,076.—PIPE MOLD.—W. H. Story, Flatbush, N. Y.
122,077.—WASH BOILER.—D. P. Sulouff, Milton, Pa.
122,078.—HOLD BACK.—J. Thornton, E. G. Latta, Genesee, N.Y.
122,079.—CONNECTING SPRING.—J. A. Topliff, G. H. Ely, Elyria, O.
122,080.—BEE HIVE.—J. Tritt, New Richmond, O.
122,081.—CORSET, ETC.—M. J. C. Vanorstrand, Pekin, Ill.
122,082.—PUMP PISTON.—J. Van Tassel, Toledo, O.
122,083.—GRINDER.—P. W. Vaughan, De Kalb, Ill.
122,084.—STOVE.—J. V. Vrooman, J. H. Clute, Schenectady, N.Y.
122,085.—BOOT, ETC.—P. Ware, Jr., Boston, Mass.
122,086.—STEAM TRAP.—J. E. Watts, Lawrence, Mass.
122,087.—PLOW FENDER.—A. P. Webber, Saratoga, Ill.
122,088.—HINGE.—W. T. Wells, Decatur, Ill.
122,089.—WASH BOWL.—W. Westlake, Chicago, Ill.
122,090.—FAGOT FOR METAL BARS.—E. Wheeler, Phila., Pa.
122,091.—GLOVE.—E. V. Whitaker, Gloversville, N. Y.
122,092.—SOLDERING IRON.—J. Williams, Jefferson, Texas.
122,093.—WASHING MACHINE.—J. B. Wilson, Philadelphia, Pa.
122,094.—EXTRACTING GREASE.—J. B. Wilson, Phila., Pa.
122,095.—CONNECTING ROD.—J. W. Zinn, Morrison's Mills, Fla.

REISSUES.

4,677.—STEAM BOILER.—W. H. Cornell, Easton, Pa.—Patent No. 113,857, dated April 18, 1871.
4,678.—PUMP.—R. M. Lafferty, Three Rivers, Mich.—Patent No 101,604, dated June 21, 1870.
4,679.—BACK CHAIN.—W. B. McClure Alexandria, Va.—Patent No. 119,382, dated September 26, 1871.

DESIGNS.

5,424 to 5,426.—FRINGES.—W. B. Cunningham, P. Hill, Philadelphia, Pa.
5,427.—CARPET.—J. C. Johnston, Scarborough, N. Y.
5,428.—MATCH BOX.—J. Kintz, West Meriden, Conn.
5,429 to 5,432.—WATERPROOF GOODS.—B. Metz, New York city.
5,433.—MEDALLION HEAD.—J. H. Miller, Philadelphia, Pa.
5,434 to 5,441.—CARPETS.—R. R. Campbell, Lowell, Mass.
5,442.—CAKE TAZZA.—G. Gill, Taunton, Mass.
5,443.—THREAD SAMPLE CASE.—J. N. Leonard, Rockville, Ct.
5,444.—CARPET.—D. McNair, Lowell, Mass.
5,445.—CAKE TAZZA, ETC.—W. Parkin, Taunton, Mass.
5,446.—CARPET.—E. Perrin, Kidderminster, England.

TRADE-MARKS.

586 and 587.—WHISKY.—A. W. Balch & Co., New York city.
588 and 589.—GIN.—A. W. Balch & Co., New York city.
590.—WINE.—A. W. Balch & Co., New York city.
591.—PITCHFORK.—Bouton, Whitehead & Co., Naperville, Ill.
592.—COOKING STOVE, ETC.—Bridgeford & Co., Louisville, Ky.
593.—AXES.—C. Gerber & Co., Toledo, O.
594.—FERTILIZERS.—J. Horner, Jr., Baltimore, Md.
595.—SHEET IRON.—Rogers & Burchfield, Pittsburgh, Pa.
596.—GLOVES.—Ware, Marshall & Co., Boston, Mass.
597.—COLORS.—B. Weber, New York city.
598 and 599.—MEDICINE.—Holloway & Co., New York city.

EXTENSIONS.

LOCOMOTIVE FURNACE.—S. A. Bolster, Boston, Mass.—Letters Patent No. 18,883, dated Dec. 15, 1857.
MECHANICAL MOVEMENT FOR SEWING MACHINES, ETC.—J. ley, New York city.—Letters Patent No. 18,845, dated Dec. 15, 1857; reissue No. 4,583, dated Oct. 10, 1871.

APPLICATIONS FOR EXTENSION OF PATENTS.

STOP MOTION FOR HAIR CLOTH LOOMS.—Foster H. Stafford, Fall River Mass, executor of Rufus J. Stafford, deceased, has petitioned for an extension of the above patent. Day of hearing, March 6, 1872.

FLY NET.—William E. Wilson, Milton, Pa., administrator of Robert Wilson, deceased, has petitioned for an extension of the above patent. Day of hearing, April 24, 1872.

MACHINE FOR PLANING BLIND SLATS.—Charles Carlisle, Woodstock, and Leonard Worcester, Brattleboro', Vt., have petitioned for an extension of the above patent. Day of hearing, February 28, 1872.

VALVE FOR STEAM ENGINE.—Isaac Van Doren, Annandale, N. J., has petitioned for an extension of the above patent. Day of hearing, Feb. 21, 1872.

JOURNAL BOX KEY, ETC.—Levi Dederick, Jersey City, N. J., has petitioned for an extension of the above patent. Day of hearing, February 21, 1872.

SASH FASTENER.—Frederick W. Brocksieper and Joseph B. Sargent, New Haven, Conn., have petitioned for an extension of the above patent. Day of hearing, April 24, 1872.

WINDLASS.—Joseph P. Manton, Providence, R. I., has petitioned for an extension of the above patent. Day of hearing, March 13, 1872.

RAILROAD CAR AXLE BOX.—R. N. Allen, Pittsford, Vt., has petitioned for an extension of the above patent. Day of hearing, March 6, 1872.

ROTARY CUTTER FOR TONGUEING AND GROOVING.—James A. Woodbury, Boston, Mass., has petitioned for an extension of the above patent. Day of hearing, March 13, 1872.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row.

Inventions Patented in England by Americans.

From November 15 to November 27, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

DENTURES, ETC.—T. A. D. Forster, Philadelphia, Pa.
FURNACE.—M. Wilson (of Coldspring, N.Y.), London, Eng.
GOVERNOR.—D. J. Wolfe (of N.Y. city), Liverpool, England.
HOIST.—C. R. & N. P. Otis, Yonkers, N.Y.
IRON, ETC.—W. Sellers, Philadelphia, Pa.
LAMP.—R. W. Kemp, Philadelphia, Pa.
LININGS FOR CARPETS.—C. A. Pease, Astoria, N. Y.
ORGAN.—C. Fogelberg, Boston, Mass.
PRINTING MACHINERY.—E. Densmore, Meadville, Pa.
PRINTING ON ENAMEL.—S. J. Hoggson, New Haven, Conn.
PUMP.—G. W. Heald, W. F. Morris, E. Sisco, Baldwinsville, N. Y.
RESTORING SPENT INDIGO.—F. A. Sawyer, Mass.
SAFE.—C. C. Rowell, W. Duncan, Lebanon, N. H.
SAFES.—W. Corliss, Providence, R. I.
SEWING MACHINE ATTACHMENT.—D. McC. Smith, Orange, N. J.
SHEARS, ETC.—R. S. Gladwin, T. D. Hotchkiss, West Meriden, Conn.
SHUTTLE, ETC.—T. Isherwood, Stonington, Conn.
STRENGTHENING PAPER, ETC.—W. H. Chase, New York city.
SUPPORTING BEDS, ETC.—J. Evans (of Denver, Col.), London, England.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000 Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

PATENTS.

American and European.

MUNN & CO. continue to give opinions in regard to the Novelty of Inventions, free of charge; make special Examinations at the Patent Office, prepare Specifications, Drawings, Caveats, and Assignments; and prosecute applications for Letters Patent at Washington, and in all European countries. They give special attention to the prosecution of Rejected Claims Appeals, Extensions, and Interferences.

☞ Pamphlet of the New Patent Law for 1870 furnished free. Address

MUNN & CO.,
37 Park Row, N. Y.

Subscribers—Who wish to have their volumes bound, can send them to this office. The charge for binding is $1·50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

City Subscribers.—The SCIENTIFIC AMERICAN will be delivered in every part of the city at $3·50 a year. Single copies for sale at the News-stands in this city, Brooklyn, Jersey City, and Williamsburgh, and by most of the News Dealers in the United States.

Advertisements.

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page - - - - $1·00 a line,
Inside Page - - - 75 cents a line
for each insertion.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

OFFICE MANHATTAN GAS-LIGHT COMPANY,
NEW YORK, Dec. 13, 1871.

J. W. BARTLETT, ESQ., No. 569 BROADWAY. DEAR SIR: You ask my opinion in writing of the street lamps introduced in this city by you. I give it with pleasure. I have not seen any to equal them, either in this country or in Europe. They are stronger, and in every way superior to any other with which I am acquainted, and not only better but far more sightly in appearance.

Sincerely yours,
CHARLES ROOME, President.

NEW INVENTIONS—NEW STYLES.

MASON & HAMLIN

Cabinet Organs.

Highest Excellence, Lowest Prices.

We introduce this season several new inventions of great value; including DAY'S TRANSPOSING KEY-BOARD, enabling every performer to transpose the key without the slightest difficulty.

Also, NEW STYLES of Cabinet Organs, in very rich and beautiful cases, at *extraordinarily low prices.*

Full particulars in circulars and ILLUSTRATED CATALOGUES, sent free to any address.

It can hardly be longer necessary to advertise the *quality* of the Mason & Hamlin's Organs, for it is scarcely disputed by any that they ARE THE BEST IN THE WORLD; the

VERY STANDARD OF EXCELLENCE

among instruments of the class.

Every purchaser may be sure that he is obtaining, in proportion to its size, capacity, style and class, the very best instrument which it is practicable to produce. We are not afraid to warrant all our work as up to even this high standard.

But while the superiority of the Mason & Hamlin Organs is established, it is not so widely known that the prices are not higher than those of ordinary instruments. We offer the largest variety in the country—one to thirteen stops—at from $50 to $1,000 each.

Every one interested should at least send for the ILLUSTRATED CATALOGUE and CIRCULARS of the Company, which COST NOTHING, being sent post-paid.

MASON & HAMLIN ORGAN CO.,
596 BROADWAY, NEW-YORK,
154 TREMONT ST., BOSTON.



You ask WHY we can sell First Class 7 Octave Pianos for $290? We answer—It costs less than $200 to make any $600 Piano sold through Agents, all of whom make 100 per ct. profit. We have no Agents, but ship direct to families at Factory price, and warrant Five Years. Send for illustrated circular, in which we refer to 500 Bankers, Merchants, &c. (some of whom you may know) using our Pianos in 40 States and Territories.

U. S. Piano Co., 865 Broadway, New York.



"Buckeye" Hominy Mill.

IN THE WORKING OF THIS MILL the Corn requires no preparation except shelling. It has a regular feed and discharge, and needs but little attention. IT IS COMPLETE IN ITSELF. Hominy can be made from common as well as flint corn. It occupies very little room, and any miller can work it. There is nothing the miller can manufacture to a better profit than Hominy. Send for descriptive pamphlet. BALTIMORE PEARL HOMINY CO., Baltimore, Md., Sole owners of Patent.

WHAT YOU ALL WANT, is a MONTHLY MAGAZINE, containing good practical and useful, as well as interesting and entertaining, matter—not *merely* stories; and in this line you will find nothing so good as the ILLUSTRATED PHRENOLOGICAL JOURNAL. The Articles it contains are of the highest value to all, tending to make men wiser and better. Only $3 00 a year; 30 cents a number; clubbed with all the leading periodicals at reduced rates. Specimen number sent for examination to any address FREE on receipt of two stamps. Address,

S. R. WELLS, 389 Broadway, N.Y.

ALCOTT'S LATHES for Broom, Fork, Hoe, and Rake Handles, Chair Rounds, &c.
HILLS & HOAG, 32 Court and St., New York.

PLATINUM. H.M. RAYNOR, 25 Bond st., N. Y.
For all Laboratory and Manufacturing purposes.

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



Reynolds'
TURBINE WATER WHEELS.

The Oldest and Newest. All others, only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch, reliable, economical power. Beautiful pamphlet free. GEO TALLCOT, 96 Liberty st., New York.
Gearing, Shafting.

STEAM
PUMPING MACHINERY

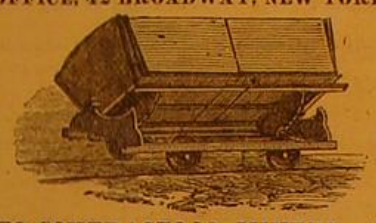


INDEPENDENT
BOILER FEEDER.
Works Hot and Cold Water.

LARGE AND SPLENDID
Illustrated Catalogue,
Sent Free on Application.

Cope & Maxwell Man'fg Company,
118, 120 & 122 East Second St.,
CINCINNATI, O.

Peteler Portable Railroad Company,
OFFICE, 42 BROADWAY, NEW YORK.



TO CONTRACTORS, MINERS, etc.

By this invention one horse does the work of ten, and one man the work of eight.
The great labor-saving invention of the age.
CARS AND TRACKS FOR SALE.
Samples at the office. New Illustrated Circulars free. State Rights for sale.

First Premium, American Institute, 1871.

MICROSCOPES, Magnifying Lenses, etc., for Botanical, Mineralogical, and Scientific Investigations in general. Illustrated Price List free to any address. T. H. McALLISTER, Optician 49 Nassau st. N.Y.

MASON'S PAT'T FRICTION CLUTCHES are manufactured by Volney W. Mason & Co., Providence, R. I. Agents, R. BROOKS & CO., 123 Ave. D, New York; TAPLIN, RICE & CO., Akron, Ohio.

THE "PHILADELPHIA"
HYDRAULIC JACK.

PISTON guided from both ends; all working parts guarded from dust; single or double pumps cylinders, shafts, rocker arms, pistons, etc., entirely steel. No. 14 N. 5th st., Philadelphia, / No. 42 Cliff st., New York. / PHILIP S. JUSTICE.

AMERICAN GRAPHITE CO.,
24 CLIFF ST., NEW YORK.
MINES AND WORKS, TICONDEROGA.
Standard unequaled grades **PLUMBAGO** perfected expressly for
Stove Polish; Glazing Powder, Shot, &c.; Paint, Crucibles, Pencils, Electrotyping, Piano and Organ action, and for *lubricating machinery of every description.*
Grades for Special Uses prepared to order.

PATENTEES,

WHO WISH TO REALIZE PECUNIARY benefit from their inventions, either by sale of their rights, or parnership with capitalists, are invited to send for our explanatory circular. Many valuable labor saving inventions are lying dormant which might realize a fortune for their owners, if brought properly before the public. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall Street, New York.

PROPELLER PUMPS.
Any capacity and elevation. See Sci. Am., Aug. 19, '71. W. B. BUCK, Sec., 67 N. Front St., Philadelphia, Pa.

BELT FASTENER.—A new and superior Belt Fastener, just patented, simple in construction and cheaply made. The subscriber, lacking facilities for manufacturing, will dispose of rights, or the entire patent, on reasonable terms. Address M. OLMSTEAD, Patentee, Alum Creek, Bastrop county, Texas.

SHAFTING with PATENT HANGERS
A Specialty, also Power Looms, Spooling, Winding, Reaming & Sizing Machines of latest improvements, manufactured by THOS. WOOD, 2106 Wood st., Phila., Pa.

E. M. MAYO'S BOLT CUTTER, patented in 1867, improved in 1871, is the best in use. Send for illustrated Circular. Cincinnati, Ohio.

Trade-Mark Patents.

MUNN & CO. desire to call the attention of manufacturers and business men generally, to the importance of the law of patents, as applied to trade-marks for business purposes.

Any person, firm, or corporation, domiciled in the United States, or in any foreign country affording similar privileges to citizens of the United States, can obtain the right to the exclusive use, for THIRTY YEARS, of any TRADE-MARK, consisting of any new figure, or design, or any new word, or new combination of words, letters, or figures upon their manufactures.

This protection extends to trade-marks already in use or any length of time, or about to be adopted.

Full information on this important subject can be obtained by addressing

MUNN & CO.
37 Park Row, New York.

Canadian Inventors,

Under the new Patent Law can obtain patents on the same terms as citizens.

For full particulars address

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

PATENT BANDSAW MACHINES



Of the most approved kinds, of various sizes, to saw bevel as well as square, without inclining the table, by **FIRST & PRYIBIL**, 452 to 456 Tenth ave., New York. Price $250, $275, $350, and $400. At present (Oct. 16), there are in operation, in this city alone, 88 of our machines. Send for circular. Manufacture, also an improved saw-filing apparatus; price, $30. Have also on hand a large stock of best FRENCH BANDSAW BLADES.

Figures will not lie!
How Large Fortunes are made!
FACTS FOR THE PEOPLE.

SEE the prices at which four of the leading Sewing Machines are sold in the UNITED STATES, and ENGLAND.

	Price in England.	In the U. S.
Wheeler & Wilson	$45.00	$85.00
New Singer - -	32.50	65.00
Elias Howe - -	35.00	65.00
Wilson Shuttle -	40.00	45.00

The above Prices are for exactly the same classes of machines as sold in both Countries. There is scarcely any difference in the cost of material and labor in any of the above named machines.

AFFIDAVIT—W. G. Wilson, President of the Wilson Sewing Machine Co., personally appeared before me, and made oath that the above prices are correct, and taken by him from Circulars published in the United States and England under the corporate names of the Companies manufacturing said machines.

FRED. SMITH,
Clerk of the Court of Common Pleas of Cuyahoga Co., O.

The WILSON SEWING MACHINES are for Sale in most every County in the United States, and
No. 707 BROADWAY, NEW YORK.

Washington Iron Works,
MANUFACTURERS of Steam Engines and Boilers, Saw Mills, Flouring Mills, Sugar Cane Mills, White's Patent Double Turbine Water Wheel, Gray's Patent Cotton and Hay Press, Baker's Anti-Friction Lining Metals, and American White Brass, Iron and Brass Castings, and general Machinery. Send for Circular to Office, 60 Vesey st., New York.

PATENT IMPROVED
VARIETY MOLDING MACHINERY,
And Adjustable
CIRCULAR SAW BENCHES.
For Machines and information, address
J. P. GROSVENOR, Lowell, Mass.

Chemical Analysis. Address Prof. J. C. DRAPER, 429 Lexington Avenue, New York City.

MODELS, PATTERNS, EXPERIMENTAL and other machinery. Models for the Patent Office built to order by HOLSKE MACHINE CO., Nos. 528, 530 and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

PATENT Emery Grinders, Twist Drills, Fluted Hand Reamers, &c., unsurpassed for elegance of design, workmanship, and durability. These indispensable Tools can be purchased of us for less than half their cost in an ordinary machine shop. Illustrated catalogue free. AMERICAN TWIST DRILL CO., Woonsocket, R. I.

Niagara Steam Pump
CHAS. B. HARDICK,
23 Adams st., Brooklyn, N. Y.

SHINGLE AND BARREL MACHINERY.—Improved Law's Patent Shingle and Heading Machine, simplest and best in use. Also, Shingle Heading and Stave Equalizers, Stave Planers, Turners, etc. Address TREVOR & Co., Lockport, N.Y.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK,
P. O. Box 1,057 Boston, Mass.
N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

NEW CENSUS AND PATENT LAWS

A new edition of the Patent Laws, with official rules for proceeding before the Patent office, etc., including Census for 1870, complete. It shows the population by counties of all the States and Territories, and population of cities of over 10,000 inhabitants. Important to every patentee who has rights to sell. It enables him to calculate the value of territory, by the population.

Price, bound, 25 cents. Mailed on receipt of price.
Address

MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
New York City.

THE WOODWARD
STEAM PUMP.

Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Dealers in Wrought-Iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, and Public Buildings heated by Steam, Low Pressure. Woodward Co., 76 and 78 Center st., N.Y.

MACHINERY, NEW and 2d-HAND.... Send for Circular. CHAS. PLACE & CO., 60 Vesey st., New York.

PORTABLE STEAM ENGINES, COMBINING the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than 900 being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO., Lawrence, Mass.
46 Cortlandt st. New York.

$375 A MONTH—Horse and outfit furnished. Address NOVELTY CO., Saco, Me.

HINKLEY KNITTING MACHINE

The Simplest, Cheapest, and Best in use! Has but one needle! A Child can Run it. **Agents wanted in every Town.** Send for Circular and Sample Stocking, to HINKLEY KNITTING MACH. CO., Bath, Me.

1832. SCHENCK'S PATENT. 1871.
WOODWORTH PLANERS
And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y., and 118 Liberty st., New York.

LATHE CHUCKS—HORTON'S PATENT from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks Conn.

THE CELEBRATED
Cold-rolled Shafting.

THIS Shafting is in every particular superior to any turned Shafting ever made. It is the most ECONOMICAL SHAFTING to buy, being so very much stronger than turned Shafting. Less diameter answers every purpose causing a great saving in coupling, pulleys and hangers. It is perfectly round, and made to Whitworth Gage. All who give it a trial continue to use it exclusively. We have it in large quantities. Call and examine it, or send for price list.
Address GEORGE PLACE & CO.,
126 and 128 Chambers st., New York.

Sturtevant Blowers.

THESE are in every particular the best and most perfect Blower ever made. A full assortment of every size on hand, ready to deliver.
Address GEORGE PLACE & CO.,
126 and 128 Chambers st., New York.

N. Y. Machinery Depot.

GEORGE PLACE & CO., Manufacturers and Dealers in Wood and Iron Working Machinery, of every description, Stationary and Portable Engines and Boilers, Leather and Rubber Belting, and all articles needful in Machine or Railroad Repair Shops. 126 and 128 Chambers st., New York.

Andrew's Patents.

Noiseless, Friction Grooved, or Geared Hoisters, suited to every want.
Safety Store Elevators. Prevent Accident, if Rope, Belt, and Engine break.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical.
Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

P. BLAISDELL & Co.,
MANUFACTURERS OF FIRST CLASS **MACHINISTS' TOOLS.** Send for Circulars.
Jackson st., Worcester, 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, Kloman & Co., Union Iron Mills, Pittsburgh, Pa.

SWIVEL HEAD ENGINE LATHES
GAGE MACHINE WORKS.
WATERFORD, N.Y.

WOODBURY'S PATENT
Planing and Matching
and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, 91 Liberty street, N. Y.;
Send for Circulars. 87 Sudbury street, Boston.

Machinist's Tools.

AT low prices, 97 to 113 R. R. Ave., Newark, N. J. E. & R. J. GOULD successors to Gould Machine Co.

WOOD-WORKING MACHINERY GENERALLY. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass.
WITHERBY RUGG & RICHARDSON.

$150 A MONTH! EMPLOYMENT
EXTRA INDUCEMENTS!
A premium HORSE and WAGON for Agents. We desire to employ agents for a term of seven years, to sell the Buckeye $50.00 Shuttle Sewing Machine. It makes a stitch alike on both sides, and is the best low-priced licensed machine in the world. W. A. HENDERSON & CO., Cleveland, Ohio, or St. Louis, Mo.

MACHINISTS.
Illustrated Catalogue and Price List of all kinds of small Tools and Materials sent free to any address. GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.

Milling Machines.

STANDARD, UNIVERSAL, INDEX AND PLAIN, in every variety, of unequalled design and first class workmanship. Send for illustrated catalogue to the BRAINARD MILLING MACHINE COMPANY, 80 Milk Street, Boston. Works at Hyde Park.

AGENTS WANTED. Agents make more money at work for us than at anything else. Particulars free. G. STINSON & Co., Fine Art Publishers, Portland, Me.

$425 A MONTH! Horse and carriage furnished. Expenses paid. H. B. SHAW, Alfred, Me.

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction, manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield street, Boston, Mass. Illustrated catalogue sent free on application.

FOOT LATHES, best in the country. WOODMAN & PIKE, Lake Village, N. H. Circulars free.

DANIEL'S PLANER,
75 feet long and 3 feet wide, for sale, at MACHINERY DEPOT of S. A. WOODS, 91 Liberty Street, New York.

CINCINNATI BRASS WORKS.—Engineers and Steam Fitters' Brass Work. Best Quality at very Low Prices. F. LUNKENHEIMER, Prop'r.

BURDON IRON WORKS.—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines and Boilers, of all kinds, Sugar Mills, Screw, Lever, Drop, & Hydraulic Presses, Machinery in general. HUBBARD & WHITTAKER, 10 Front st., Brooklyn.

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 st. New York. 11 1

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever invented, with Overwhelming Testimony in its favor, send for new illustrated pamphlet (& pp.) to Messrs. HEALD, SISCO & CO. Baldwinsville, N. Y.

SMITHSONIAN INSTITUTION
BIBLIOTECA BOX XXV
No. 110623

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

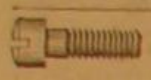
VULCANIZED RUBBER

Adapted to Mechanical Purposes. New York Belting and Packing Co., 37 & 38 Park Row.

ASPHALTE ROOFING FELT.



A WELL tested article of good thickness and durability, suitable for steep or flat roofs; can be applied by an ordinary mechanic or handy laborer. Send for circular and samples to E. H. MARTIN, 70 Maiden Lane, and 9 Liberty Street, N.Y.,



MILLED MACHINE SCREWS of superior quality made to order from sample or drawing.
BROWN & SHARPE M'FG CO.,
Providence, R. I.

AMERICAN
OIL FEEDERS,

For Shafting, Engines, &c. The subscriber gives notice to have his rights to make, use, and sell, respected under reissued patents of Dec. 13, 1871, and Oct. 17, 1871. The New York, Cincinnati, and Eastern, glass oil cups are most of them direct infringements of the above patents. The American Oil Feeder is the best oiler. References—Wm. Sellers & Co.; American Twist Drill Co., &c. Send for Price List. J. B. WICKERSHAM, removed to 1005 Ridge Avenue, Philadelphia, Pa.

Pennock's Patent
Iron Bending Machine,

INVALUABLE in Car and Machine Shops. Saves several times its cost in one year's use. Instantly adjustable to thickness, and bends at any desired angle. Price, $150. Address
THE PENNOCK MANUFACTURING CO.,
Kennett Square, Chester Co., Pa.

KIDDER'S PASTILES—A Sure Relief for Asthma. STOWELL & CO., Charlestown, Mass.



BABCOCK
Fire Extinguisher.
"ABSOLUTELY THE BEST PROTECTION AGAINST FIRE!"
Send for "It's Record."
F. W. FARWELL,
Secretary.
OFFICES:
407 BROADWAY, N. Y.
656 WABASH AVENUE, CHICAGO.

SCHLENKER'S PATENT
BOLT CUTTER
NEW INVENTION. ADDRESS
HOWARD IRON WORKS, BUFFALO, N.Y.

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, the Lowell Tests.
For Report of tests at Lowell, with Diagrams and Tables of Power address
THE SWAIN TURBINE CO.,
North Chelmsford, Mass.



LUBRICATORS.
DREYFUS' celebrated Self-acting Oilers, for all sorts of Machinery and Shafting, are reliable in all seasons, saving 75—95 per cent. The Self-acting Lubricator for Cylinders is now adopted by over 80 R. R. in the U.S., and by hundreds o stationary engines. Send for a circular to NATHAN & DREYFUS, 108 Liberty St., N.Y



ORIENT SAFETY LAMPS,
Entirely of metal, are the only lamps in use which can neither break, leak, nor explode. Are ornamental and cheap. Adapted to all household uses; also, to stores, factories, churches, &c.
AGENTS MAKE $10 A DAY
SELLING THESE LAMPS.
Manufactured by
WALLACE & SONS,
89 Chambers St., 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 lists mailed on application to
JONES & LAUGHLINS,
129 Water street, Pittsburgh, Pa.
Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 128 Chambers street, N. Y.

THE BEST SAW GUMMER OUT, ONLY $15; Emery Grinders, at $25, $40, and $100; Diamond Turning Tools, $15; Solid Emery wheels of all sizes; The above standard goods are *all* of our own manufacture. Address THE TANITE CO., Stroudsburg, Monroe Co., Pa.

A. S. CAMERON & Co.,
ENGINEERS,
Works, foot of East 23d Street, New York City.
STEAM PUMPS,
Adapted to every Possible Duty.—Send for a Price List.

THE BAND SAW!
Its ORIGIN and
HISTORY, with Engravings of the OLDEST MACHINE, sent gratis. Address RICHARDS, LONDON & KELLEY, 22d st. (above Arch), Philadelphia.

PATENT IRON RIM MOULDERS RIDDLES and SIEVES. Send for circular. Made only by HORTON & MARIE, Peekskill, N.Y.

NOTICE.
THE MONTREAL CITY PASSENGER RAILWAY COMPANY of Montreal offers the following premiums for an invention by means of which its Cars and Sleighs can be heated with perfect safety to Passengers and Vehicles:
First Premium.....$100 00
Second " 50 00
For further particulars, apply to the Company, at its office, in Montreal, Canada; and all decisions must be arrived at not later than the 10th March, 1872.
W. D. DUPONT, Secretary.
Montreal, 8th December, 1871.

PREVOST'S ELECTRO-
Magnetic Motor Co
To Telegraph Co's., Gilders, Silver Smiths, Physicians, Professors of Science, etc. A new recoil apparatus is presented for electric light for light houses and public works. The services of M. Meynial, maker of mathematical instruments, and former manager of the electric light at the Grand Opera of Paris, are secured. Also, Proprietors of Prevost's new battery, and Barjon's new galvanic fluid: No. 1 Battery, 6 in., $5—No. 2, 8 in., $6—Fluid in Carboys, 7c. per lb. Both possess continuity, economy, strength, and are odorless. Address Company, 36 Amity Street, New York. E. Prevost, Superintendent.

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

TODD & RAFFERTY, Manufacturers of Steam Engines, Boilers, Flax, Hemp, Tow Bagging, Rope and Oakum Machinery. Steam Pumps and Governors always on hand. Also Agents for the New Haven Manufacturing Co.'s Machinists' Tools. ☞ We invite especial attention to our new, Improved, Portable Steam-Engines. Warerooms, 10 Barclay st.; Works, Paterson, N.J.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

HARTFORD
Steam Boiler
INSPECTION & INSURANCE CO.
CAPITAL.....$500,000
ISSUES POLICIES OF INSURANCE, after a careful inspection of the Boilers, covering all loss or damage to
Boilers, Buildings, and Machinery,
—ARISING FROM—
STEAM BOILER EXPLOSIONS.
The business of the Company includes all kinds of
STEAM BOILERS,
STATIONARY, MARINE, AND LOCOMOTIVE.
Full information concerning the plan of the Company's operations can be obtained at the
HOME OFFICE, in Hartford, Conn.,
or at any Agency.
J. M. ALLEN, President. C. M. BEACH, Vice Pres.
T. B. BABCOCK, Secretary.

BOARD OF DIRECTORS:
J. M. Allen.....President.
Lucius J. Hendee.....President Ætna Fire Ins. Co.
F. W. Cheney....Ass't Treas. Cheney Bros. Silk Mfg. Co.
John A. Butler.....Pres. Conn. River Banking Co.
Charles M. Beach.....of Beach & Co.
Daniel Phillips.....of Adams Express Co.
G. M. Bartholomew.....Pres't American Nat'l Bank.
R. W. H. Jarvis.....Pres't Colt's Fire-Arms Mfg. Co.
E. M. Reed.....Sup't Hartford & N. Haven Railroad.
Hon. Chas. M. Pond.....Tres. State of Connecticut.
T. O. Enders.....Sec. Ætna Life Ins. Co.
Leverett Brainard.....of Case, Lockwood & Co.
GEN. WM. B. FRANKLIN, Vice Pres't Colt's Pat. Fire-Arms Man'f'g Co.
Austin Dunham.....Pres. Willimantic Linen Co.
Geo. Crompton.....Crompton Loom Works, Worcester.
Earl P. Mason...Pres't Prov. & Wor. R. R., Providence.
Wm. Adamson, of Baeder, Adamson & Co., Philadelphia.
New York Office.....239 Broadway.
THOS. S. CUNNINGHAM, Manager.
R. K. McMURRAY Inspector.

138 & 140 Fulton Street, NEW YORK. **FREEMAN & BURR.** 138 & 140 Fulton Street, NEW YORK.
CLOTHING WAREHOUSES.
EVERY NOVELTY OF STYLE, AND TEXTURE OF MATERIAL, in SUITS, OVERCOATS, and CLOTHING of every description.

SUITS, $15.	OVERCOATS, $8.	BOYS' SUITS, $5
SUITS, $20.	OVERCOATS, $10.	BOYS' SUITS, $8.
SUITS, $30.	OVERCOATS, $15.	BOYS' SUITS, $10.
SUITS, $40.	OVERCOATS, $20.	BOYS' SUITS, $15.
SUITS, $50.	OVERCOATS, $30.	BOYS' SUITS, $20.
SUITS, $60.	OVERCOATS, $40.	BOYS' SUITS, $25.

ORDERS BY LETTER PROMPTLY FILLED. Thousands avail themselves of our NEW SYSTEM OF SELF-MEASURE, enabling parties in any part of the country to order Clothing direct from us with the certainty of receiving the most PERFECT FIT attainable.
RULES FOR SELF-MEASURE, Samples of Goods, Price List, and Fashion Sheet, SENT FREE on application.

WIRE ROPE.
JOHN A. ROEBLING'S SONS,
MANUFACTURERS, TRENTON, N. J.
FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse No. 117 Liberty street.

CARBOLIC SALVE (HEALING COMPOUND. C.S.)
CURES Cuts, Burns, Wounds, and all disorders of the Skin. Recommended by Physicians Sold by all Druggists, at 25 cts. JOHN F. HENRY, Sole Proprietor, 8 College Place, New York.

American Saw Co., Manufacturers of



And Perforated Circular and Long Saws. Also Solid Saws of all kinds. No. 1 Ferry st., cor. Gold street, New York. Branch Office for Pacific Coast, No. 606 Front street, San Francisco, Cal.

IRON PLANERS, ENGINE LATHES Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO. New Haven, Conn.



BEST DAMPER REGULATOR for Steam Boiler. Send for Circulars.
MURRILL & KEIZER, Balt., Md.

L. L. SMITH & CO.,
Nickel Platers,
6 HOWARD ST., New York,
Between Elm and Centre.

Diamond-Pointed STEAM DRILLS.

THE adoption of new and improved applications to the celebrated Leschot's patent, have made these drills more fully adaptable to every variety of ROCK DRILLING. Their unequalled efficiency and economy are acknowledged, both in this country and Europe. The Drills are built of various sizes and patterns; WITH AND WITHOUT BOILERS, and bore at a uniform rate, of THREE TO FIVE INCHES PER MINUTE in hard rock. They are adapted to CHANNELLING GADDING, SHAFTING, TUNNELLING, and open cut work; also, to DEEP BORING FOR TESTING THE VALUE OF MINES AND QUARRIES. TEST CORES taken out, showing the character of mines at any depth. Used either with steam or compressed air. Simple and durable in construction. Never need sharpening. Manufactured by
THE AMERICAN DIAMOND DRILL CO.,
No. 61 Liberty St., New York

L. W. Pond---New Tools.
EXTRA HEAVY AND IMPROVED PATTERNS.
LATHES, PLANERS, DRILLS, of all sizes; Vertical Boring Mills, ten feet swing, and under. Milling Machines, Gear and Bolt Cutters; Hand Punches and Shears for Iron.
Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.
A. C. STEBBINS, New York, Agent.

McNab & Harlin Man'f'g. Co.
Manufacturers of
BRASS COCKS, PLUMBERS' BRASS WORK, Globe Valves, Gauge Cocks, Steam Whistles, and Water Gauges, Wrought Iron Pipe and Fittings, BRASS AND COMPOSITION CASTINGS.
NO. 56 JOHN STREET, NEW YORK.

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

Fifteen Boiler Explosions
OCCURRED LAST MONTH IN THE UNITED STATES, killing and maiming a large number of persons, and destroying valuable property Had the
Harrison Safety Boiler
been employed, instead of the dangerous flue, tubular and other styles of Steam Generators, the loss of life, limb and property would have been saved.
THE HARRISON SAFETY
is the only Boiler that is *perfectly safe* from Disastrous Explosion. It is economical, easily managed, and a rapid steam generator. Manufactured at
THE HARRISON BOILER WORKS,
PHILADELPHIA, PA.
JOHN A. COLEMAN, Agent, 110 Broadway, New York, and No. 139 Federal Street, Boston, Mass.

TRADE MARK
Union Stone Co.,
Patentees and Manufacturers of
ARTIFICIAL STONE & EMERY WHEELS,
and Artificial Stone and Emery Wheel Machinery and Tools. Send for circular. 29 Kilby Street, BOSTON, MASS.

WIRE ROPE.
STEEL, CHARCOAL and B. B., of the very best quality, suitable for Ships, Rigging, Suspension Bridges, Guys, Derricks, Inclined Planes, Hoisting purposes, &c. A Large Stock *constantly on hand* at
JOHN W. MASON & CO.'S,
33 Broadway, New York.

SCIENTIFIC AMERICAN
PROSPECTUS
For 1872.

The SCIENTIFIC AMERICAN is the largest, the best the cheapest, and most Popular Journal in the world devoted to Invention, Mechanics, Manufactures, Art Science, and General Industry, and has attained a wider circulation than all others of its class.

With the New Year the Publishers intend to increase its value far beyond what it has been in the past. The Editors will be assisted by many of the Ablest Writers, and, having access to all the leading Scientific and Mechanical Journals of Europe, the columns of the SCIENTIFIC AMERICAN will be constantly enriched with the choicest information which they afford. It will be the constant study of the Editors to present all subjects relating to the Arts and Sciences in PLAIN, PRACTICAL AND POPULAR language, so that all may profit and admire stand.

A year's numbers contains over 800 pages and makes two volumes, worth as a book of references, ten times the subscription price.

ENGRAVINGS
by our own artists, will not only be given, of all the best inventions of the day, but especial attention will also be directed to the description and illustration of
LEADING MANUFACTURING ESTABLISHMENTS, MACHINES, TOOLS AND PROCESSES.

Inventors and Patentees
will find in each number an official List of Patents, together with descriptions of the more important Inventions. We shall also publish reports of decisions in Patent Cases and points of law affecting the rights and interests of Patentees.

THE NEW VOLUME OF
SCIENTIFIC AMERICAN
commenced JANUARY FIRST; therefore, now is the time to organize Clubs and to forward subscriptions. Clubs may be made up from different post offices.

TERMS FOR 1872.

One copy, one year		$3.00
One copy, six months		1.50
One copy four months		1.00
CLUB RATES	Ten copies, one year, each $2.50	25.00
	Over ten copies, same rate, each	2.50
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress,"		4
One copy of Scientific American for one year, and one copy of "Science Record,"		4.00
Ten copies of "Science Record," and ten copies of the Scientific American for one year,		35.00

CLUB PREMIUMS.

Any person who sends us a yearly club of ten or more copies, at the foregoing club rates, will be entitled to one copy, gratis, of the large steel plate engraving, "Men of Progress."

Remit by postal order, draft or express.

The postage on the Scientific American is five cents per quarter, payable at the office where received. Canada subscribers must remit, with subscription, 25 cents extra to pay postage.

Address all letters, and make all Post Office orders or drafts payable, to

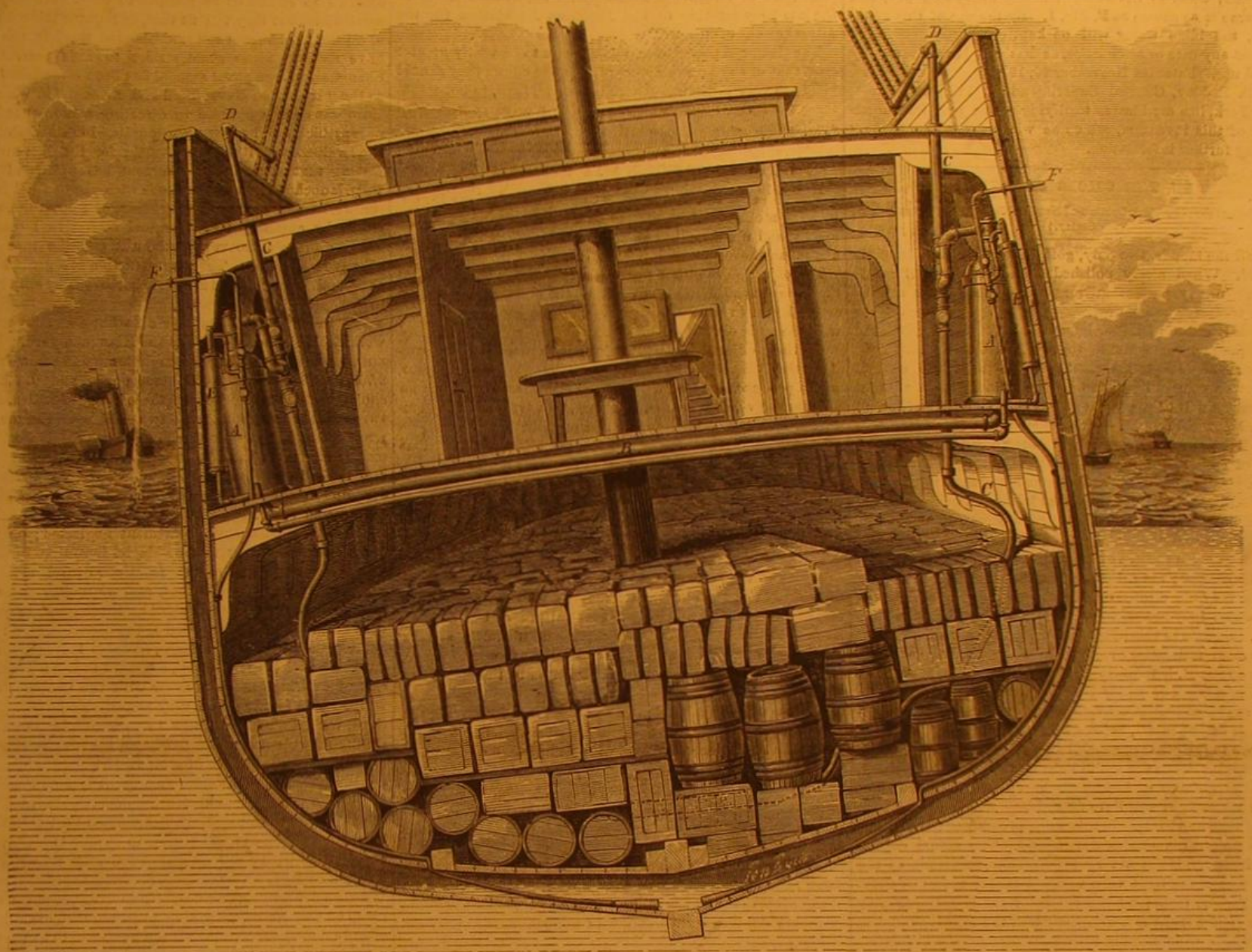
MUNN & CO.,
37 PARK ROW, NEW YORK

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. XXVI.—No. 2. [NEW SERIES.] NEW YORK, JANUARY 6, 1872. $3 per Annum. [IN ADVANCE.]



THIERS' PATENT SHIP VENTILATOR, FOG ALARM, AND BILGE PUMP.

Ship Ventilator, Fog Alarm, and Bilge Pump.

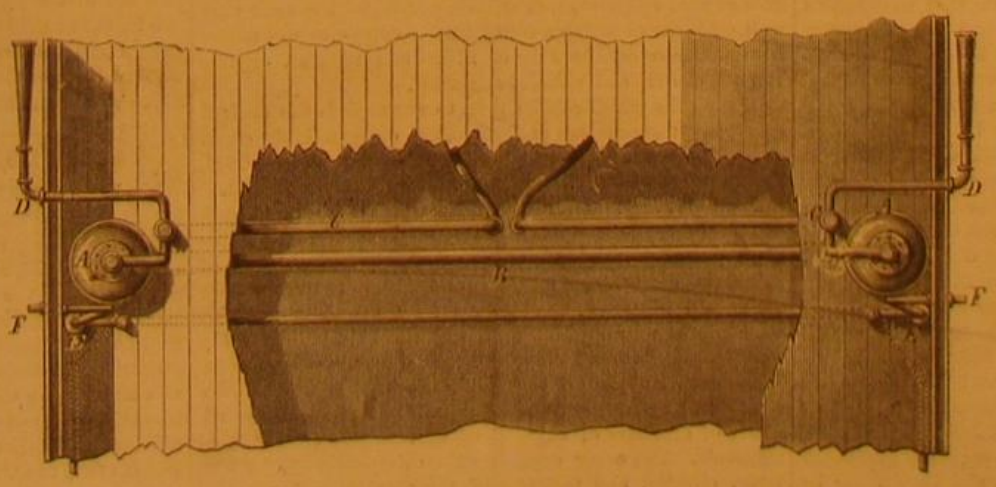
We regard the invention which we herewith illustrate as one of great importance, especially in a sanitary point of view. It has, however, advantages, besides its power of keeping ships in clean and healthy condition, which will be noticed in their proper place.

It may be necessary to explain to the general reader that beneath the hold of vessels is left a space, the primary object of which is to collect and hold the water which enters the vessel through leakage, and from which this water can be removed by pumping. This space is continuous with a space left between the outer and inner planking of the sides of the vessel. The water which collects in the bottom of the vessel is called bilge water. During a voyage, this water always becomes contaminated more or less with decaying organic matters, which get into it in all manner of ways, such as slops from the cook's galley, pieces of meat and bread, dead rats, etc., which decay and taint the water, giving off foul, fetid, and noxious effluvia that oftentimes taint all the air in the vessel. It is well settled that the deadly disease known as ship fever is caused by the foul air thus engendered, and also that this favors the progress of contagious diseases, especially yellow fever, remarkable outbreaks of which have been observed in people exposed to the smell of bilge water when pumped from vessels. The apparatus, when once introduced will, indure as longas the vessel without expense for repairs.

Perhaps, in the whole range of disgusting odors, there is none more intensely nauseating than this, and the effect of such foul air, even when distributed throughout a vessel in small quantity, cannot be other than dangerous to the health of crew and passengers.

The complete and constant removal of this foul air, accomcomplished by the invention under consideration, not only greatly improves the sanitary condition of vessels, but gives the air, in all parts, a sweetness and purity which has elicited the highest praise from those who have experienced the superior comfort of ships to which it has been applied.

Freights are often seriously damaged by heating in the holds of vessels which would be saved could a constant circulation be maintained through them. Especially is this the case with grain in bulk, to the aeration of which this improvement is admirably adapted. These, and other advantages which will appear in our explanation of the operation of the device, are the grounds upon which we base our opinion of the improvement.



The principle of pumping out the foul air from the bottom of the vessel, allowing pure air to percolate down through the interstices of the cargo to supply the place of that pumped out, is undoubtedly better than that of forcing down air to displace the vitiated atmosphere below decks. This principle is adopted in Mr. Thiers' invention, the device being automatic in its action, and working by and with the slightest rocking motion of the vessel.

Fig. 1 is a cross section of a vessel with the improvement attached, with a perspective view of the apparatus. Fig. 2 is a top view with a part of the deck broken away.

Two metal chambers, A, Figs. 1 and 2, are connected at the bottom by a pipe, B, which is filled with water. From the tops of these chambers proceed pipes, C, which penetrate to the lower part of the hold. These pipes have check valves, which permit air to flow through them into the chambers, A, but keep it from returning by the same route, while other check valves allow it to issue upward and out of the mouths, D, of the pipes, into the external air.

To the mouths, D, may be attached fog horns, as shown, which can be taken off or put on, as may be desired. When these horns are in the position shown, they sound a continuous and powerful alarm, which may be heard miles away from the ship.

The motion of the air is effected by the rocking of the vessel, as we have stated above; for whenever the vessel rolls to one side, the water column in B runs, by its gravity, to the lower end of the tube. This creates a partial vacuum in the chamber at the higher end, which the pressure of the atmosphere in the hold acts to supply through the lower part of the pipe, C. When the vessel rolls again to the other side, the air which ascended into the chamber is pressed upon by the water column; and, as it cannot return downward, through C, on account of the check valve, it is forced upward and outward through the upper part of the pipe, C. The rapidity with which the air will be changed in the vessel, by

this simple means, depends solely upon the capacity of the apparatus. A change of one inch or even less, in the relative hights of the sides of the vessel above the water line, sets the apparatus at work, so that there could rarely be a sea so calm as to prevent its action.

The efficiency of the apparatus in ventilating ships has been fully proved by actual use in vessels making long voyages, and thus the value of the improvement is attested by both theory and practice. By substituting, in a smaller but similar apparatus (the chambers of which are marked E in the engraving), a column of quicksilver for the column of water which in the ventilating apparatus connects the bottoms of the chambers, a depression of fifteen inches of either side of the vessel will, with the corresponding elevation on the other side, raise water to the hight of nearly thirty-four feet, and discharge it as shown at F, Fig. 1. By the use of this apparatus, the bilge water will be kept constantly discharged without any care or attendance, as has also been proved by actual use. Patented November 29, 1870.

P. D. Roddey, General Superintendent, 127 Pearl street, New York, has certificates testifying to the practical importance of this invention, which he will exhibit to parties requiring further information.

ON THE COLORS OF METALS.

Read before the New York Lyceum of Natural History, by Professor C. A. Seeley.)

Of all the metals, two only, gold and copper, are distinctly colored. When nicely polished, the surfaces of all metals become nearly perfect mirrors, reflecting almost all the light, whatever be its tint, which falls upon them, and the chemically clean matte surfaces of all metals except gold and copper appear white to the eye. Yet the white light from such surfaces is invariably contaminated with a small amount of colored light, and this colored light is without doubt the result of a normal and ordinary decomposition of the incident white light. If the greater part of the incident white light were in the same way decomposed, the metals instead of appearing to us white, would shine with splendid colors. The colors of natural objects are always mixed with white light, that is, the white light falling on the surfaces of natural objects is never completely decomposed; and in this regard the case of the metal shows a difference in degree and not in kind. To the eye of the scientist, then, all the metals may be colored; the colors are ordinarily invisible simply because they are diluted or overpowered by the white light with which they are mingled. With the explanation thus given, I assume in this paper that all metals are colored.

The most satisfactory method, of rendering the colors of metals apparent, heretofore proposed consists in repeatedly reflecting a beam of white light from the metallic surface under examination. A convenient arrangement is two parallel plates of the metal, between which the light is reflected from one to the other at a small angle of incidence.

At each incidence the white light is partially decomposed, and if the number of incidences be sufficiently multiplied, all the white light will have disappeared, and only the pure colored rays be visible. In this way the colors of most of the metals have been exactly determined. The actual experiment, however, is not a very brilliant one, inasmuch as the larger part of the light with which it begins is lost by gradual diffusion; especially the colored light is lost, probably for the reason that the decomposition of the white light takes place within the reflecting surface.

Another method of developing the true colors has recently occurred to me, and it is the main purpose of this paper to describe it. I present first a few theoretical considerations.

When white light is decomposed by a colored body, the reflected colored ray is complementary to that part of the white light which is transmitted or absorbed; if a colored body be seen both by reflected and transmitted light, the colors so seen should be complementary, or an approach to being so.

These statements seem to have many exceptions, as, for example, the colored transparent salts of metals show the same color by reflected as by transmitted light. But I am persuaded that a careful discussion of the case would show that such exceptions are not well taken, and that this apparent discrepancy with the statements may be consistently explained away; thus it may be shown that the supposed reflected light of the exceptions is really a part of the transmitted light which has been returned by internal reflection; such mixture of the transmitted with a reflected light implies a considerable degree of transparency of the substance under test. The luster and whiteness of metals have a close relation to their opacity and density; perhaps the relation is that effect and cause. If the opacity and density of metals be progressively decreased, the optical metallic character will in the same ratio be diminished; the true color by reflected light would become brighter and freer from white light till it came to be contaminated with more and more of the returned transmitted light. Such changes are beautifully exemplified by the gradual additions of a solvent to fuchsin or other aniline colors in crystals. Aniline colors, Prussian blue, indigo, carmine, and all other dye stuffs which have very great tinctorial powers, have the metallic lustre, and their color by transmitted light is nearly complementary to that by reflected light.

In their relation to light, I suggest that metals are closely analagous to those dye stuffs which show a bronzed surface by reflected light. Metals are more perfectly bronzed because their opacity and density are greater, or, in other words their tinctorial powers are greater.

It will be seen that the above theory requires for its demonstration a transparent diluent or solvent of metals, which shall have no chemical action on them. Such a solvent, for a few of the metals, is anhydrous liquid ammonia. If this menstruum be gradually added to the silver white alkali metals, the whiteness disappears and is replaced by copper redness, which at last gives place to the blue of transmitted light. The changes of tint in this case from copper redness to the transparent blue may be exactly repeated by treating pure aniline blue with alcohol. The alkali metals are then copper red in reflected light, and, by transmitted light blue. In this connection, the fact that the salts of copper are blue is, perhaps, of some significance. The solution of metals without definite chemical action is almost a new idea in chemistry. Faraday made the first approach to it by showing that the color of ruby glass is due to metallic gold; and it received a final and definite shape in a demonstration of the solvent properties of anhydrous liquid ammonia, which I made at the late Troy meeting of the American Association for the Advancement of Science.

The tinctorial power of metals appears to be vastly greater than that of any known dye stuff, and the colors they should yield are very brilliant. There is reason, then, to hope that these facts about metals may some day receive some useful application.

KEITH'S IMPROVEMENT IN NICKEL PLATING.

The object of this invention is to prepare solutions for depositing nickel by electricity, to be used as a coating to other metals, and which will produce a deposit sufficiently flexible and tenacious for practical use.

The objection to nickel plated goods thus far has been that the deposit is so brittle that it cannot be bent, nor, on many articles, stand necessary wear even if not bent, and that it will also scale or peel off.

All these objections the inventor of the process under consideration claims to have overcome by his improvement, which produces the nickel plating so elastic and, at the same time, adhesive, that it may, he states, be advantageously employed even on the blades of knives or tools.

The nature of the invention consists in adding, to the various solutions of nickel, whether formed of single or double salts, materials which, by their presence, prevent the decomposition of the solution of the plating bath, and the decomposition of oxide of nickel and other impurities upon the articles receiving the coating of nickel.

The greatest care is necessary in the management of the solutions of nickel now used for plating, and in graduating the strength of the electric current to prevent decomposition of the solution, and consequent failure of the deposit. Even with the greatest care the coating of nickel is always brittle, and easily cracks and peels off when exposed to usage, on account of decomposition of the solution by the electricity causing the deposit.

For preventing this brittleness and otherwise improving the deposit, there is added, to the solution of nickel, one or more salts, either single or double, acid or neutral or associated, formed by the union of organic acids, acetic, citric, and tartaric, with the alkalies and alkaline earths, ammonia, soda, potassa, magnesia, or alumina. These additions will, it is asserted, counteract the tendency to decomposition of the solution by action of the electric current. The result is a deposit possessing elasticity, toughness, and all the hardness, brilliancy, and other qualities of pure nickel, with the property of adhesion, to the article upon which deposited, not possessed by nickel deposited from solutions not containing these additions.

The deposit made is particularly suited to polished steel and iron surfaces—for instance, cutlery and tools—though equally good for all other metallic surfaces.

These various organic acid salts may be added interchangeably and collectively, though the inventor prefers to use, in case of the double salts of nickel and alkalies and alkaline earths, the organic acid salts, which have for their bases the alkali or alkaline earth which is associated with the nickel in its double salt.

Thus, when using a solution of nickel and ammonia, an organic acid salt of ammonia is preferred, though the similar salts of soda and potash, or soda or potash will answer very well. In case of using a solution of a double salt of nickel and potassa or double salt of nickel and soda, an organic acid salt of soda and potash is selected.

Of the salts which can be used to accomplish the desired effect, the tartrates are preferable. A comparatively small quantity of the organic salts is necessary to be added, though more will not change the character of the deposit.

The following is an illustration, which the experienced electro plater can apply to all solutions of nickel. To twenty gallons of a solution in water, of the double sulphate of nickel and ammonia, of a gravity of 7° Baumé, add about one gallon of a solution of an equal gravity of neutral tartrate of ammonia in water. Mix well, and the bath will be ready after standing a few hours.

More or a little less of the addition does not injure the solution. This solution may be reduced, if necessary, by the addition of solutions of sulphate of ammonia and tartrate of ammonia. The other organic acid salts—namely, the acetates, citrates, and tartrates of the alkalies and alkaline earths—may be used instead with beneficial results.

These solutions may for some purposes be made alkaline by the addition of an alkali—for instance, in the electroplating of brass and iron, wherein local action would interpose—provided the solutions were left in an acid condition.

This invention was patented through the Scientific American Patent Agency, November 28th, 1871, by Mr. N. Shepard Keith, of New York city. If in practice it justifies the claims made for it, it will prove a most important addition to the science of electro metallurgy.

Celestial Engineering.

There are very few intelligent individuals in this country who are not aware that the inhabitants of the Celestial Empire—otherwise China—are an extremely ingenious and industrious people; but it is just as certain that accurate information, concerning the progress recently made in the arts and sciences by the Chinese, is confined to a very few. We believe, therefore, that the facts which we are about to place before our readers will possess the charm of novelty if of nothing else.

Recent advices which we have received from a perfectly trustworthy source go to show that the Chinese are determined that their nation shall not be left behind in the great race of improvement. Our dispatches are not sufficiently detailed to enable us at present to enter into very minute particulars, but they tell us that, as regards the construction of all the implements and munitions of warfare, the Chinese have recently made great strides towards perfection. At Shanghai, a large naval arsenal has been established, known as the "Kiangnan Naval Yard and Arsenal," in which many Europeans are employed in directing and instructing Chinese artificers and engineering pupils. In this establishment the liveliest activity has prevailed for the last two years. During that time, the government has built and successfully launched five gunboats, one with paddles and four with screws, having a gross measurement of 3,500 tuns, and propelled by engines of 550 nominal collective horse power. These gunboats are very well built, and the machinery is effective and good. Their construction is a great feat for a nation still looked upon as nearly barbarous by only too many in Europe.

But the five gunboats represent but a small part of the work done and being done at the Kiangnan yard. There is now, far advanced towards completion, a fine screw frigate of 2,700 tuns burden and 400 horse power, and the keel of a similar vessel has been laid; these frigates will each carry twenty-eight 40 pound and two 100 pound guns, all of wrought iron, and now in course of manufacture. All the marine engines for the boats and ships we have spoken of are made in the arsenal and dockyard. Besides several dredging machines, a large dry dock has also recently been constructed there.

Nor is the small arms department neglected; on the contrary, even more activity is displayed here than in the building yard. A staff of officers from our own Enfield factory has charge of the department, and we understand that the Martini-Henry rifle is now being turned out in quantities with great success. The head of the department, an English gentleman of much experience, has also invented and introduced a novel breech loader, intended to use a peculiar species of cartridge much in favor with the Chinese; and this weapon bids fair to give a very respectable target. Negotiations, we may add, are now in progress for the supply of rolling mill plant from England, and the best known machinery for the manufacture of gunpowder.

Although foreigners have at present almost the sole control of the various manufacturing departments at Kiangnan, the Chinese government are determined that this shall not be always the case; and in order to supply themselves at no distant date with a competent native staff, they have established a college, where Chinese students are instructed in the Western languages, engineering, navigation, naval architecture, and chemistry, by able professors. This college has already done good service, all the gunboats to which we have referred being entirely officered and manned by natives, who have acquitted themselves very respectably.

It is quite possible that China may yet play a very important part in the affairs of the world. Nothing stood so much in the way of her progress as the prejudices of the people. The wars which forced her to open some of her ports to the "barbarian" English conferred the greatest possible benefits upon her. Through these ports the nation acquired information that never could have been obtained under the old exclusive rule. The ingenious Chinese have not been slow to profit by this; and when we bear in mind the indomitable patience of the people, their intense thirst for learning, and the imitative skill which, as displayed by them, has almost passed into a proverb, it becomes difficult, if not impossible, to fix a limit to the material progress which the nation may make within the next few years.—*The Engineer.*

Machine for Making Wire Nettings.

Mr. Frederick C. Charles Weber, of Brooklyn, N. Y., has invented a new machine for bending wire into a zigzag form and interlocking successive strands, to produce a fabric or netting of superior or ordinary kind. The invention consists principally in the use of a stationary cylinder, having an internal spiral thread or groove, and in an arrangement therein of a rotating flat or round rod, which carries the wire around, and brings it in contact with the spiral surfaces. In this manner the wire is brought to the desired shape. The invention also consists in the application to the machine of adjustable friction rollers, a lubricating device, and a guide, which cause the wire to issue in the required shape from the end of the cylinder, and deposit it on a table. When the desired length has been formed, it is cut and moved slightly aside, so that the next course from the cylinder will enter and pass through the meshes of that last finished, and thus complete the netting by interlocking the several strands. In this manner, netting of suitable length and width can, it is claimed, be rapidly produced at a small expense. Such netting can be used for all purposes to which wire work is now applied, and will, for larger surfaces, being made in large sheets or pieces, be much more acceptable than ordinary wire netting, as it has not to be joined in narrow widths.

HYDRAULIC CEMENTS--THEIR ADAPTABILITY FOR USEFUL AND ORNAMENTAL PURPOSES.

A Paper, read before the Polytechnic Association of the American Institute, by Adolph Ott.

PART I.

There are few branches of industry which to-day present more practical interest than that pertaining to the application of hydraulic cements. They are not only of the greatest importance for all constructions under water, but they are also capable of replacing the natural stone for superstructions in most, not to say in all, instances. Unless the use of mortar be abstained from altogether, and large and carefully prepared building stone used instead, it would be impossible to erect a building under water without having recourse to hydraulic cement. The enormous expense and the difficulties of the latter method would undoubtedly reduce the number of such constructions to a minimum. "Where, for instance, we now see imposing light houses boldly defying the threatening pressure of the waves, the mariner might be exposed to all the dangers of the coast without a warning signal or a guiding beacon. Where splendid ports, with massive docks and bulwarks, most effectually protect trade and commerce against the indomitable action of a powerful elemen:, we should probably find no trace of the lively intercourse and international commerce which animate our principal seaports, had not chemistry given us means to replace, by ar', what nature has either refused or granted only at a few exceptional places.

"For the security of commerce, for coast defence and protection, for the intercourse on our water roads in the interior, and for a thousand other purposes, hydraulic cements are of the highest importance. Concerning their use for buildings above water," says Michaëlis, "it may safely be asserted that they have made a remarkable impression on our modern architecture, and have replaced the old stiff and clumsy masses by elegance and boldness of conception. One need but compare the columns, arches, and lofty balconies of European capitals with those of former periods, to see how much more ease and freedom characterize our modern style. It seems as if the architect knew how to influence his design by his genius; yes, as if he had succeeded in freeing himself, as by magic, from the fetters of gravitation to which all matter is inevitably subjected."

Hydraulic mortars are all mortars which, in contradistinction to common or lime mortar, resist the action of water. These mortars were already known by the Romans, and applied by them on a very extensive scale. We will only call attention to the harbor dams of Puteoli, the aqueducts of Claudius in Rome, near Segovia in Spain, of Metz, in the Eifel (between Cologne and Treves), and to the Tiburtinian gate, which, to this day, have resisted the vicissitudes of time. However, when it is considered that hydraulic mortars occur in the volcanic districts of South Italy, the merit of this knowledge is considerably lessened; a mere accidental observation of the same, it being perhaps mixed with sand instead of lime, may have led to its application.

Vitruvius, in the fourth chapter, second volume, of his work *De Architectura* says: "There exists a kind of dust which produces strange things; it is found near Baja and the Vesuvius. When mixed with lime, it forms a mortar, which not only imparts great strength to buildings, but also to waterworks."

The natural cement in question is a volcanic earth, mostly of an ash color but sometimes yellowish and brown, which is still found in the environs of Naples. At a less remote period of time, when the Romans invaded the valleys of the Lower Rhine, they easily recognized the volcanic nature of the Brohl valley. Here, among the long extinct Rhenish volcanoes, they found another natural cement—the trass—in such considerable quantities that the quarries which they opened are still in existence. The use of hydraulic cement in ancient times could therefore have only been a limited one, as it was found only at the places mentioned. Its artificial preparation was not understood. However, the Romans had made very fine observations on the properties of this natural product. They cast, for instance, immense blocks of stone from it, which they applied as ballast for the erection of docks. Upon this topic, Vitruvius expresses himself, in the third chapter, fifth volume, of the above named work, as follows:

"If there is a place, not suited by nature to protect vessels against storms, it seems that it is the most proper to throw up walls and dams on one side, provided there be no river in the way, and a good anchoring ground on the other side. But, if piers are to be erected in the water, I proceed in getting earth from the dominion that extends from Cumæ to the promontory of Minerva, which I mix with lime in the proportion of two to one. Boxes are then submerged in the selected spot, and are united by strong piles and clamps in order to keep them in their original position. Next, the boxes are filled with a mixture of rubbish, or broken stone, and the above described mortar. But if the waves or the violence of the sea does not permit of keeping the boxes in their position, a solid platform must be thrown up from the land or shore dam, which is to be constructed for one half of its length in such a manner that it will form a level with the sea, while the outer half should be sloping. Walls should then be erected along the platform of one foot and a half in width, and of the same hight as the latter. The intermediate space is then filled up with sand. On the surface thus produced, a block of the necessary dimensions is formed, which, after its completion, is left to dry for not less than two months; but after that, the breast wall, which affords a hold to the sand, is torn down, the submerging of the block being left to the waves that wash the sand away."

From the time of Pliny (who reproduces the report of Vitruvius) up to the fifteenth century, no further mention is made of hydraulic mortar. During the fifteenth and sixteenth centuries, Leon Battista Alberto, the founder of the Renaissance, Palladio Scamozzi and Philibert De Lorme made precisely the same reports as the Latin authors. Since the later part of the seventeenth century, the Dutch, the condition of whose country renders hydraulic constructions especially desirable and necessary, first used domestic (in place of Italian) cement, from the neighborhood of Coblenz. Next to Holland, the application of water mortar was first resorted to in France and England; but up to the middle of the eighteenth century, nothing further became known about its use and application than what had already been familiar to the Romans; for the work of the celebrated engineer and architect Bélidor (*Architectura hydraulica*, Paris, 1753) contains nothing of interest except that which had before been explained by Vitruvius. Since the end of the last century, however, a lively and general interest in the subject has manifested itself.

The impetus to new experiments with hydraulic mortar was given in 1791, by the celebrated John Smeaton, the builder of the Eddystone lighthouse. "The Eddystone lighthouse," says Michaëlis, in his excellent treatise on hydraulic mortars, 'is the corner stone on which the knowledge of hydraulic mortars has been built; it is the main pillar of modern architecture. Not only to mariners, but to the whole world, this *pharos* has become a landmark of most beneficent effect."

Smeaton was required to solve the problem of constructing a high and colossal structure, exposed to the fury of a tremendous sea; for which he had to select a mortar, capable of permanently resisting the action of water. For this purpose, he subjected the best specimens of English limestones to chemical tests. Upon finding that, in treating them with dilute nitric acid, an argilliferous residue remained, he was able to declare that "all limestones which leave a residue of clay on dissolving them in acids will, if calcined, solidify under water, while all limestones not deporting themselves in this manner are unavailable as hydraulic mortar."—[*John Smeaton: "A Narrative of the Building, and a Description, of the Eddystone Lighthouse, etc." 3d edition, London*, 1793.]

In the year 1796, the so-called Roman cement was discovered by James Parker; and regardless of its cost, it was for a quarter of a century nearly exclusively used in England for building on land and in the sea. The same was prepared from the spheroidal concretions of marl, occurring in the so-called London clay; in composition, it is similar to the volcanic earth of the ancients.

In 1822, two Frenchmen, Girault and St. Leger, and in 1824, Joseph Aspdin in England, produced for the first time artificial cement of decidedly superior quality. The latter, a common mason, secured on October 21, 1824, a patent for a new improvement in the making of artificial stones. He first gave to his cement the name of Portland cement, from the fact that it was very similar in appearance and quality to the Portland stone, the uppermost strata of the English chalk formation, from which the most beautiful and imposing buildings of Great Britain have been erected.

The making of artificial cements, in spite of the patents secured by Aspdin and others, would probably have remained a mystery for a long time, had not scientific men begun to examine into the process of solidification, the composition and the requirements of hydraulic mortar. How difficult these investigations were is proved by the fact that numerous examinations by the most skillful chemists were necessary to establish a few facts, which might be related to you in one tenth of the time occupied by my paper. We may pardon the manufacturers for their caution, since they acquired, almost exclusively by long study and great sacrifices, the necessary certainty in the fabrication. Should they freely lay before the world their costly experience? This was certainly not in their interest.

Great merit is due to the French engineer Vicat for making the most extensive use of the hydraulic limestones of France, of which he discovered numerous deposits. The savings, caused by their application in the building of bridges, locks, viaducts and canals, were in his time enormous; and only to mention one instance, France saved, in the cost of bridge building until 1845, almost seventy millions francs. The credit, however, of having established the first scientific explanation of the process of solidification and of having indicated the way of composing hydraulic cement, from materials occuring almost everywhere, in the shortest and most certain manner belongs to the German chemist and academician, Justus Fuchs. His investigations are published in two memoirs, both of which were published in 1828, in "*Ueber Kalk und Mörtel*," (On Lime and Mortar) and in "*Ueber die Eigenschaften, Bestandtheile und chemischen Verbindungen des hydraulischen Mörtels*," (On the Properties, the Composition and the Chemical Combinations of hydraulic Mortar). The results of the later essay being of the utmost importance for Holland, the Dutch Academy of Science resolved, a few years later, to award him their golden medal. The credit for further valuable information on this topic is due to the Frenchmen, Berthier, Frémy, Mêne, Rivot, Chatoney, to the Englishmen Pasley, White & Sons, and Macleod, and to the Germans Pettenkofer, Winkler, Feichtinger, Manger, Heldt, Michaëlis, and others.

THE supply of India rubber is said to be inexhaustible. Each tree can be tapped for twenty successive years, and yields on an average three table spoonfuls a day; 43,000 of these trees have been counted on a tract of land thirty miles long by eight wide.

Leather Dressing.

Of all the triumphs which have been achieved by chemical science in arts and manufactures, it has been over and over admitted that chemistry has done comparatively little to advance the art of tanning; for nothing has been introduced to replace good oak bark, though many substances, of great value as aids to oak bark in the preparation of leather, have been introduced. However, it must be admitted that the art of leather production is better understood now than it has been in former years; but that has been owing to other causes besides the aid of chemical knowledge. Chemistry has certainly aided the tanner in substituting for oak bark substances containing a great amount of tannin, and which produce their effect in half the time, but the leather is not so durable as that from oak bark. The art of tanning consists in converting the skins of animals into leather by effecting a chemical combination between the gelatin, of which they principally consist, and the astringent principle, tannin, which is contained in oak bark, which, irrespective of our great progress in arts and science, is the only known substance that is capable of converting the gelatin of hides into really good and serviceable leather. Of the substitutes for the bark of the oak, valonia comes first, for it produces leather of great solidity and weight, and which is more impervious to water than leather produced by the old process. Next comes catechu, or *terra japonica*, which has been used for some considerable time; but the leather produced by this astringent is not so durable, is of a spongy nature, and very impervious to water. Of late year, divi divi, a substance much used in dyeing, has been brought into requisition by the tanner; but though it produces its effect in less than half the time that is taken by oak bark, the leather partakes of the porous nature of that which is produced by *terra japonica*. With sumach, light skins may be tanned in less than twenty-four hours, and with the aid of alum even in one hour; but, for obvious reasons, well known to tanners who have tested the process, the old system has been found to be far more preferable. It will be seen from the foregoing that chemical science has not effected much towards the art of the tanner. Where chemistry has failed, mechanical power has been introduced, but the effect produced by atmospheric means has been such that men of science assert, and that with much truth, that the resulting leather is too porous; and with respect to leather resulting from hydrostatic power, that it is too hard, and not sufficiently durable.—*British Trade Journal*.

Johnson's Improvement in the Manufacture of Soap.

Mr. William Johnson, of the city of New York, has invented and patented certain improvements in the manufacture of soap, the object of which is to produce an economical and easily made soap, suitable for all ordinary washing operations.

In the manufacture he takes four hundred pounds of tallow and two hundred pounds of resin, and boils them with a solution of caustic lye or potash. When sufficiently boiled, he allows the mixture to cool down to the temperature of about 85° Fahr. Then he adds five gallons of spirits of turpentine, eight pounds carbonate of potash, and fifty pounds French chalk, or the same quantity of American talc. These substances are then thoroughly mixed or crutched in the boiled mixture. He next sifts into the mass, ten pounds powdered sal ammoniac. The mass, still warm, is then well mixed or crutched, so that the various ingredients may be thoroughly diffused and mixed together. This crutching operation should be carefully performed, and care should be taken that no greater heat be used at this time than 85° Fahr., as the turpentine is very susceptible to evaporation, and some of the otheringredients will degenerate if a higher heat be used, and injure the soap.

The soap thus made is allowed to cool in suitable receptacles, and is then ready for use.

Sprinkel's Stone Puller.

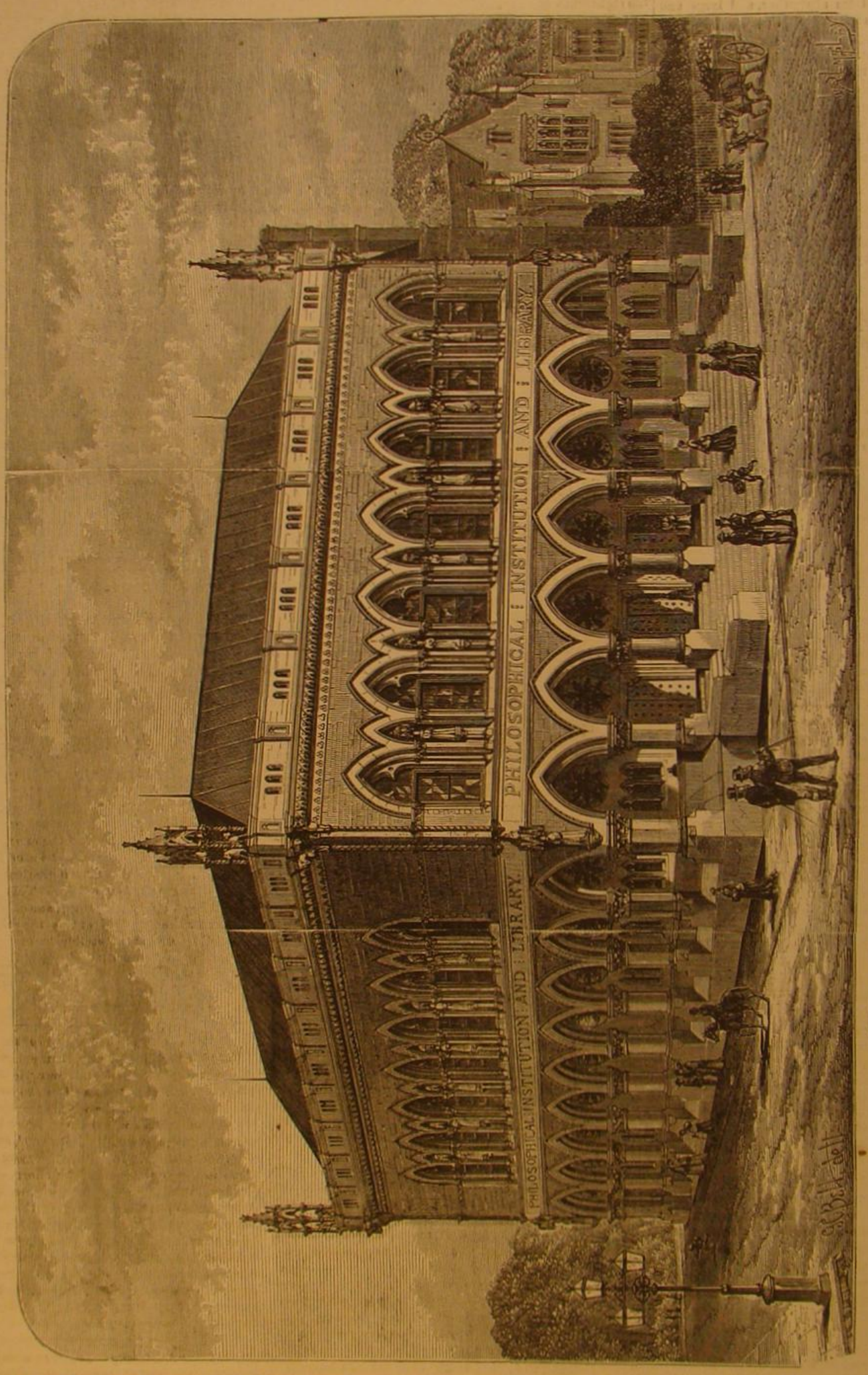
This is a new vehicle for lifting heavy stones and other things from the ground and conveying them a suitable distance. When the machine is to be used for lifting, blocks are placed in front of the wheels to prevent them from turning. The animals which are yoked to the tongue are then started ahead, and swing a lever whose long arm was first in a vertical position. In being thus moved, the lever causes a chain to hang on the end of its short arm, and thereby carries it up with the load. A very powerful leverage is thus obtained. When the long arm of the lever has been swung down, it is caught and the load locked in its elevated position by means of a spring catch. The tongue slides outward without drawing on the axle, while power is thus applied for lifting, but is otherwise locked in the bar by a suitable bolt or pin. George Sprinkel, of North Leverett, Mass., is the inventor and patentee.

NEW USE FOR ELECTRICITY.—Electricity has achieved a new triumph. Already employed to restore vigor and nimbleness to the gouty limbs of decrepit *bons vivants*, the recent discoveries of Dr. Bernier, a French physician, show electricity to be an efficient remedy for the evil effects of excessive drinking on the human nose. The doctor maintains that, by the application of an electric current to noses even of the most Bacchanalian hue, the flesh may be made "to come again as the flesh of a little child;" and he supports his assertion by a case performed on a female patient of his own, a woman of high rank.

THE Thames tunnel, thought to be such a novelty, was anticipated by one under the Euphrates at Babylon, and the ancient Egyptians had a Suez canal.

THE PHILOSOPHICAL INSTITUTION AND LIBRARY, BRISTOL, ENGLAND.

The building for these amalgamated institutions, at the top of Park street, is close to several other important edifices. The cost of the building was $50,000. Farley Down red stone stone is used for the exterior. The style is French Gothic. A flight of steps, 32 feet wide, leads to an open portico, having columns, with carved capitals and bases, from which spring seven pointed arches. The portico is laid with Coalbrookdale tiles, and is built throughout of freestone. The front wall is divided into the same number of bays, each one corresponding in dimensions with the arch which faces it. The three middle ones are devoted to doorways, and the remaining four to windows which light the entrance hall and offices. These windows each consist of three lancet headed lights, surmounted with a traceried light, the whole inclosed in a pointed arch, resting on carved shafts, with foliated capitals. The entrance doors slide on iron rails, and open into the entrance hall. There is a committee room to the left, and directly in front of the entrance, is the door to the ground floor museum. This is a large apartment 22 feet in hight. Running down the middle of the room is a series of octagonal freestone shafts, from which spring arches, for the support of the floor above. The room is lighted by five windows on one side, of geometrical tracery, exactly the same as those described in the front, and four, on the opposite side, which look into a small yard. From the entrance hall access is also gained to a spacious library, and a reading room, librarian's room, curator's room, and all necessary offices. The reading room and library are lighted by means of a lantern roof. The hight from the ground floor to the eaves of the lantern is 36 feet. A gallery runs round both rooms, communicating with a ladies' reading room, and is on the same level as a mezzanine floor. A flight of steps from the entrance hall takes us to the first floor, which is devoted to a larger museum, covering an area of 4,864 square feet, and 24 feet high. The building is an admirable design for the purpose intended, and the engraving we give will form a useful hint to projectors of similar structures in this country.



Edward G. Kearsing's and Leonzo Kearsing's Processes for Preparing Gold for Dental Purposes,

The above named gentlemen, of Spring Valley, N. Y., have invented an improved process of preparing gold for dental purposes, and a new method of making blocks of gold from prepared foil. It consists, first, in making the foil pliable, by subjecting the same to heat between layers of paper or other fabric. It also consists in forming the prepared gold into blocks, by superposing a suitable number of sheets of foil, and annealing them, cutting, when soft, spongy blocks of suitable size from the collected material. In the treatment of gold foil, they proceed as follows: They place the sheets of foil into a suitable box or frame, sufficiently close to protect its contents from direct action of the fire. Between every two sheets of foil, they interpose a sheet of paper or other soft fabric. A weighted cover is placed upon the contents of the box to prevent them from expanding in a vertical direction. The box, with its contents, is then subjected to a degree of heat which will suffice to shrink the paper. The motion thereby produced in the various particles of paper is conveyed to the foil, which is drawn and shriveled so that its smooth surface is broken, and it becomes sufficiently soft and pliable for practical purposes. The paper is then removed and the foil ready for use. The foil thus prepared (or it may be in any other manner) is, according to the second part of the invention, placed in layers, one upon another, and then annealed under slight pressure to form a spongy mass of gold, which can be cut into minute blocks for practical use, each block being of a size to be used whole. The tearing of gold and consequent injurious handling by the dentist is thus made unnecessary, and the material furnished to market in a form claimed to be of a superior and most convenient shape.

Mosaic.

Mosaic is a species of decoration composed of numerous small lozenges (*tesseræ*, they are technically called) which may themselves be colored clay or glass, and which are arranged in arabesques, or even in grouped imitations of human beings and natural scenery. Its most usual employment is for pavement, a discovery which Pliny attributes to the Greeks. Sosus, the most celebrated of the Greek mosaic workers, composed such a pavement representing the remains of a supper left carelessly on the floor. Perhaps the most interesting of all the ancient mosaics is one which was discovered at Pompeii. It represents, as is supposed, the battle of Issus; its composition is simple, energetic, and graceful, exhibiting in many respects merits of the highest order. The march of art, as of civilization which it adorns, was from the East. The Orientals, from time immemorial, have been noted for those masterpieces of patience and ingenuity which we gaze upon to-day with wonder—boxes, tables, and ornaments of inlaid wood. In this marquetry, says the *British Trade Journal*, Hindoos far surpass anything which can be produced by European artizans. The Chinese, however, fashion curious inlaid work in relief much like the mosaic work of Western climes, save that it excels in delicacy and careful execution. This is, for the most part, composed of hard stone, agalmatolite of different shades, ivory, bronze, and different kinds of wood. It is most probable that it was from an Eastern source that the Grecian mind received that impulse which bore fruit in their mosaics, an art differing from the Oriental inlaid work in its greater durability and cheapness, as in increase of effect. The universality of its employment in the Grecian world may be gathered from the fact that, in the third century B. C., the floor of the great ship of Hiero the Second was composed of stone cubes representing in mosaic the whole history of the siege of Troy, a work which occupied 300 artists an entire year. Imagine a mosaic, or even a parquetry floor, laid down in a modern ironclad! From Greece, mosaics passed naturally to Rome, where they soon acquired high favor. Wherever in the Western world Rome spread her conquests, she likewise left imperishable memorials of herself in mosaic. Our own country is full of such remains, testifying to the refinement of Anglo-Roman life, and the secure hold which the officers of the legions fancied they had obtained on the land. It is needless to specify instances of tesselated pavements, when every county town, and specially the British Museum, contains admirable specimens of the art. One fine piece of this kind of pavement was exhumed last year in London; and, indeed, hardly a year passes without the plow in some part of England striking against the foundations of a Roman villa and disclosing fragments or, it may be, uninjured slabs of mosaic work. A good floor of this character is shown in Lincoln Cathedral, and the excavators at Uriconium, in Shropshire, discovered tesselated work let into the walls, a specimen which is deemed unique in England, though such were common enough in ancient Italy.

Improved Safety Governor.

The accompanying engraving illustrates a governor, invented and manufactured by Augustus P. Brown, 57 Lewis street, New York.

It was patented some time ago, but has been improved from time to time, till the inventor thinks he has attained a degree of perfection not before attained in a governor.

More than one thousand of these governors are stated to be in use, and the most flattering testimonials have been received in regard to their delicacy of action and reliability, even under the most trying circumstances, such as are found in engines driving mills for crushing ores, and other work where the labor required of the engine is liable to very sudden and wide changes in quantity.

The prominent features of this governor are that it positively and instantly stops the engine upon breakage of the governor belt, and that when the belt is mended and again run on to the pulley, the governor is at once ready for work without any attention on the part of the engineer. The governor may be put on any engine, and its pulley be brought into line with the driving pulley, without any alteration of parts and with the utmost facility, all of which will appear upon referring the following description to the engraving which illustrates it.

A is a sleeve, provided with a box at the top for lubrication, and joined by a crotch to a vertical sleeve, which covers another fixed sleeve, through which the valve stem ascends to jam nuts inclosed in the cap, D.

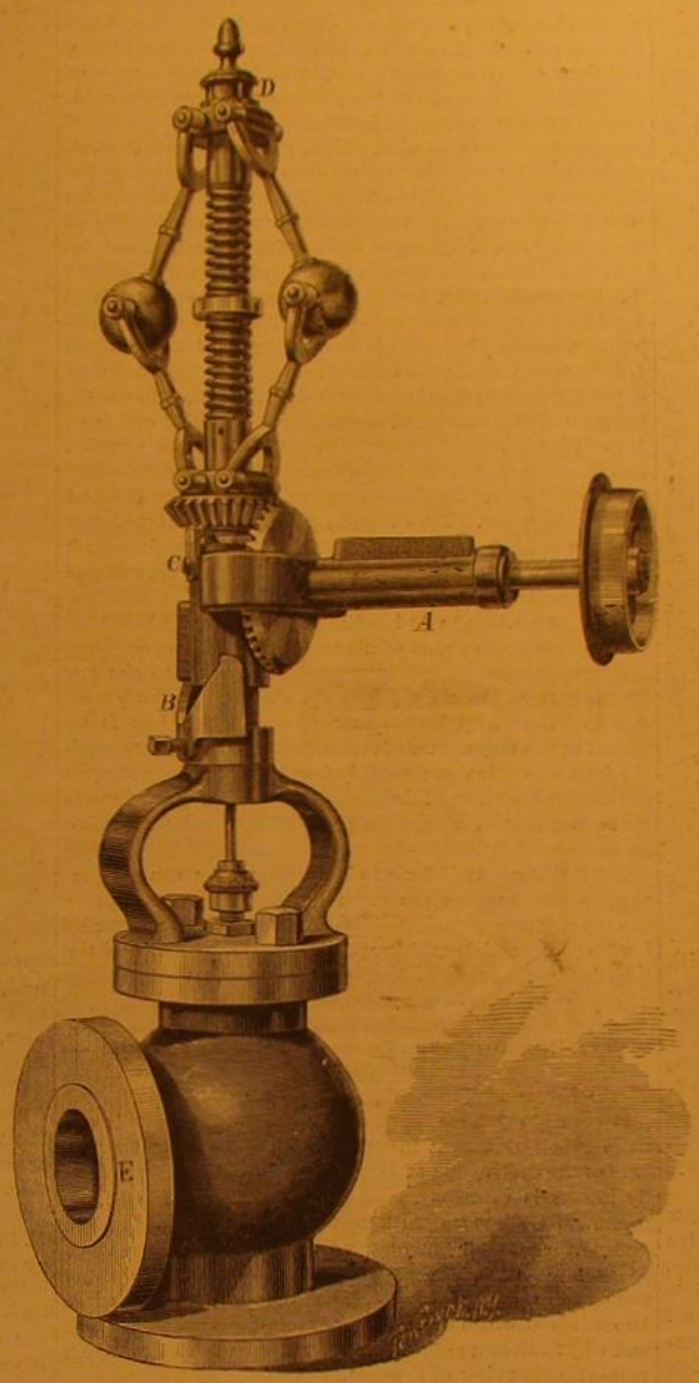
The removal of the cap, D, the angle iron C, and the jam nuts allows the whole to be taken apart for cleaning.

Through the sleeve, A, passes the pulley shaft, which, by bevel gearing, revolves the governor balls. The expansion of the orbit of the balls causes the stem of the valve to descend, as the lower arms are prevented from rising by a grooved collar and an angle iron, C, which fits into the groove of the collar. The descent of the valve stem closes the valve more or less, and thus regulates the supply of steam, the stem being raised again by the action of springs when the speed of the balls decreases. B is a fixed cam, held by a set screw when properly adjusted.

On the exterior vertical sleeve, with which the sleeve, A, is rigidly connected, there is a projection, which, when the belt is off, slides up or down the inclined face of the cam, B, according as the sleeve, A, with its shaft and pulley, are rotated partly about the vertical axis of the governor; the amount of rotation being limited by a vertical shoulder rising from the inclined face of the cam. The adjustment of the governor, after its attachment to the induction pipe by the flange, E, consists in simply setting this cam properly, to regulate the degree of opening of the valve, by turning it about the vertical axis of the governor, so that when the projection on the vertical sleeve abuts against the vertical shoulder of the cam, the governor pulley shall be in line with the driving pulley. The moment the belt breaks, the pulley and its shaft, with the sleeve, A, and the vertical sleeve to which A is rigidly connected, slide by their own weight down the cam, making a partial revolution about the vertical axis of the governor; and the valve stem and valve are lowered so as to entirely cut off the supply of steam to the engine, thus preventing the engine from "running away" and the serious accidents likely to result from such an occurrence. This action may, however, be limited by setting the fixed cam in such a way as to allow the passage of enough steam to keep the engine slowly running when it is desirable that a full stop should not be made. By thus setting it, the motion of the engine will, on the breaking of the belt, be at once reduced so much as to avoid all risk and the inconveniences of a sudden full stop.

The whole arrangement is so simple as to not increase the cost of this governor beyond that of ordinary governors without the safety attachment, while it is much easier to apply and adjust, affords absolute security, and is an efficient and sensitive regulator of power.

For further particulars address A. P. Brown, as above.



BROWN'S SAFETY GOVERNOR.

A Pleasant Incident---Employer and Employed.

The annexed extracts from the London *Spectator* exhibit a relationship between employer and employed which, at this time, is pleasant to see. The celebrated firm to which it refers is among our oldest patrons in England. The records of the Patent Office show that their enterprise has not been confined entirely to the manufacture of farm implements.

"Most of our readers have heard, we imagine, of Messrs. Ransome, Sims & Head, the great Quaker firm on the Orwell, which turns out so large a proportion of the agricultural machinery used throughout England, and is always coming to the front with new inventions and appliances, like the road steamer now being so largely ordered for India. This firm, now ninety years old, is remarkable in industrial history for the amity and long continuance of its relations with its employees.

"Some thirty-five years ago, work was slack, money was scarce, and the firm was compelled to take the men into council, and ask for concessions which, in many places, would have been the signal for a determined strike. The masters, however, explained their situation frankly, the men entirely believed them, and, after a single meeting, the whole body agreed to work three quarters time, at reduced wages, that is, in fact, to put up with 12s. or 13s. in the pound of their usual receipts till better times came round. 'That matter rested in my mind,' says the present head of the firm, speaking so many years after the occurrence, and doubtless tended to deepen so remarkable an amity that the firm, though noted for the strictness of its discipline, has now 456 hands in its employ whose services average 20 years, 328 who average 25 years, 51 who average 36 years, and 14 who exceed 46 years.

"In fact, departure has become, among the more experienced hands, as unusual as dismissal, a fact all the more remarkable because similar works are now in existence all over England, and Messrs. Ransome's men express, in their speeches about the Nine Hours movement, complete sympathy with their order throughout the country, and are evidently not disposed to surrender any of the advantages generally enjoyed. Immediately after the termination of the Newcastle strike, the men, more than 900 in number, decided that it would be 'discreditable to Ipswich to remain behindhand, in such a reform; but instead of striking or threatening to strike, they held a meeting in the Lecture Hall, at which doctrines were propounded that would have made a communist white with rage. One was that it was to the workman's advantage that his master should get rich—a statement made, not, indeed, by a workman, but received by them with unanimous applause; another, that 'workmen had duties as well as rights;' and a third, that, if they were 'courteous and reasonable,' their employers would, in all probability, be so too. There was a bit of a fight as to the best hours for beginning and leaving off, but it ended in a unanimous decision to ask for a full half holiday on Saturday, that is, from noon instead of from two P. M., and such a reduction on other days as would bring the weekly stint of labor down to fifty-four hours. A deputation, accordingly, waited on Messrs. Ransome, with the men's request, and were, it seems, not only told that it would be granted, but that it was granted with pleasure, as a partial repayment of the ancient obligation conferred by the hands upon the firm. So touched were the men by this reception and the instant concession of their demand, that they could not be content without some public exhibition of their feeling, and accordingly resolved to present their employers with an address at a public *soirée*."

Regulating Watches.

A writer in the *Watchmaker and Jeweler* thus discourses on regulating watches: Many of our best watchmakers take great pride in educating themselves in the art of horology, and in cultivating a taste for the work bench, which is furnished with the latest and best improved tools, and these are arranged and kept in the neatest possible order. Skill is indispensable, to understand at a glance all the difficulties which may arise in the thousand different kinds and grades of watches, and more especially to exercise it equally to every emergency, to cure every ill, master every difficulty, however intrinsically complicated it may be. The ear is attuned to dissect the most delicate "vibrations of air" (sound), and to read the life of the living machine by the beating of its little heart; the hand as well, to the delicate touch and solid firmness; the eye, to the mechanism in its correct and scientific proportions and finish, to take in every defect of the most minute character which may hinder uniform action; the foot, to the steady movement of the lathe; the endless breath, to the blow pipe; the muscle and will—yes, all must work in harmony in executing the plans of the great motive power—the mind. There must be with all, to give success, a good compensated regulator, or fine rated chronometer, or both, can they be afforded; and, above all a watchmaker's transit, so that the variation of the fraction of a second may be detected—every day in the year if necessary—but let all of these necessary things be at hand, and further attention or requisites and appliances neglected, and the result is—our watches go out to give dissatisfaction.

It is at this point that the majority of our best workmen are in fault. Our watches—even the best ones—are delivered imperfectly rated; the inevitable result is, our customer returns his watch, after carrying it a few days, compares it, finds it "off time." We only answer (in an important manner), "it must be regulated to your pocket, sir;" when the truth is, we did not half regulate it as it should have been done; we were too lazy or too busy to give it the necessary attention, or did not have the facilities which every good workman should have; the watch perhaps has been suspended by the pendant on a small pin or careless hook; in this position the balance will generate a pendulous motion—to a greater or less degree—which will accelerate its vibrations and cause much variation in the time; or it may have been put away at night, and carelessly allowed to lie upon its face or back, or in a sideways position, which will be as fatal to its correct performance, more particularly with the cheaper grades of ordinary priced watches. Should any one who carries a timepiece subject it to such an abuse, we would scold him at once, as he is expected to know better, if he knows anything at all.

Every good watchmaker knows that there is nothing connected with his business of so much importance, in giving satisfaction to his customers, as to have his watches keep good time when taken from the shop; and anything but this will give the workman a bad reputation (even if he be a first class mechanic, and has done his work faithfully); and in order that a watch please, it must be regulated as near as possible to an approximate point. By giving it the position and rest which it will—or should—receive, when carried by its owner, it must have careful and continued attention.

Psychic Force.

The Davenport Brothers lately gave some of their psychic exhibitions at Ithaca, N. Y., but their tricks were sadly disarranged by some of the Cornell University fellows. A private letter tells us that some of the students, having a scientific turn of mind, provided themselves beforehand with pyrotechnic balls containing phosphorus, so made as to ignite suddenly with a bright light. During the dark *séances*, when the Davenports purported to be, and as the audience supposed were, bound hand and foot within their closet or cabinet, and when the guitar was floating in the air and playing musically around, the aforesaid students struck their lights all of a sudden, when the "spirits" were found to be no others than the Davenports themselves, who were dodging about the stage, brandishing the guitars, and playing the tunes. The music suddenly ceased, the committee declared the performance a humbug, and the players departed from Ithaca by the earliest train.

Do your own thinking. Yes, that is the idea. Think for yourself. It is well to listen to the expressed thoughts of others, and it is an agreeable pastime to give expression to your thoughts. But when alone, weigh what you have said. What you thus gain from surroundings, you will unwittingly transmit to the rising generation, and the result will be that you will do your share in elevating the human family.

MONGOLS *versus* DEEP SEA CABLES.—A novel obstruction to the spread of civilization in China is reported. A branch of the new system of cable telegraphy has actually been taken up and stolen by the Chinese. This is the very latest style of ways that are dark and tricks that are vain which we have had of the heathen Chinese.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

The "Working Man" of the Magazine Writers.

To the Editor of the Scientific American:

At the risk of increasing the impatience which the public is beginning to show at the mention of the everlasting question of the condition of the working classes, I ask you to give me a little of your valuable space, that I may make an earnest protest against one phase which this subject is frequently made to assume.

Almost every writer in a popular periodical has had something to say on this question, and most of them have some nostrum, generally a political one, to propound. The ground covered by the various methods of dealing between capital and labor is a very wide one. In Russia, the paternal owner of the soil buys tenants and laborers with his new estate, and kindly takes charge of their liberties; while the other extreme is found in the communism recently displayed in Paris, the programme of which was made up of murder, arson, and destruction of everything that had any value to anybody. We are not likely to approve the autocratic view of the rights of property which obtains in the empire of our potent ally in Eastern Europe; and, although popular lecturers are going about this country, applauding the Commune, the people of the United States have no sympathy with insensate and wanton pillage of factories, laboratories, libraries and museums. While, therefore, we are in no danger of an industrial war for or against either of these conditions, the working men are being grossly misunderstood and insulted by some would-be philanthropists, who are anxious to play Providence over a class of society whose capability of taking care of itself cannot reasonably be doubted. Many writers of the present day, who are for ever telling us of the talents, merits, and virtues of working men, seem to forget that we are not proper objects for public charity, that we want no public funds voted for our support, and that any special legislation, on the subject of the status of labor as distinguished from other occupations, such as commerce and the professions, must end in being fatal to our independence.

It is perhaps too much to insist that writers on the question now before us shall be logical and consistent; but there is a blank in most of the talk on this subject. We have not been told why a workman should not dispose of his labor as a farmer does of his potatoes, that is, get the best price he can for it; but we now hear constantly that a desire to get higher wages (surely no novelty in this world), is a fearful portent, that a new era is about to be inaugurated, and property is to be taken from one man to be given to another, and other very desirable results are to be achieved when labor resolves to make itself heard. This is the style of the writer who is in the new era business; then another comes with ideas of homes for workmen, built out of the public funds. Why the national or local taxation, heavy enough already, should be augmented to further a supply of what will surely be provided, in the ordinary way, by the creation of a demand, I do not know; and why homes should be built, by our much loved and long suffering Uncle Samuel, for workmen, and not homesteads for farmers and country villas for merchants, I must leave to be explained by the new political economy, and its bastard offspring, class legislation.

After all the expression of good intentions of the wise men who protect and patronize us, we can surely ask them to give us credit for a little principle, honesty, and common sense. I am sure that I am speaking the opinions of an irresistible majority of workmen in this country and in Europe, when I say that an era of communism, of the destruction of some classes of property, and the division of the land into lots large enough for good sized pig pens, would be a blow to the interests of the classes who live by their manual labor from which they would never recover till science, art, and commerce had once more accumulated sufficient wealth to provide the splendid institutions for education and employment, which are now the pride of all men who desire to see the toilers of the world well employed and well instructed.

In this country the question assumes an aspect different to the one it wears in Europe, and especially in England We have no titled aristocracy to hold up as a bugbear; but we have among us large territorial proprietors and accumulated fortunes, which the new era men may be assured have not yet excited our cupidity or undermined our honesty. We know well that the law (or rather the anarchy) which takes away one man's property because it is large, will take away another's because it is better than nothing; and that the real genuine communist is as ready to avail himself of John Blacksmith's purse as of A. T. Stewart's palace, or the Duke of Bedford's acres. These things are almost too trite to lay before your readers; but while our would-be friends are attributing all sorts of evil to us, we must repudiate them wherever we find them, even at the risk of being somewhat tautological. The respect of working men for the laws of their native country is not surpassed by the loyalty of any other members of society; and so long as the man who has little can least afford to share with the idle, the worthless, and the scoundrel, so long will working men be the most zealous wishers for the security of property. And if there be some among us, ignorant of their own interests, whose cupidity and selfishness are excited by large estates or accumulated wealth, the great majority are well aware that it is only by capital that extensive operations in the industrial world can be carried on; and it is by these undertakings that commerce is attracted to a country, and maintained in the fierce rivalry which now exists in the business world.

I think, therefore, that the better and wiser of the world's workers are convinced that the existence and maintenance of property is essentially important to their interests, and I am sure that the large majority are quite prepared to resist a raid upon the capital that employs them, the factories, mines, and estates on which they work, as much as if it were on their own pockets and bank balances.

There are other points in this question to which I will, with your permission, call attention in another communication.

New York city. PRINTER.

The Mechanical Equivalent of Zinc.

To the Editor of the Scientific American:

A short time ago there appeared in your columns a very interesting scientific discussion in regard to the value of zinc as a substitute for coal. As the discussion came to an end without apparently exhausting the subject, I propose to submit a few additional remarks. 32·7 grains of zinc in a battery will decompose 9 grains of water, of which 8 grains are oxygen (23·3 cubic inches) and one grain is hydrogen (46·6 cubic inches) being at the rate of ¼ grain oxygen and $\frac{1}{32}$ grain hydrogen to one grain of zinc. Now, assuming that the mechanical equivalent is in proportion to the amount of oxygen consumed, we find that, in a battery, one pound of zinc unites with ¼ lb. of oxygen, at the positive plate, forming oxide of zinc; and $\frac{1}{32}$ lb. of hydrogen unites with (8 times its weight) ¼ lb. of oxygen, at the negative plate, forming water, being ½ lb. oxygen to 1 lb. zinc. But as the ratio of the amounts of heat developed by the combustion of equal parts of zinc, sulphur, carbon and hydrogen is equal to that of the numbers 1, 4, 16 and 64, while the amounts of oxygen consumed during combustion of equal parts are respectively 1, 4, 16 and 32, the ratio of the mechanical equivalent of zinc and coal is as 1 to 3½ (3,080,000 foot pounds to 10,808,000 foot pounds). But the oxygen consumed in a battery is in what is called the nascent state. By this we mean that it is quite different from oxygen gas. Take oxygen gas and place it under a pressure of 7,000 lbs. to the square inch, and reduce it in bulk to $\frac{1}{670}$ of its normal state, then liberate it suddenly, and you have nascent oxygen.

If the proportion be as 1 to 600, then we have 1,848,000,000 foot pounds to one pound of zinc. There is also an additional consumption of oxygen in reducing the oxide to the sulphate of zinc. As we obtain only about $\frac{1}{170}$ of the actual value of the coal (1,000,000 foot pounds) which loss is inherent in the very nature of steam itself, and which no possible form of engine can remedy (our best engines giving 93 per cent of the value of the steam), a favorable comparison is made in favor of zinc as a possible material for motive power.

But it still seems difficult to believe that zinc can ever supersede coal, because the earth probably does not contain enough zinc; and even if it did we shall probably do better by burning coal and furnishing carbonic acid to carry on the negative system, than to lock up for ever the world's share of oxygen in oxide of zinc. J. C.

The Influence of the Moon---or rather of Worms---on Timber.

To the Editor of the Scientific American:

It seems to be a matter of regret that entomology is not more generally taught in our schools. The annual aggregate of the destruction of farm products and other property by insects is enormous. But what do we hear? Oh! the moon. Let all moonstruck mechanics go to the moon for a remedy for all their troubles, unless they can be persuaded to listen to reason. To-day there are piles of saw logs and timber in the forest and before the thousands of saw mills, two thirds of which will be more or less damaged by worms; and why? Because of the moon's influence? Let us take a more scientific view of the case.

Your correspondent cuts two sticks of hickory early in May and before the insect has deposited her eggs in the seams of the bark of forest trees; a few days later (or in the full of the moon), after the moth has deposited her eggs, he cuts two sticks more. The worms devour the latter, but touch not the former. Wonderful, is it not? What a wonderful moon! Oh, if we had such another, what would escape the ravages of the all devouring worms? But the first of May is too early to cut timber; what shall we do? Why, strip the timber of bark as soon as cut, by all manner of means, if you do not want it worm eaten. This is your remedy and your only remedy, the moon's influence to the contrary notwithstanding. CHARLES THOMPSON.

St. Albans, Vt.

Influence of the Moon on Timber.

To the Editor of the Scientific American:

It seems that your correspondents disagree in the result of their experiments with timber and worms. I too have tried such an experiment, and get a result different from either of them.

On the 12th of September, 1870, I cut a hickory stick, and again on the 27th I cut another; I marked them carefully, and placed them together in a dry place. After a year I examined them, and found just the opposite of the experience of D. A. M. The one cut three days after the new moon was badly worm eaten, and the one cut after full moon showed no trace of worms.

This seems to me, Mr. Editor, to be a still further proof on your side of the question—that "the moon has nothing to do with the worms." I have often heard it said that the best time to cut timber to make it last, and also to keep worms from injuring it, is in "the old of the moon in February;" but this is something like the other. It is my opinion that the sap has something to do with it, both in regard to the worms and to its durability. X. PERRY MENTOR.

Sans Souci, O.

To Smoke or not to Smoke.

To the Editor of the Scientific American:

Having waited to hear an answer to the remarkable proposition, as it appears to me, of V. B., in your issue of December 16, in favor of smoking, allow me, through your valuable journal, to point out some of the mistaken positions assumed by the writer, not as a controversialist, but to allay the pernicious effects which such a line of argument is calculated to produce, in encouraging the use of tobacco. He attempts, in the first place, to make us believe that nicotin, although a poison to animals, is not so to man, but immediately abandons that idea by saying, "but granted that tobacco contains matter poisonous to the human system, what does not? Potatoes, cereals, and nearly all vegetables, contain alcohol and other matter, which, if taken alone, or in overdose, may kill a man in two minutes and a quarter." Now alcohol is not found in potatoes nor any other vegetable, as nature furnishes it for our use; this is as well established as any other of the well known scientific facts.

When vegetable matter begins to decay, then alcohol is produced. But suppose we had alcohol ready furnished to our hand, as V. B. seems to think, it would in no wise strengthen his position on the use of tobacco. Again, he says, "tobacco can safely be considered a benefactor in the same line as muscular or mental activity"; that is, narcotizing or stupefying by means of a drug has the same healthy reaction that labor has. I do not think this assumption needs much argument to refute it; it cannot be considered very dangerous.

And he is unfortunate, in his selection of subjects to illustrate the marvelous health-giving power of tobacco, when he refers us to the Shakers and Chinese; for it is well known, and acknowledged, by those living in the vicinity of those singular people, the Shakers, that they have as healthy, stalwart men amongst them as are to be found in the whole country; and, if he has seen the wonderful feats of strength exhibited by Chinese athletics, he would undoubtedly have left that out of the argument altogether.

In conclusion, he says if he thinks proper to smoke he will not consider himself a hypocrite, a corrupt man, or a fool. No man, I think, after reading his article will think the writer a fool; but if he should ever commence the practice of smoking, on so unstable a foundation as his argument furnishes, every unprejudiced person must believe he had done a very unwise thing. L. P. S.

New Britain, Conn.

To Know or not to Know.

To the Editor of the Scientific American:

Whether potatoes, cereals and nearly all vegetables contain alcohol, seems now to be the question, after smoke has passed away. If one's competency to advise people on the important subject of smoking is to be measured by the carpenter's rule applied to one's knowledge of alcohol and its production, then all hail to the smokers. For my part, however, I must protest against the enforced title of "adviser to the people." Far be it from me to entertain such high aspiration. My object is to observe things on all sides, and my detestations are one sided arguments. If my former statement did not carry conviction in its train, it may at least have served to show the weak points in the deductions of the other side.

This, however, does not reach the question at issue. If N. D. will squeeze an apple, and thereby produce cider, and, by evaporation or congelation of the water contained in the cider, obtain alcohol, I, for my part, will pardon him should he say, that the latter substance was contained in the apple; and the same with regard to potatoes, cereals and nearly all vegetables, which, if converted under the influence of air or warmth into sugar, can thence readily be made into alcohol, as potato and rye whiskey, etc. Such conversion, be it known, is called fermentation: saccharine, when the starch or gum of organic substances is changed into sugar; vinous, when sugar is transformed into alcohol. Sugar, no one will deny, is contained, directly or in form of starch, in the organic substances cited; its chemical constituents are subsequently found in alcohol. Thus an atom of grape sugar is composed of 12 atoms of carbon, 12 of hydrogen, and 12 of oxygen ($C_{12}H_{12}O_{12}$), and is, by vinous fermentation, converted into 4 atoms of carbonic acid, (CO_2), and two atoms of alcohol, making 4 atoms of carbonic acid, C_4O_8; 2 atoms of alcohol, $C_8H_{12}O_4$; making together, $C_{12}H_{12}O_{12}$.

The above I hope may suffice; if not, let a cabbage head be brought me, and I will try to show what spirits it contains. V. B.

Congressional Library and Copyrights.

The Congressional Library now contains 236,848 volumes of books, and about 40,000 pamphlets. The provisions of the copyright law, which make it obligatory that a copy of every publication copyrighted be deposited in the Library of Congress, have brought to its shelves during the year, in addition to the books and pamphlets, 3,401 periodicals; 5,085 musical compositions; 70 dramatic compositions; 769 photographs; 4,571 prints, engravings, and chromos; and 331 maps and charts. The whole number of copyrights entered was 12,688. The wisdom of transferring the copyright records to the library is now apparent to all, as it is more than self-sustaining, and it secures to the great Library of the government a complete representation of the literary product of the country as it comes from the press. Copyrights are procured through the SCIENTIFIC AMERICAN PATENT AGENCY. Address MUNN & Co., for particulars.

ONE house in Birmingham, England, consumes three tuns of brass wire a week in the manufacture of pins.

[For the Scientific American.]

LATENT HEAT OF DISSOCIATION.

BY P. H. VANDER WEYDE.

It was reserved for quite recent investigation to discover another kind of latent heat, besides that to which bodies owe their fluid or gaseous condition; it is the same heat which becomes latent when, at a very high temperature, all chemical affinities are destroyed, and every elementary substance exists in its separate uncombined condition, notwithstanding its being intermingled, in its gaseous or fluid condition, with any other substance also in the same gaseous or fluid state. It is the condition of all the material which makes up the mass of our sun; this has been proved chiefly by the latest spectroscopic observations of this mighty luminary, and the deductions to which these observations have driven the investigators. We know now, therefore, three kinds of latent heat; first, that of fluidity; second, that of the gaseous condition; third, that of dissociation; and as the second surpasses the first considerably, so the third surpasses the second, in amount.

As this new subject is of the most intense interest, explaining, as it does, many points thus far quite obscure or totally inexplicable in physical science, the reader is requested not only to read carefully what is to follow, but to study it, to ponder over it, till the facts have become so familiar to his mind that he may call them his own. I will only state, as an illustration of this importance, that the origin of the heat of combustion, thus far a profound mystery even to the most advanced philosopher, is now perfectly explained by the theory of the heat of dissociation, in combination with the theory of the conservation of forces. The latter theory considers heat as a mode of motion, as most readers well know; and the present series of articles, weekly prepared for the SCIENTIFIC AMERICAN, is intended to lead the student gradually into the knowledge of the laws governing *matter in motion*, which is the only true and intelligible definition of that mysterious agency which we call force, and of which heat, light, electricity, magnetism, and gravitation are only different phases.

It is scarcely necessary to remark that this subject is not only interesting in a theoretical and abstract point of view, but has a direct practical bearing in all cases where heat is transformed into motion, as is the case in the steam, the caloric, and the solar engines, etc., the theory of which will be the culminating point of the present series.

The term "dissociation" meaning thus a condition of matter of so high a temperature as to be, not only gaseous and incandescent, but beyond the power of chemical affinity, it is clear that when the temperature descends, a point must be reached where the chemical affinities will manifest themselves; in the same way, as by an ascent of temperature, from a very low degree of heat, the other extreme point of this range of chemical affinity may be reached. It has been found that these affinities manifest themselves in a comparatively limited range of temperature, below and above which they do not exist. As at an extreme cold, no chemical combination can be made, so at an extreme heat, say of 8,000° Fah., not only no combination can be made, but all compound bodies are separated into their elements, or dissociated. On cooling them and reaching, say 4,000° or 3,000°, the substances will again combine, the chemical affinities will come into activity at once, combustion will ensue, a comparatively enormous amount of heat will be developed or set free; it is the heat which before was latent in the dissociated elements, and is driven out by the play of the chemical affinities, even as the latent heat of gases is driven out during their condensation into a liquid, and the latent heat of liquids is driven out during solidification.

It is as yet impossible to give a table of the latent heat of dissociation for different substances, as no reliable data have yet been published; there is only one substance of which the latent heat of dissociation has been definitely determined (by St. Claire Deville); this substance is steam. This investigator has found that when steam is heated to 5,072° Fah., it is changed into a mixture of its component gases, oxygen and hydrogen. In the same way, when water is evaporated, or, in other words, when changing water of 212° into steam of 212°, 962 units of heat are consumed or made latent, so by dissociating steam, or changing steam of 5,072° into a mixture of oxygen and hydrogen of 5,072°, not less than 8,000 units of heat are made latent. Further, in the same way as steam of 212°, when condensed into water of 212°, gives off its 1,000 units of latent heat, so, when dissociated oxygen and hydrogen of 5,072°, combining into steam of 5,072°, giving off its 8,000 units of latent heat, of course combustion ensues; and this heat produced by combustion is nothing but the latent heat of dissociation.

If this dissociation has taken place by heat, it is of course impossible to obtain the gases afterward in a separate condition, and therefore impossible to cool the mixture without passing this point of combustion; but fortunately there are other ways to communicate, to the elements of water, this heat of dissociation, without which they cannot exist in the separate gaseous condition. One of these means is that other form of matter in motion, which we call electricity; if we discharge a voltaic current through water, we decompose it, as is well known, into its elements, which we may then collect as separate gases or as a gaseous mixture. This will then possess about the temperature of the surrounding air and the water from which it originated; the thermometer will not indicate the 8,000 units of latent heat, which the electric current has stored up in the gaseous mixture, as the same instrument does not indicate the 962 units of latent heat in steam of 212°. But let us raise the temperature of the minutest portion of this gaseous mixture to the point required for the play of affinity between oxygen and hydrogen, that is, to about 1,000°; and, in this minutest portion, the combination which takes place will expel its latent heat of dissociation, and this, in its turn, is enough to produce more than 1,000° of heat, and ignite the whole of the mixture, which then, by suddenly giving off all of its 8,000 units of latent heat, changing this into sensible heat, produces that enormous expansion or detonation of the gaseous mixture, of which the powerful effect is so well known among experienced chemists that none of them can ever believe that a bursting steam boiler ever contained any such explosive mixture. If such indeed were the case, the worst explosions would not be so comparatively mild, as was that of the *Westfield*, for instance. Such a boiler, when it bursts by the ignition of oxygen and hydrogen, would have done infinitely more damage, and would surely have knocked the bottom out of the boat, and perhaps have shivered the whole into splinters. A mere soap bubble, filled with this mixture in the right proportion, two volumes of hydrogen to one of oxygen, gives, when ignited, a report like a pistol; and the ignition, of larger or confined portions of this mixture, which occasionally takes place in laboratories, has always been infinitely more destructive, in comparison, than the explosions of steam boilers. The details of the explosions of the latter are perfectly identical with those accidental explosions or rather burstings, also sometimes occurring in laboratories, when non-combustible gases are pumped into cylinders, and at last a pressure is reached, surpassing the strength of cohesion of the weakest part of the cylinder, and an explosion or violent bursting also ensues, which, however, in its distinctive result, does not compare with that produced by the ignition of the dissociated elements of water.

[Reported for the Scientific American.]

SOCIETY OF ARTS OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

MEETING, HELD IN THE INSTITUTE IN BOSTON, DEC. 14, 1871.

The President, J. D. Runkle, in the chair.

An interesting paper, by the Secretary, Dr. S. Kneeland, on the Upper Mississippi, was the first thing in order. The paper had special reference to certain changes in the bed of the river, between Dubuque and St. Paul.

In 1870, the water, though shallow, did not obstruct navigation, but this year it was a rare thing for a steamer, if a large one, to make the trip between Dubuque and St. Paul without getting aground more or less frequently.

The water was so low that the heavy freight was shipped on flat barges, which were attached to each side of the steamer, to lessen the draft. And yet the surface of the water was four feet higher than in the summer of 1863, when the river was remarkably low, but the actual difference between the depth of the water in the summer of 1863 and that of 1871 is only five inches. This seems to show that the bed of the river is three feet and seven inches higher than it was eight years ago.

Generally there is a June or summer rise in the tributaries of the Mississippi and Missouri, which scours out, to a certain extent, the beds of these streams; the general drought which prevailed throughout the northwest last summer, drying up vegetation and preparing the country for those terrible conflagrations which have laid waste large portions of Michigan, Wisconsin and Minnesota, prevented the rise in the river this year. An immense amount of sediment must be washed into these rivers annually from the thousands of acres of cultivated land in Iowa, Minnesota, Wisconsin and Illinois. This will be readily understood by any one who has seen the turbid Missouri, or any of the tributaries of the Mississippi after heavy rains. The bottom of the Mississippi is now six and a half feet higher than it was in 1846.

The final overflow of the country, by the river, from the rising of its bed, will be prevented by two causes; first, the valley on each side of the river is gradually filling up, by the deposition of sediment from a multitude of streams, large and small, draining immense tracts of cultivated land, making a broad, natural levee; second, it is obvious that the volume of water flowing in the channel is decreasing annually. This last phenomenon is accounted for by the extensive destruction of forests and the cultivation of the land, which increases its absorptivity, and the consequent comparative desiccation of the country by the sun's heat. This has always been the case with rivers flowing through highly cultivated districts. The Danube, in Europe, is gradually becoming unfit for commercial purposes; and even our own Connecticut can be forded nine months in the year, where formerly there was a large volume of water during the whole year, and it is hardly navigable for ordinary vessels, even as far as Hartford. The rivers of the country are gradually drying up, and steam is being substituted for the former ample water powers. There seems to be a conflict between agriculture and water transportation, the former rapidly gaining the victory. It is remarkable that within a single generation man should so modify the physical configuration of the country—drying up its rivers, changing the course of trade, destroying important manufacturing interests, and, as has been seen, threatening the existence of the very "Father of Waters" as a means of communication between the great North West and the Gulf, and modifying the physical features of the Mississippi valley to such an extent as would seem impossible, except by long continued geological agencies. At the falls of St. Anthony, nature herself is opposed to man's manufacturing industry, and all the means which human skill and capital can command are employed to arrest a process of natural destruction. These falls were twenty-seven feet high forty years ago, and now they are hardly twenty. The time was when the falls were at Fort Snelling, seven miles below. They have worn their way back seven hundred feet within forty years, averaging seventeen feet a year in their backward march. The danger has become so imminent that a company with a large capital has been organized to preserve these falls by every contrivance known to engineering science.

Professor Watson said that the river Rhine had been made to flow in a regular channel with a sufficient depth, where formerly it was very unstable, by the use of fascines and other engineering devices.

Professor Gross then made a communication upon the methods employed in illustrating lectures on physics, by means of photographs projected upon a screen. The oxyhydrogen or lime light is used for the purpose. After giving a short sketch of the history of the oxyhydrogen blowpipe, the Professor exhibited a new and superior burner, used by Mr. Black; the inner tube of the jet is perforated with small holes, which issues a more perfect mixture of the gases, and consequently finer results than are ordinarily obtained. The theory of projecting images upon the screen was explained, and then the applications of the light to lecture purposes was taken up. The decomposition of water by electricity was illustrated in a most striking and vivid manner. The evaporation of ether, at the ordinary temperature, was shown, the heavy vapor slowly rolling over the edge of the vessel. Also the convection of currents of air was well illustrated. A cylinder of steatite, being substituted for that of lime in the oxyhydrogen flame and its image magnified and projected upon the screen, it could be plainly seen that the steatite was partially fused; it was a good illustration of the intense heat developed in the oxyhydrogen flame.

The Professor then exhibited the aphongoscope, an instrument intended for the projection upon the screen of opaque objects. Two lime lights are made, by means of condensing lenses, to illuminate the object to be shown, which may be a card photograph, coin, cast, or almost any opaque object; and a magnifying lens forms the image upon the screen. This instrument was brought from London by Mr. Waldo Ross.

Mr. Stimpson made a few remarks, drawing attention to the fact that the intensity of the calcium light permitted the presence of a considerable amount of common artificial or sunlight in the room, without impairing the clearness of the image; and therefore without the fatigue, to the eyes, experienced in a short time when bright pictures are represented in a very dark room. He explained that the greater comfort to the eyes, in using semi-transparent instead of opaque shades on ordinary lights, was due to the same principle.

R. O. C.

Recipe for Curing Hams.

To one gallon of water, take one and a half lbs. of salt, one half lb. of sugar, one half oz. of saltpeter, one half oz. of potash.

In this ratio, the pickle can be increased to any quantity desired. Let these be boiled together until all the dirt from the sugar rises to the top and is skimmed off. Then throw it into a tub to cool, and when cold, pour it over your beef or pork, to remain the usual time, say four or five weeks. The meat must be well covered with pickle, and should not be put down for at least two days after killing, during which time it should be slightly sprinkled with powdered saltpeter, which removes all the surface blood, etc., leaving the meat fresh and clean. Some omit boiling the pickle, and find it to answer well, though the operation of boiling purifies the pickle by throwing off the dirt always to be found in salt and sugar. [Having tried this recipe, we know it to be excellent. ED.]

Death of Mr. Sidney E. Morse.

Sidney E. Morse, a well known inventor and journalist, widely known and respected for his benevolence and philanthropy, died on December 23rd, at his residence in New York city, in the 78th year of his age. He was a native of Charlestown, Mass., and was educated at Yale, afterwards studying law and theology. For many years he was the editor and proprietor of the New York *Observer*, having, at the early age of 16, connected himself with journalism by writing on various political subjects. His inventions were ingenious and useful, and comprised, among others, the flexible piston for pumps, patented in 1817, a process of printing maps on an ordinary press, patented in 1839, and a bathometer, an ingenious device for making deep water soundings. In the latter invention, he was aided by his son, and up to the day of his death, it engrossed his attention. He was three years younger than his distinguished brother, Samuel F. B. Morse, and, like him, has lived a long life of hard work for the benefit of his countrymen and humanity.

GOLDEN INK.—Gold ink is prepared as follows: Grind, upon a porphyry slab with a muller, gold leaf and fine white honey, till the former is reduced to an impalpable powder. The paste is then carefully collected and diffused through water, which dissolves the honey, causing the deposition of the precious metal. The water must now be decanted and and the sediment edulcorated to free it from the saccharine matter; the powder exsiccated is very brilliant, and, when required for use, is suspended in mucilage of gum arabic. After the writing executed with this ink is dry, it should be burnished with ivory. Silver ink is made in the same manner by substituting this metal in leaf for gold.

WE hear from Germany of the invention of a new alloy for making imitation jewelry. It consists of copper, 58·86 parts, zinc, 39·24 parts, and lead 1·90 parts. We cannot vouch for its success, but it is so simple that any of our readers can try it for himself.

Read's Oil Can.

This is an improved attachment for oil cans, so constructed as to rise above the mouth of the can when the can becomes nearly full, to indicate the progress of the filling, and to prevent the overflowing of the oil, which is the usual indication that the can is full. A small frame is made rectangular or nearly so in form, the upper part of which is soldered to the upper part of the interior of the body of the can, which is of the usual form. Directly beneath the mouth of the body is a rod passing vertically through the top and bottom bars of the frame, so that, when the rod is raised, the upper end may project above the mouth of the can. To the upper end of the rod is attached a small cap, to enable the upper end of the rod to be more conveniently seen, and which may also close or partially close the spout of the supply can, and wholly or partially interrupt the flow of the oil. Upon the lower end of the rod is placed a disk, to prevent the bottom of the body from being injured by the end of the rod, should they come in contact. A small float or ball, made of cork or other suitable material of sufficient lightness to float in oil, is attached to the rod in such a way as to carry the latter with it in its movements. The cap of the rod is made so much smaller than the interior of the part of the nozzle through which it moves that it will not interrupt the outflow of the oil. By this means the hight of oil in the can is indicated, so that waste, by overflow in filling, with its attendant uncleanliness, is avoided. Mr. Frederick W. Read, of Marquette, Mich., is the patentee.

STEAM TOWAGE ON CANALS.

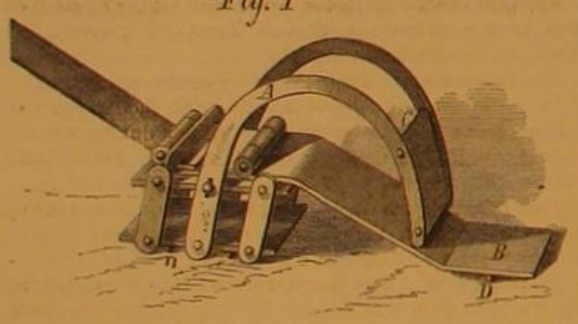
An economical substitute for towage on canals, applicable to all boats at present in use and securing a higher rate of speed, has long been a desideratum. The inventor claims that this is now furnished in the device herewith illustrated in Fig. 1, which, with the one shown in Fig. 2, was patented by Mr. Harvey Fowler, of Washington, D. C., Dec. 12, 1871.

It consists in the employment of stilts or setting poles connected with an oscillating crank shaft, to be worked by steam or otherwise, having feet of a peculiar construction at the extremity of the said stilts.

Fig. 1 represents the stilt in the act of pushing, and Fig. 2 shows the position of the parts as the stilt is withdrawn to take a new step.

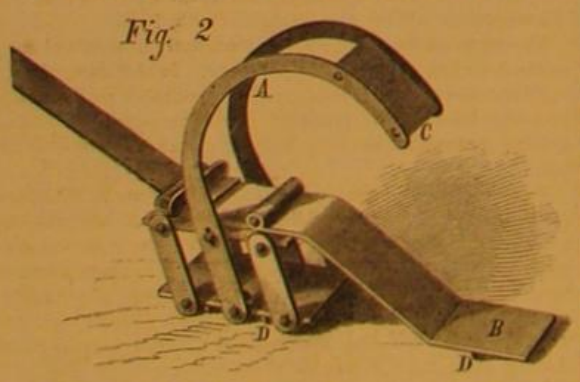
It will be evident, on examination, that no considerable disturbance of the water can take place in using this apparatus, and it will be equally apparent that but very slight disturbance of the ground is occasioned, whether the same be hard or soft, far less, indeed, than that produced by a submerged screw propeller. The push is obtained by direct downward pressure, as is shown in the engraving, the clasp, A, falling upon the flat, B, and pressing directly downwards; and, when the stilt is drawn forward, it does not drag upon

Fig. 1



the ground at all, but is lifted therefrom as the foot of an animal in walking, by the resistance of the water acting upon the lower surface of the stilt itself, as well as upon the surface of the various parts composing the foot, the initial pull lifting the forward part thereof, and giving suitable direction to the curtain or flange, C, the inclination of which will also prevent the rise of the foot in the water above a certain moderate distance. For the purpose of increasing its buoyancy and facil itating its proper action, the plates, of which the foot o

Fig. 2

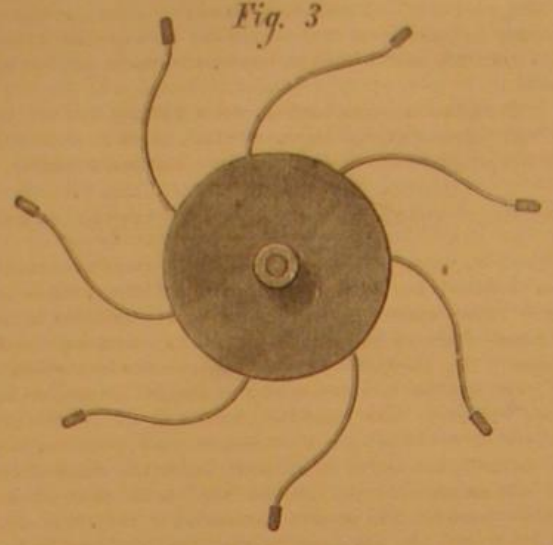


claw is composed, and also the curtain or flange, are to be hollow. When the slit is projected for giving a forward motion to the boat, the foot descends and rests firmly and immovably on the ground, its hold being increased by ribs, D. The jointed oscillating connecting rods between the stilts and the crank shaft being of spring steel, there can be no concussion and no jar.

The stilts are to be worked by steam power, or by Fowler's hand propeller, and may be attached to any boat now in use, or placed in a boat for towing, or in a section of boat, fitted upon the front of an ordinary boat, to be detached therefrom at pleasure.

The wheel, Fig. 3, with flexible spurs, is designed to be used as a side wheel (a pair, of course, for each boat, removable at pleasure), the spurs reaching to and taking hold upon the ground at the bottom of the canal. This kind of wheel will be found more suitable than any other as a means of propulsion, when the bottom of the canal shall have been made uniformly level and hard; an improvement which forcibly commends itself to the attention of the Canal Commissioners and the Legislature.

Fig. 3



The sharp or pointed bow construction of the boat using these propellers, will render protection of the banks unnecessary, as no considerable wave will be formed; and it is confidently affirmed that a speed of eight or ten miles an hour may be attained.

Core Retainer for Tubular Rock Drills.

Charles J. Stevenson, of Hazel Green, Wis., assignor to himself and Martin H. Duckworth, of New York city, has invented a reliable detainer for any broken sections of core, and one that will not injure soft matter passing through the tubes of rock drills. The invention consists in the application of spring jaws within the tubular shank of the drill, in place of the adjustable wedges heretofore in use. The springs are by the entering cores crowded outwardly, allowing them to pass, but spring against the ends of entered sections when dropping down. In rock drills now in use, the wedges, for arresting the core and preventing it from falling out when the motion is reversed or arrested, are of such nature as to crumble soft material, and make the obtaining of a perfect core almost impossible. In boring for veins of valuable minerals, it is necessary to obtain a perfect core in order to ascertain not only the quality and kind of material, but also the distance from and between certain veins. Therefore, the preservation of the core is an absolute requisite. This desirable result will be secured by Mr. Stevenson's improvement.

Fruit Dryer.

The object of this invention is to obtain pure air for the evaporation of water from fruits, berries, milk, juices, and solutions of as pure a quality as possible, so that the mass or solution may not be contaminated by impure matter carried to it by heated air. It consists in a combination of a caloric engine with a fruit dryer or evaporator, in such a manner that the engine will exhaust into the dryer or evaporator and thereby furnish the mass or solution with a supply of pure air. The exhaust pipe of the engine leads into the lower part of the fruit dryer or evaporator, and supplies the latter with the requisite quantity of hot air. The temperature may be lowered by causing a stream of cold air, driven by a pump or fan operated by the engine, to mix with the exhaust from the engine. Mr. Charlie H. Martin, of Chapinville, N. Y., is the inventor of this improvement.

The Behavior of Cements and Metals in Conjunction.

At a meeting of the Institution of Civil Engineers in 1865, when Mr. Grant's first paper on "The Strength of Cement" was read, Mr. G. Dines, in the course of the discussion which followed, said he feared that Portland cement had a corrosive effect upon iron; therefore, when cement had to be in contact with iron, he always used Roman.

Mr. Scott Russell said Portland cement had been extensively used in the insides of ships to preserve the iron from corrosion; and after eighteen years' use, he had seen Portland cement dug out of an iron ship, when the red lead paint and the skin of the iron were as sound as on the day they were put there.

Mr. H. Maudslay thought this fact appeared to show that the cement had not been in actual contact with the iron, as it was protected by the red lead paint to the extent, probably, of two or three thick coats. The caution raised with reference to the effects of Portland cement in contact with wrought iron had been made upon the supposition of a fact which did not appear to exist.

Mr. Scott Russell suggested that the inference to be drawn from Mr. Maudslay's observation would be that, wherever cement was used with iron, the iron should be painted with red lead.

Mr. F. J. Bramwell said that a question had been raised with respect to cement placed in contact with iron, which turned out to be a question of cement upon oil. He might say, that having occasion to form a deck upon a floating dock, which deck he did not wish to be combustible so as to be in danger if a hot rivet fell upon it, nor to be liable to rot if temporarily immersed in water in a tropical climate, and which therefore did not admit of the use either of creosoted or of unprotected timber, he had made every inquiry he could as to the behavior of Portland cement concrete in contact with iron; and he was then having prepared a Portland cement deck, three inches thick, but he was afraid that experiment would not settle the question at issue, because, after all, it would only be cement upon oil, all the iron having been steeped in oil when hot.

Soon after this discussion had taken place, a piece of stout iron piping was bedded part of its length in mortar brickwork and the remainder in cement brickwork; but whether it was Portland or Roman cement, we are unable to state positively. Within the last two days we have examined the pipe, and find that, where the cement was used, the iron is destroyed and full of holes, while the other portion of the pipe remains as sound as it was at first.

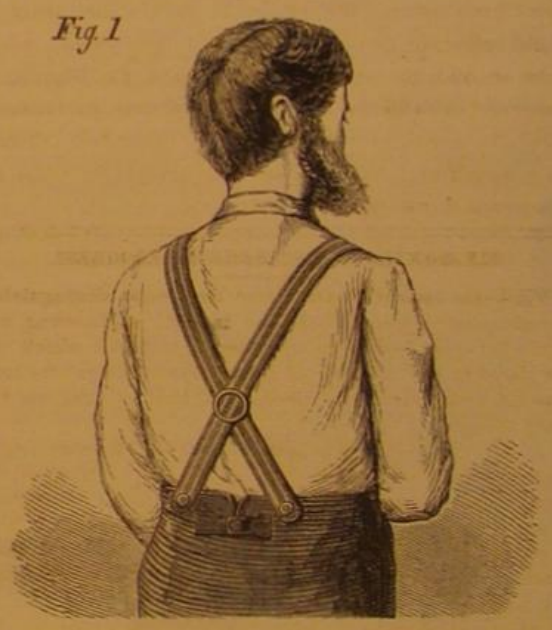
We give this fact for what it is worth, and do not wish any general inferences to be hastily drawn from it. It may be that particular conditions are requisite to lead to this result or that certain precautions will prevent it. At any rate, however, it inculcates the necessity for inquiry. Probably a special examination of one of our ironclads in which cement has been used would not be out of place.

Touching the preservative power of a coat or two of red lead, we should not be very sanguine, and for this reason: In a certain set of houses the external wall forms the back of the cistern, and the front and sides are of wood. The wall is rendered with Portland cement to form a flat surface; and the lead lining is dressed over cement and wood alike. We have recently examined several of these cisterns, and find that, while the lead on the wood front and sides is perfectly sound and good, the lead on the cement has been entirely destroyed, and, indeed, is so changed in character that, from sight alone, it would be difficult to say what the material is.—*Condensed from the Builder.*

BARTHOLOMEW'S SELF-ADJUSTING SUSPENDER.

Having ourselves tested the superior comfort and convenience of this brace, we can recommend it as a decided improvement upon anything we have tried, for ease and comfort.

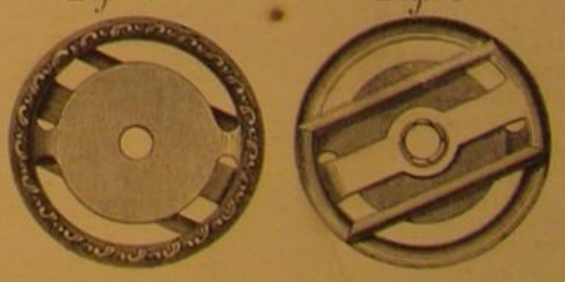
Fig. 1



The feature of the invention is the self-adjusting back slide obverse and reverse sides of which are shown in Figs. 2 and 3, Fig. 1 being a perspective view of the brace as it appears when worn.

The two parts of this slide are pivoted together in the center, each part being a keeper through which one of the webs of the brace passes. The inner one is made in the usual oblong form, with a straight crossbar. The outer one is made circular, the crossbar being also expanded into a circle, the two crossbars being pivoted together as shown.

Fig. 2 *Fig. 3*



When worn as shown in Fig. 1, the slide adjusts itself into the exact position where the suspenders naturally cross, and maintains this position, making the brace fit the form exactly and comfortably, and giving to the dress an easy and luxurious feeling, which will win for the improvement a wide popularity.

The invention was patented March 29, 1870, by Thos. W Bartholomew, and the article is manufactured by the Waterbury Suspender Company, Waterbury, Conn., to whom orders may be addressed.

JUDGE of thine improvement, not by what thou speakest or writest, but by the firmness of thy mind and the government of thy passions and affections.—*Fuller.*

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING) NEW YORK.

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

☞ "The American News Co.," Agents, 121 Nassau street, New York.

☞ "The New York News Co.," 8 Spruce street, New York.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, Prussia, are Agents for the German States.

☞ Messrs. Sampson Low, Son & Marston, Crown Building, 188 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXVI., No. 6. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, JANUARY 6, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

Answers to Correspondents..... 27
A Pleasant Incident..... 19
Applications for the Extension of Patents..... 26
Artificial Stone..... 23
Business and Personal..... 28
Celestial Engineering..... 16
Congressional Library and Copyrights..... 20
Core Retainer for Tubular Rock Drills..... 22
Death of Mr. Sidney R. Morse..... 21
Do your own Thinking..... 19
Fruit Dryer..... 22
Golden Tek..... 21
Granite and Asphalte Roadways.. 24
Hydraulic Cements..... 17
*Improved Safety Governor..... 19
Improvement in the Manufacture of Soap..... 17
Inventions patented in England by Americans..... 26
Keith's Improvements in Nickel Plating..... 18
Latent Heat of Dissociation..... 21
Leather Dressing..... 17
Machine for Making Wire Nettings..... 16
Mongols *vers us* Deep Sea Cables.. 19
Mosaic..... 18
Mr. Grove on Patent Law..... 25
Mr. Justice Grove, F. R. S..... 24
New Books and Publications..... 26
New Use for Electricity..... 17
Notes and Queries..... 26
Official List of Patents..... 28
On the Colors of Metals..... 16
Preparing Gold for Dental Purposes..... 18
Proposed Atlantic and Great Western Canal..... 23
Psychic Force..... 19
Read's Oil Can..... 22
Recent American and Foreign Patents..... 27
Recipe for Curing Hams..... 21
Regulating Watches..... 19
Scientific Intelligence..... 25
*Self-adjusting Suspender..... 22
*Ship Ventilator, Fog Alarm and Bilge Pump..... 15
Six Months of Engineering Progress..... 23
Society of Arts of the Massachusetts Institute of Technology.. 21
*Steam Towage on Canals..... 22
Stone Puller..... 17
The Behavior of Cements and Metals in Conjunction..... 22
The First Locomotive in America.. 24
The Influence of the Moon on Timber..... 20
The Mechanical Equivalent of Zinc..... 20
*The Philosophical Institution and Library, Bristol, England..... 18
The Working Man of the Magazine Writers..... 20
To Know or not to Know..... 20
To Smoke or not to Smoke..... 20

WE are printing every week 40,500 copies of the SCIENTIFIC AMERICAN, and subscriptions are pouring in as they never have before. We expect to reach a circulation of 50,000 before the 1st of next April, and, from present indications, we shall not be disappointed. Send for illuminated poster and calender for 1872, catalogue of our publications, blanks for names, or specimen copies, to Munn & Co., 37 Park Row, New York. For terms and inducements for clubs, see prospectus on last page.

SIX MONTHS OF ENGINEERING PROGRESS.

While the last six months have been more distinguished for advances in mechanical than in civil engineering, and while little has been done in either department which can be placed in the category of great improvements, the time has not been unfruitful. Good, solid, healthy progress has been made.

In civil engineering, the great works which were begun have advanced with unprecedented rapidity. Of these, the most prominent in this country are the removal of the Hell Gate obstruction at Hallett's Point, East River, the New York and Brooklyn Suspension Bridge, and the Hoosac Tunnel. Each of these works has been pushed ahead during the last six months with a vigor that evidences the continued enlargement of mechanical and engineering resources.

The Brooklyn Pier of the East River Bridge now stands 72 feet above mean high tide. The caisson on the New York side has been sunk to the bottom of the river by the weight of masonry upon it, and work in the inside has been commenced.

In regard to the tunneling at Hell Gate, although we are not in possession of exact figures on which to base estimates, we hazard the prediction that it will be found, at the termination of the work, that the cost of blasting and removing will be less than that of any similar quantity of the same material in any preceding work. This will be owing to the use of improved mining appliances, which greatly facilitate this kind of work. For the same reason, the completion of the Hoosac Tunnel will be reached much sooner than would have been the case but for recent additions to our means of drilling and blasting rocks.

The inauguration of the Mont Cenis Tunnel, which took place Sept. 19th, marks the termination of one of the greatest works of modern times.

During the period under review, many large railroad enterprises have been projected, and a large amount of iron has been put down.

In marine engineering, the compound engine system has been largely extended, and it is probable that this system will become almost universal with sea-going steamers.

Among inventions which deserve to rank far above the average, the cutting of hard substances by the use of sand projected against the surfaces to be cut, or falling thereon by the action of gravity alone, is perhaps the most noteworthy. There have been, however, important advances made in other branches of industry. Wood working machinery, in particular, has received many and important additions.

New applications of electricity to regulating large and actuating small machines have been made. Devices for increasing safety in the use of steam have been a numerous progeny, some of them being excellent inventions.

The inventive talent of the country has been concentrated on the problem of canal boat propulsion, through the offer of a large prize by the New York State Legislature. Numerous inventions have been made, and the subject has been discussed in all its bearings. What will result, the future must determine; but we trust all this labor will not come to nought.

The increased use of artificial stone, for various purposes, is a feature of the time. Concrete building is slowly winning public favor, and, we trust, will continue its advances, as in it we see the solution of the problem of cheap building.

The great fire in Chicago has aroused the attention of constructors and inventors to the necessity of increased protection from fire, and doubtless, important improvements will result.

In short, the past year has been one of activity, and decided though unostentatious progress, which gives good ground for the prophecy that the one to follow will not be barren.

PROPOSED ATLANTIC AND GREAT WESTERN CANAL.

For a long time, the question of a direct water communication between the Mississippi Valley and the Atlantic, on some route where the northern annual frosts would not obstruct a winter passage, has been discussed and rediscussed. The general Government has authorized extensive surveys, and nearly every route that seemed practicable has been explored. The extended growth of the agricultural interest in the West, and the pressure upon every outlet of its annually increasing productions, urges the consideration of this question at the present time more than at any former period. The present connection of the great chain of lakes with the seaboard, by the Erie Canal and Hudson River, has been notoriously deficient. A large amount of traffic has been diverted through the Welland Canal and St. Lawrence River, and a valuable trade established that would have been kept wholly within our own borders, had the Erie Canal been enlarged in time and sufficiently to furnish facilities for the transportation of the vast productions of the Western States.

It has long been seen that a highly practical route for a canal, connected with certain navigable rivers, exists in Georgia. The annual report of the Superintendent of Public Works, for the State of Georgia for 1871, does full justice to this route, over which constant water communication at all seasons, from St. Louis to Rome, Georgia, can be obtained by the construction of a canal, thirty miles in length, across the neck of land which, in the vicinity of Guntersville and Gadsden, separates the Tennessee and Coosa Rivers. From Rome, the proposed canal is to be continued *viâ* the Etowah river through a broad level valley, and along Rocky Creek to the nearest point of contact between this creek and Long Branch, thence along the ridge, between the Etowah and the Chatahoochee rivers to the latter, in the vicinity of Warsaw and Duluth, thence by an aqueduct across the Chatahoochee, and through the valley of the Ocmulgee river *viâ* either Atlanta or the Yellow River to Macon, whence there is always steam navigation to Savannah and Brunswick, making about 148 miles more of canal, the entire cost of the work being estimated at $10,000,000. The advantages of the proposed canal are thus summed up in the report:

"The distance from St. Louis to New York, by way of the lakes and Erie Canal, is 1,932 miles. From St. Louis, by the Atlantic & Great Western Canal to Savannah or Brunswick, 1,088, a saving of 844 miles. From St. Louis to the Gulf of Mexico, by the Mississippi, is 1,370 miles, actually 282 miles further than to the Atlantic Ocean by the Georgia route. By this route, a barge, loading at St. Louis or any other point on the Mississippi or its tributaries, can discharge her cargo on board a vessel at Savannah or Brunswick, without, in the meantime, breaking bulk, thereby saving the cost of transhipment, storage, and wharfage, incident to other routes. No marine insurance will be necessary; and being unobstructed by ice in winter, and with abundant water in summer, it will at all times afford a sure and certain transit to the sea. And being, for most of the distance, a river route, it will afford the cheapest transportation known to the commercial world. A tun of freight from St. Louis to New York now costs $11.76, sent by way of the lakes. To Norfolk, by the James River and Kanawha Canal, it will cost $6.61. From St. Louis to Savannah or Brunswick, $4.56, a saving of $7.20 upon present charges, reducing the freight upon wheat to 14 cents a bushel, and its cost to New York to 22 cents."

It will be seen that this proposition makes a bold bid for the trade of the Great West, and it is, we believe, perfectly feasible. It has been pronounced practicable by able and experienced engineers, and the route would, doubtless, have already been opened, had not the production of cotton so fully absorbed the attention of southern capital. Had the Erie Canal, twenty years ago, been enlarged to permit the passage of boats of 600 tuns burden, as it ought to have been, the interest of this State and its great metropolis would not have been endangered by the opening of competing avenues of trade, either North or South. Such an inevitable result was to have been foreseen and provided for in time. It is not, however, yet too late to retain the legitimate share of traffic that ought naturally to flow through this State to the port of New York. The resources of the West are so large that it will ultimately task every commercial thoroughfare to relieve it of its surplus products. It is to be hoped that the legislature of New York will not content itself by the offer of its $100,000 prize for a system of canal boat propulsion. Such a system, if obtained and adopted, would not increase the carrying capacity of the canal nearly to the extent demanded by the exigencies of the case. The canal should be enlarged throughout, so as to float 600 tun barges. The effect of such enlargement would be an immediate and enormous accession to the commerce of the State.

ARTIFICIAL STONE.

The importance of this subject justifies our frequent recurrence to it. The reader will find, on another page, the commencement of an able paper by Dr. Ott, recently read before the American Institute, which discusses the relative merits of various kinds of stones now looked upon as the best yet made by artificial means. Without indorsing all the views therein expressed, we call the attention, of those interested in the progress of this industry, to the facts, therein collected from many sources, which are of great value to all who desire to become perfectly familiar with what has been done and is now doing in this field.

Few are aware how much has been written upon this subject, or what an amount of study it has received. The following is an imperfect list of authorities which may be consulted by those who can gain access to them:

Guyton Morveau. *Recueil de divers mémoirs sur les puzzolanes naturelles and artificielles.* Paris, 1805.

Fleuret. *L'art de composer des pierres factices, etc.* Paris, 1807.

John Smeaton. Directions for preparing, making and using puzzolano mortar. London, 1812.

Vicat. *Recherches experimentales sur les chaux de constructions, les bétons et les chaux ordinaires.* Paris, 1818.

John. *Ueber Kalk und Mörtel.* Berlin, 1819.

Rancourt de Charleville. *Les mortiers.* St. Petersburg, 1822.

Freussart. *Mémoire sur les mortiers hydrauliques, et sur les mortieres ordinaires.* Paris, 1829.

Ch. Bérigny. *Mémoire sur un procédé d'injection.* Paris, 1832.

Vicat. *Resumé sur les mortiers hydrauliques.* Paris, 1840.

Pasley. Observations on limes, calcareous cements, mortars, stuccos and concrete, and on puzzolana, natural and artificial; together with rules deduced from numerous experiments for making an artificial cement, equal in efficiency to the best natural cements of England. London, 1847. Second edition.

Henschel. *Gesammelte Erfahrungen über die Verarbeitung und Anwendung des Ciments, aus der Cementfabrik von Ernst Koch in Hessen-Cassel.* Cassel, 1851.

Joseph Bonin. *Travaux d'achèvement de la Digue de Cherbourg, de* 1830-1853. Paris, 1857.

G. Feichtinger. *Ueber die chemischen Eigenschaften mehrerer bayerischer hydraulischer Kalke im Verhältnisse zu Portland Cement.* Munich, 1858.

John von Mikálik. *Practische Anleitung zum Béton Bau.* Vienna, 1859.

W. A. Becker. *Der feuerfeste Treppenbau von naturlichen und künstlichen Steiner* (with 16 plates). Berlin. Second edition, 1861.

J. Manger. *Der Stettiner Portland Cement in Versuchen und Erfahrung in dargestellt und beleuchtet.* Berlin, 1862. (?)

Practical treatise on Limes, Hydraulic Cements and Mortars, by Q. A. Gilmore, A. M., U. S. Corps of Engineers. New York; D. Van Nostrand, 1863.

Von Gerstenberg. *Die Cemente.* Weimar, 1865.

W. A. Becker. *Practische Anleitung zur Anwendung der Cemente zu baulichen, gewerblichen, landwirthschaftlichen und Kunstgegenständen* (with 31 colored plates). Berlin, 1860-1868.

Victor Petit. *Habitations champêtres. Recueil de maisons, villas, châlets, pavillons.* Paris.

G. Hagan. *See Ufer und Hafenbau.*

W. Michäelis. *Die Hydraulischen Mörtel, insbesondere der Portland Cement in chemisch-technischer Beziehung.* Leipzig, 1869.

A Practical Treatise on the Manufacture of Portland Cement, by Henry Reid, C. E., to which is added a translation of M. A. Lippowitz' Work, describing a New Method, adopted in Germany, of Manufacturing that Cement. Philadelphia, Henry Carey Baird, 1869.

E. Böhmer and F. Neumann. *Kalk, Gips und Cement. Handbuch für Anlage und Betrieb von Kalkwerken, Gipsmühlen und Cementfabriken.* (With Atlas). 1870.

J. Mikálik. *Die hydraulischen Kalke und Cemente; ihre Verwendung.* (With five plates). Pesth, 1870.

The signs of the times point significantly to artificial stone as the building material of the future. In this category, we include bricks, which, when made of suitable material and properly burned, will probably resist the action of disintegrating influences as long as any natural stone obtainable.

Brick making, which has generally been done in the rudest fashion, has received considerable attention of late, and important improvements have resulted, especially in the construction of kilns by which a much better average stock is produced, and a large percentage of fuel saved. Bricks will, therefore, long compete with the very best natural and artificial stone as a building material, some having already stood the test of time for thousands of years.

In conclusion, we may say that with anything so universally in request as good building material, the slightest advance becomes of immense importance; and the study which is now being expended upon such improvements can scarcely fail to largely benefit the entire civilized world.

ALTHOUGH, almost ever since agriculture has been practiced, soot has been known to be a valuable manure, in the nineteenth century there are hundreds of farmers who cannot be persuaded to believe it. It is really as valuable as guano. Take a hogshead of water, and dissolve in it twelve quarts of soot, and you will have a splendid liquid manure for plants. Apply it to the roots, of course, and then watch the result.—*Journal of the Farm.*

GRANITE AND ASPHALTE ROADWAYS.

So much has been said about the superiority of asphalte over granite as a road making material, that those who have not the opportunity to form opinions from actual observation will be glad to obtain some reliable statistics, relating to the actual duration of granite roads under service, as a basis of comparison.

In Paris, where asphalt was first extensively used for street paving, the climate is such as to favor its use. It has not the slipperiness of surface that has been an objection in foggy rainy London, nor the winter ice accumulations of colder latitudes. Yet the London pavements afford an average test of its adaptability to general use in cities, better, perhaps, than is found in the Parisian roads. The report of Mr. William Haywood, Engineer and Surveyor of the Commissioners of Sewers of the city of London, made to the Streets Committee of that body, furnished most important information upon this subject. The facts therein given at length are of the utmost value to this branch of engineering. The asphalts which have been, or are about to be, laid down in the carriage ways of the city of London are, the Val de Travers Compressed Asphalt, the Val de Travers Liquid Asphalt, the Limmer Liquid Asphalt, Barnett's Liquid Iron Asphalt, McDonnell's Patent Adamantean Concrete Paving; and to these may be added granite sets with asphalt joints.

The term "liquid" asphalt is used to indicate those asphalts which are brought to a semi-liquid state by heat, before being laid. French writers have named these, "mastic" asphalts.

For the methods of constructing asphalt roads in Paris, the reader is referred to an illustrated article on page 107, Vol. XXII. (February 12, 1870) of the SCIENTIFIC AMERICAN, in which full details are given.

The Limmer asphalt is brought from Limmer, near Hanover, and from Vorvohle, near Alfeld, Brunswick. The method of constructing roads with it is thus described by Mr. Haywood: "A concrete foundation is first formed, and the asphalt, which, in the Hanoverian mine, differs in quality from that in the Brunswick mine (the one being harder than the other), is used in certain proportions by the judgment of those directing the work; it is broken up and mixed with clean grit or sand of different sizes, according to the place in which the pavement is to be laid; a small quantity of bitumen is then added to the materials, which are placed in cauldrons on the spot, and made liquid by heat, and the compound is run over the surface and smoothed with irons to the proper slopes and curvatures. It is run in two thicknesses, the lower stratum being made with grit of a larger size than that of the upper. The total thickness of the asphalt, when finished, is from 1¼ to 2 inches, according to the traffic in the street."

This pavement is laid in London only in Lombard street. Concrete foundations are also generally used for the Val de Travers asphalt in London.

There are various kinds of pavements, that have been tried or are to be tried, into which asphalt enters as one of the materials; those not yet tried are mentioned in Mr. Haywood's report, but we shall not refer to them further in the present article.

A granite pavement, with joints filled with a composition of pitch and oil, has been experimented with in Duke street, since 1868. In that street 350 yards of pavement were formed of granite, the size of the stones being about 6 inches by 3 inches, and 6 inches deep; they were laid one inch apart from each other, the joints were filled up with small clean pebbles, and a composition of pitch and oil in a heated state was then run into them. Immediately adjacent to this was laid a granite pavement, constructed in the usual manner in vogue in London, the joints being filled with stone lime grout. The results are so far favorable to the pavement with pitch joints

The granite pavements are, in certain places, subjected to as severe traffic as can be found in the world, and as a consequence the very hardest stone is sought for in their construction. That usually employed is brought from Aberdeen, Scotland, and it is with this class of granite the comparisons are made. In our review of Mr. Haywood's report, we shall omit detailed comparisons of cost, since these would be no guide to American road builders. The comparison of relative durability is one which is universally applicable, and is what we wish to bring before our readers.

In these comparisons, the durability of the asphalt roads is assumed to be that period for which the contractors guarantee them to last. This period is, with one exception, seventeen years, in the streets referred to in the report. A pavement, called liquid iron asphalt, is guaranteed for eighteen years. The following is a summary of the durability of Aberdeen granite pavements (blocks 3 inches by 9 inches), the estimated duration being computed from extended data and records of dates of laying and relaying the streets named: Cheapside, 15 years; Poultry, 8 years; Old Broad street, 20 years; Moorgate street, 15 years; Lombard street, 20 years.

Two of these streets, Cheapside and Poultry, are those which are subjected to the most constant and heavy traffic in London.

The comparison is also limited to granite and Val de Travers asphalt, which, in Paris, is considered more expensive than granite. In London, there is little difference in cost, on streets where a great amount of traffic prevails.

In an extended statement of the advantages of asphalt roads, as compared with granite, Mr. Haywood gives a great many details and references, of which we shall make only a brief summary.

The asphalt roads are far less trying to vehicles and passengers than granite roads. The asphalt is far less noisy than granite, but not so much so as wooden roads. It is not so noiseless after being used some time as when first laid. The asphalt makes a road which dries very much more quickly after rain than the granite. In ordinary dry weather, it is less slippery than granite; at other times horses fall upon it, but not more frequently than they do on granite roads. In frosty weather, without snow, which makes the granite pavement slippery, the asphalt does not become so. When slight rains fall, followed by hard frost, the asphalt becomes very slippery, and at such times is more dangerous than granite; but this defect is at once remedied by slightly strewing the surface with sand. A worn, dirty granite pavement would, however, be more dangerous, under such circumstances, than the asphalt. The secretary of the London Omnibus Company, the Inspector of Pavements, the Superintendent of Street Cleansing, and the Police, are of the opinion that no more horses fall, on an average, on asphalt than on the granite roads.

On the whole, the comparison seems favorable to the asphalt roads, not only in point of cost, but in comfort. This conclusion will doubtless prove true of roads made of similar material in this country, provided such a material can be found to compete in cost with the stone now used for paving. It is further questionable whether the superior comfort and cleanliness of asphalt would not compensate for increased cost. We noticed in our issue of Sept. 2, 1871, an American asphalt which seems to us to have properties for roadmaking even superior to the Val de Travers or the Limmer asphalts, and we look to see extensive trials of its merits.

MR. JUSTICE GROVE, F.R.S.

Our English advices inform us that the distinguished philosopher, William Robert Grove, who has long been one of the most eminent men of the legal profession, has been raised to the Bench of the Court of Common Pleas.

Mr. Justice Grove is the son of a Welsh gentleman of property, and was born in Glamorganshire, in 1811. He was educated at Brasenose College, Oxford, and took his M. A. degree in 1833. He studied law in London for two years, and was called to the bar of Lincoln's Inn in 1835. Being compelled by ill health to surrender the more active duties of his profession, he, fortunately for science, devoted his brilliant intellect to the investigation of physical phenomena, especially those of electricity. One of the first productions of his researches was his invention, in 1839, of the voltaic battery which has given him a worldwide fame. Subsequently, in 1840, he received the chair of experimental philosophy at the London Institution, and continued to occupy it for seven years; and it was in the fulfilment of his duties as a lecturer that his courageous originality and penetrating diagnosis were shown in the assertion of the correlation and mutual convertibility of the various species of force. This announcement, one of the most brilliant lights over the field of nature which has ever illuminated the path of the investigator, and one of the greatest discoveries which has been made since Newton promulgated the laws of gravitation, is now universally accepted as indisputable truth; and Mr. Grove's experiments have substantiated the fact that no force whatever can be evolved except at the expense of some other force. The new doctrine gave the word at which many other scientists commenced their labors, and proofs of the truth and importance of the Doctrine of the Correlation of Forces are coming before us daily. Mr. Grove further developed his views in another lecture, published in 1846. Among his many valuable and important discoveries are the gas voltaic battery, the striæ in the electrical discharge, the electricity of flame, the voltaic etching of daguerreotypes, the electro-chymical polarity of gases, new combinations of aplanatic object glasses of telescopes, and the molecular impressions by heat and electricity.

Although Mr. Grove's weak health formerly prevented him from following the arduous career of a popular advocate, as a lawyer he has achieved a high reputation for learning and forensic ability, and he has just received a fitting recognition of his talents by his elevation to the judicial bench. To a philosopher of Mr. Grove's renown, public honors and wealth are of little importance, and indeed, his acceptance of the judicial ermine will cause him to forego a lucrative practice, and take the moderate income of $25,000 a year. But the ease and dignity of the new position will enable the eminent recipient to prosecute further his investigations, and we have no reason to doubt that the world of knowledge and science will be greatly benefitted thereby.

THE FIRST LOCOMOTIVES IN AMERICA.

There has been on our table for some weeks a book which we were reluctant to notice in the usual brief space we can generally allot to new publications. We have read this book*, which makes no pretensions to high literary style, with an interest and enjoyment that we are sure it will give to every intelligent mind.

The history of locomotives is perhaps more instructive than that of any other department of steam engineering. But in its beginnings, it has a peculiar attraction to young and old. The ludicrous predictions, the unbelief of the world, the daring of the earlier inventors, their mistakes and struggles, the genius displayed by them, the marvelous results that have followed their labors, form a chapter, in the annals of civilization, unequaled in grandeur and importance.

The author of the work under review states that, "being familiar with railroads from their first construction, he has, at much labor and expense, collected all the important facts in relation to their construction and to the development of the locomotive machine in this country. These facts have been obtained from the living witnesses who were the actors in those early events, and are presented in their own language."

The book opens with a dedication to Mr. Peter Cooper, in which the first paragraph is as follows:

"It is my belief that your early and most successful experiments upon the Baltimore and Ohio Railroad in 1829-30 proved that the locomotive could be used upon the short-curved railroads in this country. The practicability of this was doubted at the time mentioned even by the most eminent engineers in Europe. I cannot therefore refrain from bestowing upon you the praise of having given the first impulse to the adoption of the locomotive in the United States, a fact which justly entitles you to the honor of being regarded as the 'Father of the Locomotive System in America.'"

We venture to say that Mr. Cooper has become far more widely known through his public benefactions, since the period referred to, than by his connection with the introduction of locomotive engineering in America and his other inventions. The facts are however that he has been a rather prolific inventor, and has done as much for the general welfare in the quiet walks of industry as he has through his generous gifts of money for educational purposes.

The experiment referred to is described in the following extracts from a letter to the author by Mr. Ross Winans, who was present on the occasion:

"On Saturday, the 28th of August last, 1830, the first railroad car propelled by steam proceeded the whole distance from Baltimore to Ellicott's Mills, and tested a most important principle—that curvatures of 400 feet radius offer no material impediment to the use of steam power on railroads, when the wheels are constructed with a cone on the principle ascertained, by Mr. Knight, chief engineer of the Baltimore and Ohio Railroad Company, to be applicable to such curvatures. The engineers in England have been so decidedly of opinion that locomotive steam engines could not be used on curved rails, that it was much doubted whether the many curvatures on the Baltimore and Ohio Railroad would not exclude the use of steam power. We congratulate our fellow citizens on the conclusive proof, which removes for ever all doubt on this subject, and establishes the fact that steam power may be used on our road with as much facility and effect as that of horses, at a very reduced expense.

"The engine" (Cooper's locomotive engine) "started from Pratt street depot, taking the lead of a train of carriages. The power of the engine is a little, if any, over that of one horse, and it can therefore only be regarded as a working model. Immediately in front of and connected with it, was a passenger carriage containing (including the engine attendants) twenty-four persons. The aggregate weight of carriages, persons, fuel, and water, as nearly as could be ascertained, was estimated to be from four to four and a half tuns. Notwithstanding the great disproportion of the moving power to the load, the following highly gratifying results were obtained; the time was accurately noted by disinterested gentlemen of the first respectability:

"The entire passage of thirteen miles was made in sixty-one minutes, including the four minutes lost in taking in water at the middle depot. If this be deducted, it will give precisely fifty-seven minutes in traveling the distance."

Other names connected with the early history of locomotives are John B. Jervis, Horatio Allen, B. H. Latrobe, David Matthew, Stevens, Dickson, and others familiar to the engineering world, and, many of them, of wider fame as public men.

From evidence that seems conclusive, Mr. Brown states the first locomotive that ever ran upon an American railway was the "Stourbridge Lion," purchased by Horatio Allen for the Delaware and Hudson Canal and Railroad Company. Its first trial on the railroad took place at Honesdale, August 8, 1829. The engine was found too heavy for the track, and was consequently taken off.

The Hon. John Torrey, a resident of Honesdale who witnessed the trial, says:

"The failure was a great disappointment, not only to the directors and stockholders of the company, but also to the community, who were interested in the prosperity of the county.

"While thus standing by the side of the railroad, it was an object of great dread to timid children who were obliged to pass by it; and many, now residing in Honesdale, remember the care they were accustomed to take, when children, to avoid passing near the fierce looking 'lion.' In November, 1829, it was housed in with rough boards, as it thus stood beside the railroad, though some of the boards on the sides were soon displaced, to give opportunity for the curious to examine it more readily. It remained where thus housed some fourteen or fifteen years, until so many of its parts were detached or broken, that it was entirely disabled and considered worthless as a locomotive: when the boiler was removed to Carbondale, and used with a stationary engine in one of the company's shops, and the wheels, axles, and loose parts were sold for old iron. Some of the loose parts are still kept as mementos of the first locomotive run upon a railroad in America. The boiler is now [March 28, 1870] in use in Carbondale."

"Its plan of construction was much less simple than that of those now in use. From the great number of its rods and joints, some who were observers of its experimental trial on the road describe it as looking like a mammoth grasshopper, having three or four times the usual number of legs. Its driving wheels were of oak wood, banded with a heavy wrought iron tire, and the front was ornamented with a large, fierce looking face of a lion, in bold relief; and it bore the name of 'Stourbridge Lion.'

"This locomotive and two others, purchased by or made

*The History of the First Locomotives in America. From Original Documents and the Testimony of Living Witnesses. By William H. Brown, one of the Pioneer Locomotive Engineers in this Country.

for the company in England, arrived in New York in May, 1829. August came before the railroad was so far completed that the formal opening could be attempted."

The first American locomotive, the experiments with which we have already referred to, was built by Mr. Peter Cooper. With characteristic modesty, this venerable inventor writes, under date of May 18, 1869:

"The engine was a very small and insignificant affair. It was made at a time when I had become the owner of all the land now belonging to the Canton Company, the value of which, I believe, depended almost entirely upon the success of the Baltimore and Ohio Railroad.

"At that time an opinion had become prevalent that the road was ruined for steam locomotives, by reason of the short curves found necessary to get around the various points of rocks found in their course. Under these discouraging circumstances, many of the principal stockholders were about abandoning the work, and were only prevented from forfeiting the stock by my persuading them that a locomotive could be so made as to pass successfully around the short curves then found in the road, which only extended thirteen miles, to Ellicott's Mills.

"When I had completed the engine, I invited the directors to witness an experiment. Some thirty-six persons entered one of the passenger cars, and four rode on the locomotive, which carried its own fuel and water; and made the first passage, of thirteen miles, over an average ascending grade of eighteen feet to the mile, in one hour and twelve minutes. We made the return trip in fifty-seven minutes."

At the risk of making our extracts too profuse, we give the following description of Mr. Cooper's locomotive, from a lecture by Mr. B. H. Latrobe, before the Maryland Institute in 1868:

"The boiler of Mr. Cooper's engine was not as large as the kitchen boiler attached to many a range in modern mansions; it was of about the same diameter, but not much more than half as high. It stood upright in the car, and was filled above the furnace, which occupied the lower section, with vertical tubes. The cylinder was but three and a half inches in diameter, and speed was gotten up by gearing. No natural draft could have been sufficient to keep up steam in so small a boiler; and Mr. Cooper used, therefore, a blowing apparatus, driven by a drum attached to one of the car wheels, over which passed a cord that in its turn worked a pulley on the shaft of the blower. Among the first buildings erected at Mount Clare was a large car house, in which railroad tracks were laid at right angles with the road track, communicating with the latter by a turntable, a liliputian affair indeed compared with the revolving platforms, its successors, now in use.

"In this car shop, Mr. Cooper had his engine, and here steam was first raised; and it seems as though it were within the last week that the speaker saw Mr. George Brown, the treasurer of the company, one of our most estimable citizens, his father, Mr. Alexander Brown, Mr. Philip E. Thomas, and one or two more, watch Mr. Cooper, as with his own hands he opened the throttle, admitted the steam into the cylinder, and saw the crank-substitute operate successfully, with a clacking noise, while the machine moved slowly forward with some of the bystanders who had stepped upon it. And this was the first locomotive for railroad purposes ever built in America; and this was the first transportation of persons by steam that had ever taken place on this side of the Atlantic, on an American built locomotive."

It is thus seen how large a debt the country owes to one of the most estimable of its citizens; a debt larger than is generally known and understood by the public; for, be it known, that other industries have been largely advanced by his inventions and suggestions. Like Franklin's, Mr. Cooper's name will descend to posterity clothed with honor, and in the future years, as in the present, will be uttered with pride by every true American.

We should gladly extend our rambles through this pleasant and instructive book; but our limits forbid. We have shown the reader some of its attractions, of which copious extracts from autograph letters are the chief, as they bring the reader into close contact with the individuality of a class of men which he rarely finds in other works.

The book is plainly but neatly bound, and is sure to meet with an extensive sale.

The author will supply the work on addressing him, care American Publishing Co., 31 Beekman Street, New York.

MR. GROVE ON PATENT LAW.

In a recent editorial, we placed our advocacy of the system of granting patents upon the broad ground of public rather than individual benefit. We held that patents are privileges granted, not rights inherent. Like other civil rights or privileges, patents are granted as a matter of policy. They are an inducement for inventors to make public rather than conceal their improvements; and thus the public gets the benefit of what it would otherwise never possess, or would in most cases only obtain after long delay. We now find these views so ably sustained, by the opinions of Mr. William R. Grove, Q.C., F.R.S., in his evidence before the House of Commons Committee on the subject of patents, that we reproduce below a portion of his statement.

It is well known on both sides of the Atlantic that Mr. Grove occupies a high rank as a scientist, and is perhaps as able a patent lawyer as can be found in England. Our extract is taken from the short hand report furnished to the *Engineer*.

Most of the honorable members of the Committee would perhaps agree with him that the notion of Government rewards is quite out of the question. To make political interest for inventors would be simply to have that man rewarded who was the most ingenious beggar. To his mind, it is not worthy of argument. He was perfectly prepared to justify what he said if any of the Committtee thought that any practical plan could be devised; but he thought it would lead to a perfectly impracticable result, that instead of having to attend their own business, they should have them running about the corridors of the House of Commons trying to obtain rewards for their inventions. He had considered that subject a good deal, and heard it a good deal discussed. Then what is next best? They might suggest a number of things, but they would come ultimately to this, whether they could not effect their purpose by something like letters patent; that is to say, by making the invention reward itself. Of course that was a very unequal and irregular reward, like most other human rewards; but he did not put letters patent on the ground of rewarding the inventor. He did not think that it was the business of the Government to be charitable or to give medals as tutors at school do; it is not a ground on which the Government could act, and, if Government were to act in all things on that principle it would lead to an, impossibility, to a theoretical Laputa. The real reason for rewarding the inventor is *pour encourager les autres*, to induce inventors to make their inventions and to work them or, so to speak, to force them on the public. The benefit, and the benefit alone which he thought should be looked for, from letters patent is the benefit to the public. He refused to consider it a matter of right. He considered it a matter of expediency. He did not in the least recognize a right in it. The merit of the great scientific man whose discovery leads to a thousand valuable inventions is immensely greater than that of the man who takes a single valuable commercial step; but though they gave the former some titular honors, they would pay the physician for saving the life of a child far more dearly than they would pay a man for discovering the law of gravitation. It is idle to talk of apportioning reward to abstract merit; the future must decide that; they must look to the practical question of immediate benefit to the State. He submitted that the sole ground on which letters patent can be held to be justifiable or permissible is that they are beneficial to the public. If they are, and so far as they are, keep them. If they are not, abolish them. [The distinguished witness has been since raised to the judicial bench. ED.]

SCIENTIFIC INTELLIGENCE.

BURNING METALS AS FUEL.

We can hardly expect to make use of the heat of burning metals as a substitute for wood, coal, or other fuel, but there may be occasions, where a sudden and short heat is required, in which metals would prove available. Some experiments, made by Ditte, upon the heat of combustion of a few of the commonest metals are therefore of sufficient interest to be recorded in a technical journal. Without going into the details of the processes by which he arrived at his results the results themselves are all that we require. The author has compiled the following table:

	For one grain.	For one equivalent.
Magnesium.....	6,130·5 units of heat.	73,568 units.
Zinc.....	1,357·6 " "	44,248 "
Indium.....	1,044·6 " "	37,502 "
Cadmium.....	271·1 " "	15,231 "

Two of these metals have been actually tried for both light and heat, namely, magnesium and zinc.

NEW USE OF THE HYDRATE OF CHLORAL.

Since the production of hydrate of chloral in considerable quantity, we occasionally hear of its incidental use in chemical manufacture. There are important compounds of acetic acid (not popularly known, but of considerable value, especially medicine) which can be derived from the new hypnotic, chloral; for example, trichloracetic acid. A mixture of hydrate of chloral with three times its weight of fuming nitric acid is allowed to stand in the direct sunlight for three or four days until red fumes no longer appear. It is then distilled with thermometer, and, as soon as the temperature remains constant at 195° C., the product is saved, and proves to be pure trichloracetic acid. This interesting compound solidifies at 44° C. and fuses again at 52° C. Three hundred grammes of the pure acid were obtained from forty-eight grammes of the hydrate of chloral. Dichloracetic acid, a liquid resembling acetic acid, is one of the best agents for burning off warts and similar excrescences that we possess. Within a few years, numerous compounds of acetic acid have been invented, for which some use ought to be suggested; among them is the trichloracetic acid described above.

MODIFICATION OF LECLANCHE'S BATTERY.

M. Bouman, of Holland, has proposed some modifications of Leclanche's celebrated galvanic battery, that are said by our exchanges to be of considerable value. In a flat bottomed glass jar, a plate of gas carbon and a rod of amalgamated zinc are placed upright, a short distance apart. The intervening space and the surrounding parts of the vessel are then two thirds filled with the usual mixture of coarsely pulverized coke and black oxide of manganese. In order to prevent the zinc pole from coming in contact with the black mass, it is protected by a cover—a sort of muff—of woolen cloth. As soon as the coarse powder is in place, water is poured in until it rises a trifle above the surface; and a few crystals of sal ammoniac are laid in, which can be renewed as often as they disappear, as well as the water removed by evaporation. Leclanche produced the connection with the carbon plate by means of a covering of sheet lead, but as this was liable to oxidation, complete contact was often destroyed. Bouman remedies this evil by cutting a slit in the gas carbon pole, and inserting a platinum wire, on the end of which are clamps for connection with the outer circuit. Thus modified, the elements were found to run without interruption for a year, sufficiently strongly to drive an electric clock, and to sustain an alarm clock for two years. For the renewal of the battery, it is only necessary to wash out the coke and manganese with weak muriatic acid, and to replace such portions as have been consumed. Under the new arrangement, this is said to be the work of a few minutes The chief modifications appear to be the omission of the sheet lead, and the covering of wool or felt for the zinc plate.

DISINFECTING BY HEAT.

We learn from English exchanges that the corporation of Dublin have constructed a hot air chamber, in which clothes and bedding are disinfected for the public at a moderate charge. The walls and ceiling, of the compartment in which the clothes are heated, are built of brick, and its floor is composed of perforated iron plate. The heat is supplied from the exterior surface of a coil of pipe, eighty feet in length, which acts as part of the furnace flue. The products of combustion escape into the atmosphere without passing into the close chamber, and no emanations from the infected clothes can pass into the open air; this disinfecting apparatus cannot, therefore, taint the atmosphere of the locality Clothes can be disinfected in a common oven, the theory being that contagious germs are destroyed at a heat considerably lower than that at which the goods would be injured.

NEW TEST FOR STARCH.

The old and familiar test for starch is the blue color which free iodine produces when brought in contact with it; but this is not the only reagent by means of which we can detect the presence of starch in combination with similar bodies. Bromine is nearly as good as iodine, and tannic acid is said, in some instances, to be better. A solution, of 3·5 grammes tannin in 300 C.C. distilled water, will answer for making the test. A drop of this tannin solution will cause a precipitate in extremely dilute solutions of starch; the precipitate dissolves when warmed and reappears when the solution cools; and where the starch paste is old, the reaction is said to be more sensitive than that of iodine.

A SUBSTITUTE FOR THE SPECTROSCOPE.

E. Lommel has devised three very simple instruments called the *erythophytoscope*, the *erythroscope*, and the *melanoscope*, which can be advantageously used, instead of the spectroscope, for the detection of substances by their colors and colored flames. Two colored plates of cobalt blue and dark yellow oxide of iron glass are laid upon each other, and, by inserting them in black pasteboard, with a slit for the nose, something like a pair of spectacles is made of them. The combined glasses are only transparent for the ultra red, for yellow green, for blue green and blue rays; and they cut off all other colors. Substances, known to possess these colors or to impart them to the flame of a spirit lamp or Bunsen burner, can be detected by viewing them through such spectacles. The *erythroscope* consists of a cobalt glass and ruby glass, which only admits the ultra red, beyond Fraunhofer's line B, to pass. The third combination, called the *melanoscope*, consists of a dark red and clear violet glass which only allows the middle red tints to pass. Any one who possesses the facility of alternately using the right and left eye, could employ two combinations at once and thus cover nearly the whole length of the spectrum. For the use of students in laboratories, we should think that the simple arrangement described above could be frequently employed to advantage for the detection and separation of a large class of bodies which give characteristic colors to flames; and, by practice, the learner would soon be able to assign the true position to each color nearly as well as if he used the scale usually attached to the spectroscope.

DETERMINATION OF SULPHUR AND PHOSPHORUS IN IRON.

The presence of the least trace of phosphorus and sulphur in iron will destroy it for many purposes, and a correct and easy way of detecting these substances is therefore of importance. K. Meineke dissolves the finely pulverized iron in chloride of copper, separates the reduced copper by treatment with an excess of chloride of copper and common salt, filters through a layer of asbestos, brings the insoluble portions adhering to the asbestos into a beaker glass, and oxidizes by strong nitric acid and chlorate of potash; then he evaporates with hydrochloric acid and determines the sulphur by baryta, as sulphate, and the phosphorus by molybdic acid in the usual way. The novelty of this method is in the substitution of chloride of copper for the chloride of iron employed by other chemists, and its advantages are said to be in the greater facility with which the various liquids and solutions can be filtered. It also yields more accurate results than the former methods.

ECONOMICAL USE OF THE PHOSPHORUS OF IRON ORES.

A Bohemian engineer proposes to economize the waste phosphorus of iron ores by converting it into soluble salts He accomplishes this result by acting on the stamped ores by sulphurous acid, thus rendering the phosphorus soluble, according to the principle recently described in our journal. The ore is then thoroughly leached by water, the excess of sulphurous acid expelled by heat, and quicklime added until the whole of the phosphorus is precipitated. The precipitate can be used at once for agricultural purposes or can be worked up into salts of phosphorus. Where sulphur ores are used, they can be roasted and the sulphurous acid thus evolved advantageously economized to convert the phosphorus into the soluble modification. The iron ore, freed of its phosphorus, is now in condition to be worked for pure

metal. The process can only be available where labor is cheap and good iron scarce, and where the yield of phosphoric acid would pay for the cost of its separation. The use of sulphurous acid for the purpose of reclaiming phosphorus ought to receive more attention from our metallurgists and chemists.

RELATIVE VALUE OF GALVANIC BATTERIES.

Count Moncel comes to the following conclusions, after examining the various forms of batteries in use: Of all the galvanic elements used in industry and the arts, those with bichromate of potassa yield the greatest electromotive force, are the most economical, and give off no irritating vapors; but are, on the other hand, not very constant, and become strongly polarized. He commends the following batteries, but gives no description of them: The Delaurier element, the Chutaux element, and the Grenet element.

ELECTROTYPES OF GELATIN PICTURES.

To prepare gelatin relief pictures for the galvanoplastic deposition of copper, the film is glued to a glass plate by copal varnish, and immersed for an hour in a concentrated solution of tannic acid, in order to render it less sensitive to the action of water. It is then suspended in a silver bath, until the whole surface is moistened. The picture is then laid down horizontally in the sunlight, and a copper wire moved over its surface. The silver separates as brilliant metal on the wire and on the parts of the picture touched by it. It then becomes a conductor, and only requires a weak current to deposit copper upon its surface. In this way, a gelatin picture can be easily converted into an electrotype.

APPLICATIONS FOR EXTENSION OF PATENTS.

MACHINE FOR TRIMMING BOOKS.—Mary H. Semple, Lowell, Mass., administratrix of A. C. Semple, deceased, has petitioned for an extension of the above patent. Day of hearing, February 28, 1872.

GRAIN SEPARATOR AND CLEANER.—Simeon Howes, Silver Creek, and Gardner E. Throop, Syracuse, N. Y., have petitioned for an extension of the above patent. Day of hearing, February 28, 1872.

HUB OF CARRIAGE WHEEL.—James M. Whitney, Providence, R. I., has petitioned for an extension of the above patent. Day of hearing, March 13, 1872.

PHOTOLITHOGRAPHY.—James A. Cutting and L. H. Bradford, Boston, Mass., have petitioned for an extension of the above patent. Day of hearing, February 28, 1872.

WIRE STAPLE.—Byron Boardman, Norwich, Conn., has petitioned for an extension of the above patent. Day of hearing, March 13, 1872.

HOT AIR FURNACE.—John Child, Elyria, Ohio, has petitioned for an extension of the above patent. Day of hearing, March 6, 1872.

LIGHTNING CONDUCTOR.—Caroline A. White, Racine, Wis., administratrix of Oren White, deceased, has petitioned for an extension of the above patent. Day of hearing, March 13, 1872.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row,

Inventions Patented in England by Americans.

From November 28 to December 4, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

ALE TIE.—J. T. Butler, New Orleans, La.
EXCAVATOR.—J. Shelley, Mahanoy, M. C. Bullock, Pottsville, Pa.
HAT LOOMS.—J. Van D. Reed (of New York city), London, England.
LAMPS, ETC.—J. W. Bartlett, New York city.
PUDDLING FURNACE, ETC.—J. Mackintire (of New York city), London, Eng.
STAIR ROD FASTENING, ETC.—H. C. Marston, F. W. Brooks, New York city.
STONE SAWING MACHINERY.—H. Young, Stamford, Conn, and J. L. Young, New York city.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—MOLDS FOR IRON CASTINGS.—Can these be made of plaster of Paris, and yield good castings?—J. H. P.

2.—TINNING CAST IRON.—Can any one inform me by what process I can tin cast iron?—J. R. W.

3.—LIQUEFACTION OF SULPHUR.—Will some of your readers tell me whether sulphur can be liquefied or not, and how?—F. C. A.

4.—CYLINDER LUBRICATOR.—What is the best lubricator for the cylinder of an engine?—A. S.

5.—BLUE THISTLE.—Can any of your readers tell me how to effectually kill out a very obnoxious weed, popularly called "blue thistle," which grows luxuriantly upon our poorest pasture land?—J. H. M.

6.—PAPER MAKING MATERIAL.—Can information be given of a simple process for testing the various paper making substances that come under the eyes of observing persons? and how can I make a sample of paper in the laboratory?—J. H. M.

7.—WHITEWASH.—Can any of your readers give me a good recipe for whitewash for rough wood work that is exposed to the weather, which will not come off when wet?—A. M.

8.—LETTERING ON STEEL.—How can I stamp letters or figures, on polished tempered steel, in black, such as we see on saws, (the makers name, etc.)?—C. T.

9.—WASTE OF PIG IRON IN CASTING.—Can any one tell me what would be the percentage of loss on iron, in pigs, passing through fire for purpose of making castings? The experience of any large foundry will be sufficient.—E. M.

10.—STAINING CANES.—Will some one oblige a number of amateur cane makers with a receipt for staining canes a good chocolate color, also for giving a matted appearance? The kind of wood used is principally white thorn, which is almost as hard and white as ivory.—W. H.

11.—LIGHTING BY GAS.—Is there any rule by which gas fittings may be proportioned in number in lighting churches, public halls, etc.? The burners consuming six foot of gas each per hour, how many will be required to light a given space?—G. E. E.

12.—TUBING FOR SIPHON.—I wish to bring hard water from a well by means of a siphon, distance 700 feet, fall 20 feet; what size and kind of tubing should I use? Will iron pipe fill up? Would bathing in, or watering stock with, water drawn through lead pipe from a cistern, be injurious?—P. B.

13.—CONSUMPTION OF FUEL IN MELTING IRON.—Will some of your readers state their experience as to the amount of coal that will be consumed in melting three thousand pounds of iron (mixed Scotch pig and scrap, one part of first, and five parts of second) in a small furnace; and how the coal and iron should be distributed to obtain best results?—H. A. W.

14.—TRANSFERRING POWER.—I have a small machine shop, and wish to put up a circular saw as cheaply as possible. I can get the speed required direct from the line shaft, and I want my saw mandrel to set at right angles with it. Can I run it with a quarter twist belt? The drum on the line shaft is three feet eight inches in diameter, and the saw pulley is five inches in diameter. The distance between the face of the two pulleys is three feet.—E. L.

15.—IMPURITIES IN COAL GAS.—Will some one please explain the following points? (1.) What is the easiest and simplest way of detecting, in coal gas such as is used for illuminating our buildings, the impurity known as a compound of sulphur and carbon? (2.) Where this impurity exists, is it deleterious to health, and injurious to furniture, paintings, gildings, etc.?—J. T. P.

16.—UTILIZING HUSKS.—Will any one give me, in few words, the best and most recent method of utilizing corn husks? In the West, they can be supplied in large quantity, but for the want of a remunerative market are now lost. And will any one inform me if there is any manufactory in the United States where the husk of the maize is used in making felt, paper, etc., successfully; and whether there is any simple form in which it could be introduced into our humane institutions, poor houses, etc? The value of such industry in public institutions, as a means of preserving health and order, deserves attention.—L. S. P.

17.—NEATS' FOOT OIL.—Will some one of your correspondents inform me how best to clarify neats' foot oil?—M. B. E.

18.—BOILERS IN THE UNITED STATES.—Can any readers of the SCIENTIFIC AMERICAN inform us how many steam boilers are in use in each of the New England and Middle States, also in the principal cities in each State?—V. & N.

19.—SAND IN DRIVE WELL PIPES.—Will some of your readers give me a remedy or sand drawing up the pipes, in drive wells, and thereby causing the valves to leak?—W. J.

20.—FUSION OF SAND.—Can common sand be melted and molded into blocks, say 16 inches square, without being mixed with other materials? If so, would such blocks be strong and hard to break, or would they be brittle? What degree of heat would be required to melt sand?—W. S. G.

21.—WATERWHEEL.—I have an overshot wheel, eight feet in diameter, which propels a drag saw for sawing wood, and a lathe. The wheel is getting old, and must be renewed or replaced by another kind. Will a small turbine, say 16 inches diameter (12 feet fall) with same quantity of water, give as satisfactory results as an 8 feet overshot, for moving a drag saw?—J. H. P.

22.—HEATING SMALL IRON ARTICLES.—Can any of your readers tell me the best mode of rapidly heating, to a red heat, small iron work, to be stamped or worked on drop presses, etc., without much scale? W. S. H.

23.—PREPARATION OF COTTON SEED OIL.—How can we prepare cotton seed oil in such a way as to make a quickly drying oil, to use for painting purposes, instead of boiled linseed oil?—S. & B.

24.—PROPORTIONS OF CUT OFF.—My engine works full stroke. I wish to cut off at three-fourths. I have a common slide valve; and have had a new valve made, with ¾ inch more lap than the old one, which I think will give the proper cut off. What I wish to know is, will I have to alter anything else, either eccentric rod or eccentric?—A. H. G.

25.—PRINTING ON WOOD AND METAL.—Is there any way by which one can print, with type, on wood or on some common metal, so as to withstand entirely, or to a certain degree, the inclemencies of the weather, sun, rain, heat, and cold? The printing should be done in some kind of ink; and instead of on wood, it may be done on some kind of paper, parchment or other material that will withstand moisture, and can be nailed on the wood. But of course the direct application to the wood, if practicable, would be best.—G. H. P.

26.—MECHANICAL MOVEMENT.—I wish to procure a mechanical movement by which, two wheels being given, one acting upon the other and the motor wheel revolving at a uniform rate of speed, the speed of the wheel acted upon may be increased or diminished at pleasure. To be of any value the increase or decrease should be positive, and under the certain and complete control of the operator.—D. L.

27.—FRICTION MATCHES.—Doubtless the lucifer match was regarded as a great improvement upon the tinder box, and upon the friction of two sticks upon each other; but in these days of lightning expresses and lightning telegraphs, the lucifer match is a slow coach entirely. It requires about ten seconds to pick a match out of the box, scratch it, and ignite a candle or lamp. There are, in the United States, say 30,000,000 inhabitants or 6,000,000 families, and every family averages ten matches per day. A simple calculation will show that the people of the United States spend more than nineteen years every year in scratching lucifer matches. Cannot this valuable time, or a part of it, be saved? An almost indispensable requisite of the chemist's laboratory is the hydrogen lamp, which consists of a suitable vessel for generating hydrogen gas, having a stopcock and tube, at the end of which is a bit of platinum sponge; and almost in contact with the latter is the wick of a miniature alcohol lamp. This lamp is ignited by simply turning the stopcock, and apparently without loss of time. The hydrogen lamp is very simple in its operation, and the expense attending its use must be very trifling. If some enterprising inventor would perfect, cheapen, and introduce to the public the hydrogen lamp, or some other device equally effectual, to take the place of the friction match, he would not only secure for himself a fortune, but be instrumental in saving to the world a great deal of time, and preventing many destructive conflagrations, and deaths of children from eating matches, to say nothing of the burnt fingers, the loss of temper, and the profane swearing.—J. H. P.

Examples for the Ladies.

Mrs. Enoch Knight, of Piedmont, W. Va., has stitched and trimmed two silk dresses in a day with her Wheeler & Wilson Machine, and earned from $20 to $30 a week with ease.

Burnett's Cocoaine stops falling of the hair.

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.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. D. Bulkley, Patentee, Cleveland, Ohio.

Wanted, the address of every Painter and Sign Writer in the world. A. B. Putman, Green Bay, Wis.

Presses, Dies & all can tools. Ferracute Iron Wks, Bridgeton, N.J.

Lumber Manufacturers—For the best Gang Edger, address E. C. Dicey, Montague, Muskegon Co., Mich.

Reliable business men wanted as State Agents. Also, good patents. Inventor's Co-operative Mf'g Co., 21 Park Row, New York.

Wanted, a Mechanical Draughtman used to Railway Locomotive and Car Work. Apply by letter, stating terms and references. Matt. P. Wood, Gen'l Supt. C. & T. H. Railway Co., Terre Haute, Ind.

For Sale—A good Foundry Plow and Stove Manufactory in Mississippi. Cheap, and terms easy. All machinery necessary. Established 1854. Address Shaw & Son, Water Valley, Miss.

Two toy Steam Engines for sale, like the one noticed in Scientific American of Nov. 25. C. T. Mason, Jr., Sumter, S. C.

Cast Cast Steel Plow Shares, or Points are made by the Pittsburgh Steel Casting Co., which can be Worked and Sharpened as other steel. See advertisement.

Maine's Portable Ventilator—Adjustable to any window. Fresh air without draft. See Scientific American, Dec. 23. Send for Circular. Underhill & Co., 95 Duane Street, New York.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4 00 a year. Advertisements 11c. a line.

Chard & Howe's machinery oils, the best—try them—134 Maiden Lane, New York.

A practical Machinist, having first class Machinery for Iron Work, would like to hear of power, with inducement to settle in Virginia, Kansas, or intervening States. Address, J. D. A., Lock Box 91, Boston, Mass.

We will remove and prevent Scale in any Steam Boiler, or make no charge. Geo. W. Lord, 232 Arch street, Philadelphia, Pa.

Rubber Valves—Finest quality, cut at once for delivery; or moulded to order. Address, Gutta Percha & Rubber Mf'g Co., 9 & 11 Park Place, New York.

Engineering and Scientific Books. Catalogues mailed free. E. & F. H. Spon, 446 Broome St., New York, and Charing Cross, London.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

Williamson's Road Steamer and Steam Plow, with Thomson's Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

For Hand Fire Engines, address Rumsey & Co., Seneca Falls, N.Y.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca, Falls, N.Y.

Scale in Steam Boilers—To remove or prevent scale, use Allen's Patent Anti Lamina. In use over Five Years. J. J. Allen, 4 South Delaware Avenue, Philadelphia, Pa.

Presents—A Doty Washing Machine and Universal Clothes Wringer—warranted satisfactory. R. C. Browning, 32 Cortlandt St., N.Y.

Improved Mode of Graining Wood, pat. July 5, '70, by J. J. Callow, of Cleveland, O., enabling inexperienced grainers (" without the long required study and practice of heretofore") to produce the most beautiful and Natural Graining with speed and facility. Send stamp for circular.

3 Hydraulic Presses for sale on reasonable terms. Apply to Whitneyville Armory, Conn.

Stencil Tools & Steel Letters. J.C.Hilton, 66 W. Lake st. Chicago,

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. Send for Circular.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W.D. Andrews & Bro, 414 Water st., N.Y.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

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

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Safety Stove Elevators. Provision against Rope, Bolt, and Engine breaking. One third the cost of others claiming to be safe. Andrews Bro., 414 Water Street, New York.

Diamond Carbon, of all sizes and shapes furnished for drilling rock, sawing and turning stone, conglomerates, or other hard substances also Glazier's Diamonds, by John Dickinson, 64 Nassau st., New York.

Glynn's Anti-Incrustator for Steam Boilers—The only reliable preventive. No foaming, and does not attack metals of boilers. Price 15 cents per lb. C. D. Fredricks, 587 Broadway, New York.

The Greenleaf Grate Bar saves fuel, and lasts much longer than the ordinary bar. Address Greenleaf Machine Works, Indianapolis, Ind.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

CARBON PLATES FOR BATTERY.—Let A. N. take coke from the gas works, pulverize, mold to the required shape with flour and a little molasses, and bake it in an oven.—J. A. L., of Ohio.

HYGROMETER.—T. M., Jr., can pour alcohol or ether, instead of water, on the wet bulb of his hygrometer when the air is of a known humidity, and find the difference; then he can compute the humidity at lower temperatures.—J. A. L., of Ohio.

J. A. L., of Ohio, asks: Is Ampère's theory generally accepted, namely: If a compass is placed above or below a wire through which a strong current of electricity is passing, the needle tends to place itself at right angles to the wire? Ans. Yes.

T. J. P., of Ill.—We refer you for answers to your queries to the elaborate discussions of steam boiler explosions, already published by us.

W. T., of Mich.—A cylinder, to give a spherical surface to pilules of semi-plastic material, should revolve slowly and not be overcharged with the pilules. With these points properly attended to, we judge your apparatus will succeed.

SCREW CUTTING.—Let R. F. C. take the number of threads to be cut for a numerator, and the threads of the back screw for a denominator; thus, two threads on the back screw and four threads to be cut will give 4 divided by 2, equals 2 divided by 1. This is the proportion; so if 80 threads are required on the screw to be cut, the back screw must have 40 threads.—J. A. L., of Ohio.

REVOLUTION OF BODIES.—If R. O. H. goes around a tree, of course he goes around anything that may be on the tree. The varying position of the squirrel, in the case mentioned, does not affect the question at all, as the squirrel is always within the circle described by the man around the tree.—H. G. F., of Va.

BINIODIDE OF MERCURY IN SOLUTION.—If H. G. I. will dissolve the potassium iodide and the corrosive sublimate separately in small portions of the water or other menstruum, he will find, on mixing the solutions, that the resulting biniodide readily dissolves.—H. G. F., of Va.

SALT AND ICE.—We put salt in our pumps in cold weather, because water holding salt in solution does not freeze as readily as pure water. But where salt and ice (or snow) are mixed, the consequent liquefaction renders a large amount of heat latent, thereby effecting a very considerable reduction of temperature. A mixture of ice and salt in equal proportions will remain at a temperature of 4° Fahr. for several hours, and is, therefore, an excellent agent for refrigerating creams, jellies, etc.—H. G. F., of Va.

BEES IN WINTER.—Bees should, if possible, be wintered in the cellar or some other warm and dark room. A strong swarm, well supplied with honey, in a hive with good upward ventilation, with a small opening through the bottom board, would probably winter safely, even though covered with snow. A hive of bees out of doors requires for the winter, says Langstroth, twenty-five pounds of honey. In 1869, my twenty-seven hives (stored in cellar) consumed, between December 1st and March 18th, 15¼ pounds. Greatest loss, 21 pounds; the least, 9 pounds.—J. H. P.

J. H. V., of Kan.—Not knowing the cause of your boilers foaming, we cannot suggest the remedy. It is probable the fault is either in the construction of the boiler or in the quality of the water. If the former, the only remedy is to get a boiler properly made; if the latter, thorough purification of the water, by chemical means or by the use of a surface condenser, is necessary.

G. W. B., of Mich.—A wheel is in "standing balance" when, not being revolved, a perpendicular plane drawn through its axis of revolution will divide it into two portions having this relation, namely, that when the weight of each particle is multiplied by its horizontal distance from the vertical plane, the sum of all the products on each side of the plane shall be equal. If you should perform this operation with the wheel you propose, you will find the sums equal, and hence the wheel will be in standing balance, but not necessarily in "running balance," as the action of centrifugal force might change the relative distances of the particles.

CUTTING BEVELED JOINTS.—G. S. N., in reply to C. S., gives a rule for finding the miter cut of hoppers, etc., but not the bevel joint. Let C. H. S. bevel the edges of his stuff at any angle required; then, with the same bevel, strike a line across the face of the board, say from the top edge. Now, with the perpendicular hight of hopper, from the same edge draw a line parallel with the edge, cutting the line just formed; from the point of crossing, square across to the opposite side of the stuff; then a line drawn across the board, connecting the ends of the lines thus made, will give the true joint in every case where the hopper is square, or the sides at right angles.—G. D. Y., of N. J.

HYGROMETER.—To T. M., Jr., No. 19, December 16, 1871. Throw your hygrometer away: it is an ingeniously constructed one, but impracticable to American love of simplicity. Take two strips of soft poplar, cross grained, an inch and a quarter wide and four inches long, rubbed evenly down as thin as stout drawing paper. Secure an end of one to a suitable metallic frame, the edges of the wood being free and confined in polished metallic grooves, the opposite end to be attached securely to a strip of thin metal which reaches back to the place of beginning, at which place the other strip of wood takes the metal strip, and in its own grooves lies snugly, parallel with the first. Now, from the free end of the last wood, another shorter strip of metal acts as a connecting rod to a toothed sector; this engages a pinion on an arbor, which, passing through a disk, secures the pointer of the index. Graduate the circular scale from 1 to 100, having 50 at the top and a space between 1 and 100 at the bottom. Whenever the weather indicates that the dew point is reached, 80° on your dial will be about right, the pointer of course moving towards 50 as the moisture lessens, and "dry" being opposite to dew point. This instrument will never fail.—R. H. A.

NEW BOOKS AND PUBLICATIONS.

SCIENCE RECORD FOR 1872. Being a Compendium of the Scientific Progress and Discovery of the Past Year. 400 pages, octavo. 100 Engravings, Steel Plate and Wood. Handsomely bound in muslin, $1.50: extra binding, half calf, $2. Munn & Co., Publishers, 37 Park Row, New York, Office of the SCIENTIFIC AMERICAN.

This new and elegant work presents, in convenient form, notices of the leading subjects and events, pertaining to science, that have occupied public attention during the past year. The progress of the more important public works is duly chronicled, with illustrative engravings. The leading discoveries, facts, and improvements, in chemistry, mechanics, engineering, natural history, and the various arts and sciences, are recorded and illustrated. Sketches of prominent scientific men, with illustrations, are given, and among the portraits are those of Faraday, Murchison, Darwin, Agassiz, Huxley, and Herschel. The Mont Cenis tunnel, the Hell Gate works, the Brooklyn suspension bridge, the Hoosac tunnel, the St. Louis bridge, the United States Patent Office, and other works are illustrated. A large amount of useful information, tables, descriptions of improvements, with engravings, are likewise presented. The book is one of much interest and value, and should have a place in every library.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

WINDOW AWNING.—Charles C. Moore, New York city.—There is nothing new about the construction of the frame of the window. A strip of cloth, or other suitable material to form a shade, is made of the proper length and width to fit into the frame. The upper edge of the shade is attached to a roller in the ordinary manner. The roller may be a spring roller, or any other kind of a shade roller that may be desired. Triangular pieces of cloth, or of the other material of which the shade is made, may extend nearly to the upper end of the shade or only half the length. The triangular pieces may be made separate and sewed to the edges of the piece, or they may be all formed in one piece of the requisite width and cut to reduce them to the desired form. A bar is placed in a hem formed upon the lower ends of the parts. The bar is hinged or jointed at the seam or meeting of the pieces, so that it may be folded together to adapt the shade to be rolled upon and unrolled from the roller with the same facility as an ordinary shade. To adjust the shade for use as an awning, it is passed out of the window, above the upper sash, when the triangular pieces extend nearly to the upper end of the shade proper, and below the upper sash, when the same pieces extend only half the length of the shade proper. The end parts of the bar are then opened out at right angles with the middle part of said bar, and their ends are placed and rest upon the lower part of the window frame, thus forming an awning. The awning is secured in place by cords attached to the lower end of the shade, or to the middle part of the hinged or jointed bar, or at any other point or points equidistant from the joints of said bar, and are secured to hooks, catches, or other fastenings attached to the lower part of the frame. The cords may be the ordinary cords for raising and lowering the shade. If desired or necessary, the edges of the triangular pieces may have eyelets formed in them, to enable them to be conveniently secured to the sides of the casing or frame.

SEEDER.—Thomas L. Pierce and George Pierce, New Providence (Union Post Office), Iowa.—This invention consists in placing oval shaped buttons on cutaway ends of the conducting spouts to admit of scattering the seed to a greater or less extent, according to the nature of the seed to be deposited.

FENCE.—Russ B. Meeker, Sandford's Corners, N.Y.—The posts have bases which are broad transversely to the line of the fence, and which enter the ground slightly at their outer extremities, so as to hold them firmly from tipping by the action of strong winds, or by any pressure that animals may bring to bear against them. The rails are interlocked with these posts in such a way that a wedging action is secured with the rails themselves and with the rails and posts, making a firm yet easily created structure, which may readily be taken apart, and replaced whenever desired. In short, it is a portable fence, obviating the need of post holes, and not disturbed by the action of frost.

KNIFE CLEANER.—William S. Beebe, Joseph T. Baynes, and Abraham A. King, West Troy, N. Y.—This invention consists of a roller cleaner for knives, forks, spoon handles, and the like, in which one elastic faced roller turns and the other is stationary when the article is pushed in between them, and when it is drawn out, the roller, which was previously stationary, turns and the other is stationary, so that the labor of polishing is divided between the two movements, and can be accomplished with less pressure of the rollers than when the polishing is done on both sides at once; or, if the same pressure is maintained, the work will be done better. The invention also consists of a combination of a trough, containing brick dust or the like, with the lower roller so arranged that the dust will be automatically supplied to the roller.

WASHING MACHINE.—Oscar L. Dorr, of South Walpole, Mass.—The frame consists of two end uprights or posts which are, at their lower ends, connected by a longitudinal beam. In the upper part of the frame are the bearings of a multiple roller which is composed of a series of rods arranged in a circle around the axis. The ends of the rods are fitted into sockets provided for their reception in metallic head plates. These head or end plates are mounted upon a central axle, and further connected by screw rods. The rods are so fitted into the head plates that every other rod is free to revolve on its own axis, the remainder being rigidly secured. The axle is continued beyond the head plates and has its bearings in the uprights of the frame. Its ends are connected with springs which tend to draw it down, and with it the entire roller. Three plain rollers are hung in the frame under the multiple roller. The springs crowd the latter down upon the plain rollers. The fabrics to be washed are placed between the rollers, and rotary motion is then imparted to the latter by means of a crank handle, so that the rods and rollers will be successively brought into contact with the fabric, and by the springs carried forcibly against the same. The connection of the springs with the bearings of the axle is peculiar. These bearings are made in form of cylindrical blocks with an annular recess, cut into their lower ends. The spring enters this recess, thus embracing the pendent plug, and is fastened by a nail or pin driven through the block and one of the convolutions of the spring. The lower end of each spring is secured to the base by a screw or pin. Slotted or forked cleats are secured to the side of the tub to which this machine is to be applied, the base piece of the frame fitting into these cleats, and being thereby securely held in place.

EARTH SCRAPER.—George W. Bayley, of Stuyvesant, N. Y.—We shall be unable, in the absence of diagrams, to give our readers an idea of the details of this novel combination. It is, however, a marked improvement in scrapers used for grading roads, lawns, etc., and though quite peculiar not complicated and costly. Its use will lighten the labor of both horses and men in the performance of this class of work.

BRICK MACHINE.—John Treadway, of Haverstraw, N. Y.—This invention consists in certain improvements on a brick machine for which letters patent were already issued to the same inventor, and consists in the mechanism employed for varying the action of the presser and operating the follower, and in a joint box for the presser guide.

CHURN.—John Cochran, Jr., of Auburn, Mo.—This invention relates to improvement in that class of churns in which two dashers are so arranged on separate shafts as to be rotated in opposite directions by suitable connection with bevel gears. It consists in so combining clutch devices with the shafts or rods of the dashers and the operating gears that said dashers may be readily set parallel to each other, so as to be revolved together, to facilitate gathering of the butter, or at right angles, or to be revolved in opposite directions, as heretofore.

SPRING PERCHES FOR BIRD CAGES.—Edward Aldom, of New York city.—This invention consists in a spring perch attached to the side of a cage and extending into the cage. To the perch is attached, a wire coil spring, the spring itself being soldered or otherwise fastened to a metallic plate. On the outer or opposite side of this plate are hooks soldered or riveted thereto, and also fingers, which project outward. The hooks clasp the surrounding band wire of the cage, while between the fingers one of the vertical wires of the cage is received. When the plate is thus attached, the two fingers may be bent together so that the vertical wire will be firmly clasped and the perch well supported in position. The perch thus supported by the coil spring resembles the bough or twig of a tree or bush in its elasticity, and gives the bird that graceful movement so much admired by the observers in birds of song when they are free to select their own perches in the open air. The device has, moreover, the merit of being exceedingly neat in its appearance.

WAGON BRAKE.—John A. Gerhart, of Easton, Pa.—This is an improvement in wagon brakes wherein a lever is arranged horizontally beneath the wagon body in such a manner as to operate the brake bar through a connection established therewith by means of rods; and the invention consists in a particular arrangement, whereby a brake is provided, combining, it is claimed, in a pre-eminent degree, economy in manufacture, simplicity of construction, and ease and efficiency of operation. A great advantage of leverage is obtained, so that the brake may be readily applied with any desired force to the wheels.

TINMAN'S TONGS.—Samuel T. Dickinson, Jr., of Belvidere, N. J., assignor to himself and Ezra De Witt, of same place.—This tongs is formed of two jaws hinged together like a butt hinge, with a pintle, each jaw having a handle rigidly attached to the jaws, the jaws and the handles being connected to operate like the ordinary tongs. These jaws are chambered out on their inner sides, forming a hollow space. A gage bar extends through the space. There is a slot in the top jaw and a lug on the gage bar, which projects through the slot. An index pointer is used, by which the gage is set to correspond with lines indicating inches on one of the jaws. The side edges of this jaw are grooved. The ends of the gage bar are turned up on to these edges with set screws therein. The ends of the set screws slide in the groove when the gage is moved, and, when the gage is placed in the desired position, the screws are turned up and confine it there. Guide arms are attached to the guide bar, standing at right angles therewith. These arms pass through slots in the back jaw and project therefrom when the jaws are closed. When the tongs are open and applied to the edge of the metal sheet, the edge of the metal will strike these arms and thereby be prevented from passing beyond the gage. When the jaws are closed, the edge of the sheet is forced by the jaws down to the gage, when the angle in the sheet may be made at the edge of the tongs. These tongs may be made o any size, so that with a single pair an edge may be turned on sheet meta from half an inch to twelve inches, and the work may be done by one man, whereas in turning edges in putting on tin roofing in the ordinary way, or by the tinners' tongs now in use, three or four men are required. The advantage of having an adjustable gage arranged and operating as described must be apparent to all who are at all acquainted with tinmen's tongs.

FASTENING FOR MAIL BAGS.—Thomas McGrane, of New York city.—A label is formed by bending a strap together at its middle to form a loop to receive a ring, and sewing its parts together along their side edges and ends, with a narrow strip of leather between the edges to form a pocket to receive the direction, which should be printed upon stiff paper to enable it to be conveniently inserted and removed. The middle part of one of the sides is cut away to allow the direction to be seen. The label has a small flap formed in its side near its looped end to form a place through which the direction card may be inserted and withdrawn. The flap is made of such a length that it may be tucked beneath the part that is not cut away to confine the direction card in its pocket. The flap may have a small tag attached to it by two eyelets, for convenience in inserting and removing it. In the back of the label, directly opposite the eyelets in the flap, are inserted two other eyelets, so that, when the bag is to be sent a long distance by puncturing holes in the end of the direction card with the point of a pencil or other convenient instrument, a cord may be passed through and tied and a seal attached. The label may be attached to any mail bag, letter bag, or other package. For mail bags it is preferred to attach it to a strap in the loop formed by turning back the end of the strap to receive the buckle. Through the same loop is passed a strap, which is designed to be attached to the mail bag to serve as a handle for handling the bag. The strap is passed around the mouth of the bag and buckled. The free end of the strap is then passed through the label link or ring which serves as a keeper; and is then passed over a staple secured to the strap, and its end passed through a keeper. The bag may then be secured by a padlock passed through the staple, or by a seal passed through the staple and gummed to the strap. In the latter case the strap may be provided with a small leather key, to be passed through the staple after the seal has been attached to protect the said seal and keep it from being accidentally injured.

RIDING SADDLE.—Francis M. Simpson, of Pittsville, Mo.—This invention provides a saddle having springs so arranged as to better secure the comfort of equestrians than those of an analogous character heretofore in use. The invention consists in the peculiar arrangement of the springs and bars composing the seat of the saddle. The saddletree is slotted longitudinally to allow the air to have free access to the horse's back. Two curved springs pass over the saddletree transversely. The ends of the springs rest upon the plate, attached to the lower parts of the sides of the saddletree, to which they are secured by screws or rivets which pass through longitudinal slots in the ends of the springs and into the plates, so that the springs may have an up and down movement, and at the same time may be firmly secured. To the rear spring, near its ends, are securely riveted the ends of a bent bar or bow, to which are securely riveted the rear ends of side bars and a central bar. These bars are securely riveted to the springs. The forward end of the central bar projects, and is bent or inclined upward along the pommel of the saddle, and is slotted longitudinally, to receive the screw or rivet by which it is secured to a plate attached to the pommel, so that the bar, while held securely in place, may yet be free to move up and down with the springs. The springs, more especially the rear one, form a fulcrum for the longitudinal bars, so that the weight of the rider, applied to the rear part of said bars and the cantle bow, will increase the elasticity or spring of the seat. Thus a very pleasurable effect is claimed to be secured, independently of the direct vertical movement of the seat.

BUNG ATTACHMENT TO BARRELS.—Anton Wieners, of Williamsburg, N. Y.—The barrel bung, made of rubber, wood, or other suitable material, is perforated axially, and only applied when the barrel is to be fitted for drawing and after the removal of the solid bung. A tube is driven through the central aperture of the bung. A pipe is screwed into the upper end of the tube and carries a cup or disk. A bell, made of glass or other material, is placed in the cup. When beer is to be drawn, the solid bung is removed and the bung attachment put in its place, with the tube and pipe properly applied. Water is poured into the cup to about the middle of its hight, and the bell put into the same, so that the water will seal the air chamber under the bell. Experiments have satisfied the inventor that the comparatively small column of air contained within the bell is sufficient to furnish the necessary amount of pressure for relieving the vacuum produced by the withdrawal of beer. The sealed bell prevents more air from entering the barrel; still, it can be raised to admit air should this be deemed necessary.

MEDICAL COMPOUND OR FEVER AND AGUE CURE.—Louis Bodenheimer, of Paducah, Ky.—This is a combination of a vegetable acid salt and a free vegetable acid to be taken in a cup of curdled milk an hour before breakfast or from one to two hours before chill time. The administration of the remedy is claimed to pass the necessary bile from the stomach, giving increased action to the liver and kidneys, so that the patient will immediately recover. The inventor says he has not known more than a second dose to be required to perfect a cure.

STEAM BOILER.—Francis R. Hulbert, Grand Rapids, Mich.—The object of this invention is to so construct a steam boiler, comprising a proper combination of tubes, tube sheets, and fire and heat passages, as to effect a saving in fuel; to so secure the tubes in the tube sheets, as to provide an easy means of their insertion and removal for repair; and also, from the manner of construction of the double enclosing shell, to provide for the effectual bracing of every part of the enclosed tubes.

STONE CUTTING MACHINE.—Jacob Dindinger and Christian Henri, New Orleans, La.—This invention relates to a stone cutting machine, in which is employed a gang of horizontal saws, placed in a reciprocating frame, and used in connection with means for feeding the frame downward, and with means for raising and lowering the frame.

TO CITY SUBSCRIBERS.

The SCIENTIFIC AMERICAN will hereafter be served to our city subscribers, either at their residences or places of business, at $3·50 a year, through the post office by mail carriers. The newsdealers throughout this city, Brooklyn, Jersey City, and Hoboken keep the SCIENTIFIC AMERICAN on sale, and supply subscribers regularly. Many prefer to receive their papers of dealers in their neighborhood. We recommend persons to patronize the local dealers if they wish the SCIENTIFIC AMERICAN or any other paper or magazine.

Official List of Patents.

ISSUED BY THE U. S. PATENT OFFICE

FOR THE WEEK ENDING DECEMBER 26, 1871.

Reported Officially for the Scientific American.

SCHEDULE OF PATENT FEES:

On each Caveat $10
On each Trade-Mark $25
On filing each application for a Patent, (seventeen 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 application for Extension of Patent $50
On granting the Extension $50
On filing a Disclaimer $10
On an application for Design (three and a half years) $10
On an application for Design (seven years) $15
On an application for Design (fourteen years) $30

122,096.—MUSICAL NOTATION.—F. W. Acee, Columbus, Ga.
122,097.—FIRE PLUG, ETC.—A. F. Allen, Providence, R. I.
122,098.—PERFORATING MACHINE.F.Anderson,Peekskill,N.Y.
122,099.—PAPER BAG MACHINE.—J.Arkell, Canajoharie, N.Y.
122,100.—PREPARING SALT.—F. Baker, Boston, Mass.
122,101.—PREPARING SALT.—F. Baker, Boston, Mass.
122,102.—MAKING SHOT.—W. W. Brigg, Home, Tenn.
122,103.—EARTH CLOSET.—H. C. Bull, New Orleans, La.
122,104.—STOCK CAR, ETC.—J. B. Calkins, Pacific, Mo.
122,105.—DRAUGHT REGULATOR.—F. E. Chatard, Jr., Baltimore, Md.
122,106.—BOX OPENER.—R. H. Chinn, Washington, D. C., G. Hall, J. J. Fitch, Morgantown, Va.
122,107.—TREADLE.—H. A. Clark, Boston, Mass.
122,108.—WRENCH.—A. G. Coes, Worcester, Mass.
122,109.—HAY RAKE.—J. Comley, York, Pa.
122,110.—MARINE PAINT.J.J.Currier,L.Cook,Gloucester,Mass.
122,111.—UPHOLSTERY SPRING.—J. F. Duffy, Chicago, Ill.
122,112.—BOOT HEEL.—C. H. Eggleston, Marshall, Mich.
122,113.—SEWING MACHINE.—J. Fanning, E. Nugent, Brooklyn, N. Y.
122,114.—HORSE CHECK.—S. French, Boston, Mass.
122,115.—RECTIFYING.—J. G. Guenther, Buffalo, N. Y.
122,116.—SAW COLLAR. F.A.Huntington, San Francisco, Cal.
122,117.—SHINGLE MACHINE.—F. A. Huntington, San Francisco, Cal.
122,118.—BLOWER.—W. G. Hyndman, Cincinnati, Ohio.
122,119.—CALF WEANER.—T. A. R. Keech, Bladensburg, Md.
122,120.—STOCK CAR.—T. E. Knauss, Zaleski, Ohio.
122,121.—HAND PLANTER.—J. H. Latimer, Crystal Lake, Ill.
122,122.—TOY GUN.—A. L. Lenhart, New Brunswick, N. J.
122,123.—EARTH CLOSET. J.M.Loewenstein, New Orleans, La.
122,124.—LOCK.—F. P. Marsden, Galena, Ill.
122,125.—GATE.—M. Martin, Rockford, Ill.
122,126.—STOVE LEG.—J. T. Milligan, Du Quoin, Ill.
122,127.—SNAP HOOK.—L. Morse, Attleborough, Mass.
122,128.—PITCHING BARRELS.—D. Myers, Baltimore, Md.
122,129.—FEED MILL.—J. W. Myers, Lyons City, Iowa.
122,130.—REMOVING GREASE.—J. Perkins, Peabody, G. L. Newcomb, Salem, Mass.
122,131.—TIN LINED PIPE.—C. M. Platt, Waterbury, Conn.
122,132.—SOLDERING.—D. Porteous, Baltimore, Md.
122,133.—BARREL.—H. G. Porter, Grand Rapids, Mich.
122,134.—DRAWING TABLE.—J. L. Ross, Boston, F. C. Hanson, Charlestown, Mass.
122,135.—FASTENER. G.C.Setchell,C.L.Taylor,Norwich,Conn.
122,136.—DICING LEATHER.—A. Shedlock, New York city.
122,137.—PLAITING CLOTH.—W. M. Storm, New York city.
122,138.—MUSICAL CAGE.—A. Suppernio, Milburn, Ohio.
122,139.—WRENCH.—G. C. Taft, Worcester, Mass.
122,140.—SAFETY CLASP.—D. C. Tuck, Farmington, Me.
122,141.—ELASTIC WASHER.—J. P. Verree, Phila., Pa.
122,142.—TREATING RAWHIDE.B.F.Wright,Winchester,Mass.
122,143.—FRUIT JAR.—H. U. Allen, North Bennington, Vt.
122,144.—VISE.—N. H. Baldwin, Laconia, N. H.
122,145.—PARALLEL MOVEMENT.—A. G. Barrett,Barrett,Kan.
122,146.—THILL COUPLING.—L. D. Belnap, Jonesville, Mich.
122,147.—COAL HOD, ETC.—R. Bogle, Milton, Pa.
122,148.—GRAIN SEPARATOR.—J. Boozer, Potter's Mills, Pa.
122,149.—WELL SPRING BIT.—J. H. Boyd,West Monterey,Pa.
122,150.—WASHER.—T. M. Brintnall, Medina, Ohio, W. E. Powers, Cortland, N. Y.
122,151.—WINDLASS.—E. Buell, Clinton, Conn.
122,152.—CORSET BUSK.—M. E. Bulkley, Providence, R. I.
122,153.—HAIR SWITCH.—B. F. Burgess, Jr., Boston, Mass.
122,154.—BLIND STOP.—P. A. Burgess, Butler, Mo.
122,155.—PLOW CLEANER.—G. W. Burr, East Line, N. Y.
122,156.—COOKING STOVE.—W. Clark, Shelburne, Vt.
122,157.—TAN VAT.—J. W. Coburn, East Walpole, Mass.
122,158.—PICTURE FRAME. G.E.& W.C.Collins,Bucksport,Me.
122,159.—OILER.—J. Crook, Ludlow, Vt.
122,160.—HEATING STOVE.—M. A. Cushing, Aurora, Ill.
122,161.—SAW MILL.—M. W. Danks, Fulton, N. Y.
122,162.—PLOW.—W. H. H. Doty, Sonora, Ohio.
122,163.—HARNESS.—W. Fawcett, New York city.
122,164.—CLOTHES WRINGER.—J. Fox, Farmersville, Iowa.
122,165.—HEAD REST.—J. C. Giffing, New York city.
122,166.—BUTTER TUB.—J. Gilberds, Jamestown, N. Y.
122,167.—BILLIARD REGISTER.—L. Godefroy, Pulaski, Tenn.
122,168.—HAT RACK.—N. Hayden, Chicago, Ill.
122,169.—PEN AND PENCIL CASE.—W.S.Hicks,New York city.
122,170.—PRINTING ENAMEL.—S. J. Hoggson, New Haven, Ct.
122,171.—METALLIC LATHING.—I. V. Holmes, New York city.
122,172.—HOMINY MILL.—T. Hudnut, Terre Haute, Ind.
122,173.—PEAT.—E.J.Hulbert, A.N. N., Aubin, Portland,Conn.
122,174.—LIQUID METER.—D. W. Huntington, W. A. Hempstead, South Coventry, Conn.
122,175.—CAR COUPLING.—F. A. Illingworth,Waltham, Mass.
122,176.—HARVESTER.—J. Johnson, Mott Haven, N. Y.
122,177.—CLOSING CASES, ETC.—A. Koegler, Newark, N. J.
122,178.—SUPPORTING DRAWERS.C.F.Langford,Brookl'n,N.Y.
122,179.—BUREAU.—J. E. Lawrence, J. S. Young, Phila., Pa.
122,180.—HEMMER.—S. B. Lawrence, Scarsdale, N. Y.
122,181.—PEAT FUEL.—T. H. Leavitt, Boston, Mass.
122,182.—FIRE ARM.—T. Lee, Westport, Conn.
122,183.—HAIR CURL, ETC.—J. Mayer, Philadelphia, Pa.
122,184.—KNEADING MACHINE. E.McAllister,Rochester,N.Y.
122,185.—AXLE BOX, ETC.—M. McNalley, Houston, Texas.
122,186.—BRUSH.—J. Michales, Jr., R. J. Combs, Bergen, N.J.
122,187.—GUN BARREL.—R. R. Moore, Cortland, N. Y.
122,188.—RELEASING DEVICE.—E. B. Myers, York, Pa.
122,189.—CAR COUPLING.—F. Nalley, Battle Ground, Ind.
122,190.—TWEER.—S. Parsons, St. Francisville, Mo.
122,191.—CORN PLANTER.—J. Pies, Sparland, Ill.
122,192.—JEWELRY.—R. J. Pond, New York city.
122,193.—TOY PISTOL.—H. M. Quackenbush, Herkimer, N. Y.
122,194.—EVAPORATOR.—P. Robinson, Harrisburg, Ill.
122,195.—LIQUID MEASURE.—J. Schmidt, Vienna, Austria.
122,196.—SOUNDING BOARD.—J. H. Schucht, London, Eng.
122,197.—PRESS.—T.D.Simpson,W. S. Lamkin, Marshall,Tex.
122,198.—CUT OFF.—George W. Smith, New Haven, Conn.
122,199.—CLOTHES PIN.—Land C.H.Sprague,Henderson,N.Y.
122,200.—HOUSE BELL.—A. L. Swan, Cherry Valley, N. Y.
122,201.—HARVESTER.—J. B. Thomson, Lynchburg, Tenn.
122,202.—RAILWAY SIGNAL.—C. D. Tisdale, Boston, Mass.
122,203.—SHOE FASTENING.—S. P. R. Triscott, G. A. Wheeler, Worcester, Mass.
122,204.—HEATER.—W. E. Walsh, Jersey City, N. J.
122,205.—BLOCK WASHER.—A. D. Westbrook, Astoria, N. Y.
122,206.—SPADE BAYONET.—W.S.Wetmore,London,England.
122,207.—CAR LOADER.—J. Williams, Bell's Depot, Tenn.
122,208.—PASSENGER CAR.—J. T. Worley, Cleveland, O.
122,209.—TRAP.—A. B. Ashman, A. H. Newell, Cincinnati, O.
122,210.—THRESHOLD.—E. Baker, Meriden, N. H.
122,211.—FILLER BOX.—G. Barry, Chicago, Ill.
122,212.—ENVELOPE.—S. D. Bates, Boston, Mass.
122,213.—THILL COUPLING.—E. Batwell, Ypsilanti, Mich.
122,214.—BRICK MACHINE.—F. Beaujeu, Orleans, La.
122,215.—HEAD BLOCK.—N. F. Beckwith, Omro, Wis.
122,216.—BRONZING MACHINE.—E. F. Benton, Buffalo, N. Y.
122,217.—LAMP.—E. Boesch, San Francisco, Cal.
122,218.—BILLIARD CUE, ETC.—C. A. Bogert, Bay City, Mich.
122,219.—JOURNAL BOX.—R. Brewer, Pontiac, Ill.
122,220.—CLOTHES WRINGER.—J. Brinkerhoff, Auburn, N.Y.
122,221.—SCHOOL DESK.—W. M. Brooke, Eaton, O.
122,222.—TURNING STONE.—J.D.Brunton,Kentish Town,Eng.
122,223.—GUARD.C.G.Cahoone,A.W.Robinson,Providence,R.I.
122,224.—ENGINE.—L. Carman, McCoy's Station, O.
122,225.—TABLE.—H. Closterman, Jr., Cincinnati, O.
122,226.—CAR.—F. B. Colton, Philadelphia, Pa.
122,227.—DUMPING BUCKET.—F. B. Colton, Philadelphia, Pa.
122,228.—HEAD BLOCK.—J. M. Comins, Boscawen, N. H.
122,229.—TURNTABLE.—W. S. Coulter, Ashley, Pa.
122,230.—HOLLOW BEAM.—J. W. Cremin, New York city.
122,231.—LIQUID METER.—J. W. Cremin, New York city.
122,232.—CHEESE VAT.—F. E. Day, Kennedy, N. Y.
122,233.—RAILWAY SWITCH.—A. C. Devlan, Altoona, Pa.
122,234.—STONE SAW.—J.Dindinger,C.Henri,New Orleans,La.
122,235.—COUPLING.—W. T. Dole, Peabody, Mass.
122,236.—THREAD MEASURE.—L. F. Dunn, Oneida, N. Y.
122,237.—STUMP EXTRACTOR.—G. E. Dyer, New Sharon, Me.
122,238.—LADDER.—F. Eells, Walton, N. Y.
122,239.—SASH, ETC.—M. M. Ellis, Springfield, Mass.
122,240.—CULTIVATOR.—D. Z. Evans, Town Point, Md.
122,241.—THREADER, ETC.—G. P. Farmer, Brooklyn, N. Y.
122,242.—BEEHIVE.—H. A. Farnam, South Bend, Ind.
122,243.—BORING BAR.—J. Flower, Detroit, Mich.
122,244.—EXTINGUISHER.—J. Gardner, Louisville, Ky.
122,245.—EXPLOSIVE COMPOUND.—E. Gomez, New York city.
122,246.—WRAPPING CABLES.—J. Gray, Cincinnati, O.
122,247.—LAYING CABLES.—J. Gray, Cincinnati, Ohio.
122,248.—STEAM ENGINE.—D. A. Greene, New York city.
122,249.—INCUBATOR.—H. J. Haight, New York city.
122,250.—RETORT COVER.—A. F. Havens, Brooklyn, N. Y.
122,251.—HARROW.—J. Hill, J. G. Stewart, Jonesville, Ill.
122,252.—TUBE BUSHING.—F.R.Hulbert,Grand Rapids, Mich.
122,253.—GRINDER TABLE.—J. L. Jackson, New York city.
122,254.—FORCEPS.—P. N. Jacobus, Montague, N. J.
122,255.—CASTING STEEL.—W. Kelly, Louisville, Ky.
122,256.—PRESSER LIFTER.—T. W. Kennedy, New York city.
122,257.—ORGAN SWELL.—M. J. Kerigan, Boston, Mass.
122,258.—PRESERVING EGGS.—J. Knapp, Prattsburg, N. Y.
122,259.—SCREW PRESS.—L. J. Knowles, Worcester, Mass.
122,260.—CUTTING CLOTH.—E. J. Lake, Washington, D. C.
122,261.—PLOW.—D. M. Lamb, Strathroy, Canada.
122,262.—RULING MACHINE.D.W.Landvoigt,Washington,D.C.
122,263.—HEAD BLOCK.—D. Lane, Montpelier, Vt.
122,264.—CAR BRAKE.—C. H. Lathrop, Jersey City, N. J.
122,265.—COPYING PRESS.—A. Le Clercq, New York city.
122,266.—MAGNET, ETC.—G. Little, Rutherford Park, N. J.
122,267.—RHEOSTAT.—G. Little, Rutherford Park, N. J.
122,268.—SEWING MACHINE.—J. W. Lyon, Chicago, Ill.
122,269.—VALVE GEAR.—J. C. Macdonald, St. Louis, Mo.
122,270.—SHEARS.—G. M. Marshall, New Haven, Wis.
122,271.—SWITCH.—W. L. Martin, Rienzi, Miss.
122,272.—STEAM TRAP.—H. S. Maxim, Brooklyn, N. Y.
122,273.—DEODORIZER.—W. H. McNeill, West Orange, N. J.
122,274.—BELT PUMP.—S. C. Murdoch, T. H. Borland, Pittsburgh, Pa.
122,275.—TURBINE WATER WHEEL.—M. W. Obenchain, J. T. Obenchain, Logansport, Ind.
122,276.—PRESS.—N. M. Pepper, Danbury, N. C.
122,277.—JOURNAL, ETC.—D. N. M. Peregoy, Johnson City, R. I. Lusk, L. D. Poteet, Elizabethtown, Tenn.
122,278.—TABLE SLIDE.—J. Pleukharp, Columbus, O.
122,279.—BEE HIVE.—J. S. Procter, Franklin, Ky.
122,280.—DRYER.—Z. B. Putnam, H.H.McDonald, Belfast, Me.
122,281.—LIQUID SOAP.—J. M. Rall, St. Louis, Mo.
122,282.—HAY RAKE.—S. Rockafellow, Moline, Ill.
122,283.—TENTERING CLOTH.—G. S. Rogers, Thetford, Vt.
122,284.—PLOW.—A.P. & C. F. Rohrer, J.H.Blose, Clarke Co. O.
112,285.—PICKING HAIR ROPE.—G.Sanford, Bergen Point, N.J.
122,286.—BAND PUNCH, ETC.—G. W. Schofield, U. S. Army.
122,287.—SHOE FASTENING.—J. Slatcher, Bridgeport, Conn.
122,288.—SASH BALANCE.—H. Smith, Titusville, Pa.
122,289.—DISINTEGRATING RUBBER.J.H.Smyser,Pittsb'gh,Pa.
122,290.—LIGHTNING ROD.—C. P. Snow, Freeport, Ill.
122,291.—FILTER.—H. N. Taft, Sag Harbor, N. Y.
122,292.—TIME CHECK.—L. A. G. Vielle, J. L. Robellaz, New Albany, Ind.
122,293.—HEATING STOVE.—J. Wager, Troy, N. Y.
122,294.—CURTAIN FIXTURE.—T. N. Webb, Baltimore, Md.
122,295.—CARRIAGE HUB.—C. Weidig, New Haven, Conn.
122,296.—ROOF.—E. Westermayr, Chicago, Ill.
122,297.—CARPET BEATER.J.W.& W.A.Wheeler,Cleveland,O.
122,298.—FILLING CANS, ETC.—L. J. Wicks, Bridgeton, N. J.
122,299.—GRAIN DRILL.—L. Wight, O. G. Ewings, Whitewater, Wis.
122,300.—SEEDER.—L. Wight, Whitewater, O. G. Ewings, La Grange, Wis.
122,301.—PROPELLER.—M. K. Wildman, Brooklyn, N. Y.
122,302.—BEE HIVE.—A. E. Woodhull, Spencer, Mich.
122,303.—THRASHER.—G. H. Zschech, Indianapolis, Ind.

REISSUES.

4,680.—CLOTHES WRINGER.—R. B. Hugunin, Cleveland, O.—Patent No. 53,001, dated March 6, 1866.
4,681.—THILL COUPLING.—D. A. Johnson, Boston, Mass.—Patent No. 113,528, dated April 11, 1871.
4,682.—PUMP ROD.—H. H. Locke, Pleasantville, Pa.—Patent No. 108,602, dated May 31, 1870.
4,683.—VENTILATING ROOMS.—A. S. Lyman, New York city.—Patent No. 14,510, dated March 25, 1856; extended seven years.
4,684.—COPPER ALLOY.—W. Magee, Jamaica, N. Y.—Patent No. 119,091, dated September 19, 1871.
4,685.—EXPANDING PULLEY.—T. H. Savery, Wilmington, Del.—Patent No. 78,565, dated June 9, 1868.
4,686.—GUN BARREL.—J. H. Burton, Leeds, Eng.—Patent No. 27,539, dated March 20, 1860; antedated September 29, 1859.

DESIGNS.

5,447.—CENTER PIECE.—H. Berger, New York city.
5,448.—COOKING RANGE.—L. W. Harwood, Troy, N. Y.
5,449.—HAND STAMP.—B. B. Hill, Springfield, Mass.
5,450.—TYPE.—A. Little, New York city.
5,451.—COOKING RANGE.—S. P. Robinson, Plainfield, Conn.

TRADE MARKS.

600.—BOOTS AND SHOES.—J. W. Adams, Indianapolis, Ind.
601 & 602.—WHISKY.—A. W. Balch & Co., New York city.
603 to 606.—SPICES, GROCERIES AND DRUGS.—E. R. Durkee & Co., New York city.
607.—TOBACCO.—Goodwin & Co., New York city.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice, regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, is susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Re-Issues.

A re-issue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application, by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co. 37 Park Row, for full particulars.

Trademarks.

Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row New York.

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto-relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Rejected Cases.

Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate. Address MUNN & Co., stating particulars.

European Patents.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels, Berlin, and other chief cities. A pamphlet pertaining to foreign patents and the cost of procuring patents in all countries, sent free.

MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an honest opinion. For such consultations, opinion, and advice, no charge is made. Write plain; do not use pencil, nor pale ink; be brief.

All business committed to our care, and all consultations, are kept *secret and strictly confidential.*

In all matters pertaining to patents, such as conducting interferences procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice,

Address

MUNN & CO.,

PUBLISHERS SCIENTIFIC AMERICAN,

37 Park Row, New York.

OFFICE IN WASHINGTON—Corner F and 7th streets, opposite Patent Office.

Advertisements.

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page - - - - $1'00 a line,
Inside Page - - - 75 cents a line

for each insertion.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

"The Galaxy is about as near perfection as anything can be."—*Daily Register, New Haven, Conn.*

Why not Subscribe
FOR
THE GALAXY
For 1872.

IT IS THE
BEST AMERICAN MAGAZINE.
NO FAMILY CAN AFFORD TO DO WITH OUT IT.
IT GIVES MORE GOOD AND ATTRACTIVE READING MATTER FOR THE MONEY THAN ANY OTHER PERIODICAL OR BOOK PUBLISHED IN THE COUNTRY.

Price $4.00 per year. Send for Prospectus.

SHELDON & COMPANY,
NEW YORK.

A HAND-BOOK ON SILEX.—Embraced in three practical treatises:
I. On Soluble Glass and all its latest applications.
II. On Glass-making in all its details of manufacture.
III. A guide for Soap-making, a useful book for Tallow Chandlery, with every variety of Family Toilet and Silicated Soaps, and numerous Tables.
The work contains 347 pages, and may be mailed on remitting $3.20 to the publishers.
L. & J. W. FEUCHTWANGER,
No. 55 Cedar St., New York.

AGENTS, LOOK—$3 to $20 per day easily made—e sy and respectable business—useful article—everybody wants one—success sure. Send stamp for circulars. EUREKA RUBBER TYPE CO. 615 B'dw'y, N.Y.

REFERENCE BOOK AND DIRECTORY OF THE HARDWARE DEALERS, Plumbers, Gas and Steam Fitters, in the United States. Comprising, also, Dealers in Iron and Steel, Guns, Pistols, Fire-arms, House Furnishing Goods, China, Glass, Crockery, and kindred businesses, Gas and Water Companies and Engine Builders, for 1872. Each interest is kept distinct in every town. The Hardware dealers and kindred businesses are placed under one heading, the Plumbers, Gas and Steam Fitters, Gas and Water Companies and Engine Builders, under another. The Commercial standing of each name is indicated by figures prefixed to each name, copious remarks being given as to the Credit of each firm.
Price to Subscribers, including the monthly report of failures, changes of firms, successions, &c., Twenty Dollars. J. ARTHURS MURPHY & CO., Mercantile and Statistical Agency, 111 Nassau Street, New York city.
A book, similar to the above, of the Machinists, Founders, Engine Builders, Boiler Makers, etc. etc., of the United States, is in press. Price to subscribers, including the monthly report of failures, changes of firms, successions, etc., Twenty-five Dollars.
Architects, Engineers, Machinists, Founders, and Builders of Machinery, will please send us their card, so that we can note whatever specialty they manufacture. NO CHARGE IS MADE.

STEEL CASTINGS,
UNDER HAINSWORTH'S PATENT.
We are making **Steel Castings, Smooth, True, Free from Porosity,** capable of receiving **Very High Polish.** Can be **Forged** or **Welded** easily as **Bar Steel,** and **Strong as Forged Steel.** Send for Circular.
PITTSBURGH STEEL CASTING CO., Pittsburgh, Pa.

ORCHESTRAL, MEDIUM and COLIBRI MATHUSHEK PIANO FORTES.
Acknowledged the best in the world for tone, touch and durability. Descriptive Pamphlets free. Address MATHUSHEK PIANO M'F'G CO., New Haven, Conn.

CINCINNATI BRASS WORKS.—None but best quality of Brass Work for Engine Builders and Steam Fitters. F. LUNKENHEIMER, Proprietor.

IF YOU want even speed, reg. your wheels with J. A. WHITMAN'S Imp. Gov., Auburn, Me., p. $100.



You ask WHY we can sell First Class 7 Octave Pianos for $290? We answer—It costs less than $300 to make any $600 Piano sold through Agents, all of whom make 100 per ct. profit. We have no Agents, but ship direct to families at Factory prices, and warrant Five Years. Send for illustrated circular, in which we refer to 500 Bankers, Merchants, &c. (some of whom you may know) using our Pianos in 40 States and Territories.
U. S. Piano Co., 865 Broadway, New York.



"Buckeye" Hominy Mill.
IN THE WORKING OF THIS MILL the Corn requires no preparation except shelling. It has a regular feed and discharge, and needs but little attention. It is COMPLETE IN ITSELF. Hominy can be made from common as well as flint corn. It occupies very little room, and any miller can work it. There is nothing the miller can manufacture to a better profit than Hominy. Send for descriptive pamphlet. BALTIMORE PEARL HOMINY CO., Baltimore, Md., Sole owners of Patent.

PLATINUM. H. M. RAYNOR, 25 Bond st., N. Y. For all Laboratory and Manufacturing purposes.

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



Reynolds'
TURBINE WATER WHEELS.
The Oldest and Newest. All others, only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch, reliable, economical power. Beautiful pamphlet free. GEO TALLCOT, 96 Liberty st., New York.
Gearing, Shafting.

PERFECTION OF SPEED ON WATER WHEELS secured by the Hydraulic Rotary Governor. Return, after testing, if you can afford to run without it. Address J. S. ROGERS, Tr., 19 John st., Boston.

NEW INVENTIONS—NEW STYLES.
MASON & HAMLIN
Cabinet Organs.
Highest Excellence, Lowest Prices.

We introduce this season several new inventions of great value; including DAY'S TRANSPOSING KEY-BOARD, enabling every performer to transpose the key without the slightest difficulty.
Also, NEW STYLES of Cabinet Organs, in very rich and beautiful cases, at *extraordinarily low prices.*
Full particulars in circulars and ILLUSTRATED CATALOGUES, sent free to any address.
It can hardly be longer necessary to advertise the *quality* of the Mason & Hamlin's Organs, for it is scarcely disputed by any that they ARE THE BEST IN THE WORLD; the
VERY STANDARD OF EXCELLENCE
among instruments of the class.
Every purchaser may be sure that he is obtaining, in proportion to its size, capacity, style and class, the very best instrument which it is practicable to produce. We are not afraid to warrant all our work as up to even this high standard.
But while the superiority of the Mason & Hamlin Organs is established, it is not so widely known that the prices are not higher than those of ordinary instruments. We offer the largest variety in the country—one to thirteen stops—at from $50 to $1,000 each.
Every one interested should at least send for the ILLUSTRATED CATALOGUE and CIRCULARS of the Company, which COST NOTHING, being sent post-paid.
MASON & HAMLIN ORGAN CO.,
596 BROADWAY, NEW-YORK,
154 TREMONT ST., BOSTON.

PATENTEES,
WHO WISH TO REALIZE PECUNIARY benefit from their inventions, either by sale of their rights, or parnership with capitalists, are invited to send for our explanatory circular. Many valuable labor saving inventions are lying dormant which might realize a fortune for their owners, if brought properly before the public. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall Street, New York.

SHAFTING with PATENT HANGERS
A Specialty, also Power Looms, Spooling, Winding, Beaming & Sizing Machines of latest improvements, manufactured by THOS. WOOD, 2106 Wood st., Phila., Pa.

E. M. MAYO'S BOLT CUTTER, patented in 1867, improved in 1871, is the best in use. Send for illustrated Circular. Cincinnati, Ohio.

Niagara Steam Pump
CHAS. B. HARDICK,
23 Adams st., Brooklyn, N. Y.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK,
P. O. Box 1,057 Boston, Mass.
N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

THE WOODWARD
STEAM PUMP.
Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Dealers in Wro't-iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, and Public Buildings heated by Steam, Low Pressure. Woodward Co., 76 and 78 Center st., N.Y.

MACHINERY, NEW and 2d-HAND.... Send for Circular. CHAS. PLACE & CO., 60 Vesey st., New York.

PORTABLE STEAM ENGINES, COMBINING the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **900** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO., Lawrence, Mass.
46. Cortlandt st. New York.

$375 A MONTH—Horse and outfit furnished. Address NOVELTY CO., Saco, Me.

HINKLEY KNITTING MACHINE
The Simplest, Cheapest, and Best in use! Has but one needle! A Child can Run it. **Agents wanted in every Town.** Send for Circular and Sample Stocking, to HINKLEY KNITTING MACH. CO., Bath, Me.

Chemical Analysis. Address Prof. J. C. DRAPER, 429 Lexington Avenue, New York City.

MODELS, PATTERNS, EXPERIMENTAL, and other machinery. Models for the Patent Office, built to order by HOLSKE MACHINE CO., Nos. 528, 532, and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

PATENT Emery Grinders, Twist Drills, Fluted Hand Reamers, &c., unsurpassed for elegance of design, workmanship, and durability. These indispensable Tools can be purchased of us for less than half their cost in an ordinary machine shop. Illustrated catalogue free. AMERICAN TWIST DRILL CO., Woonsocket, R. I.

1832. SCHENCK'S PATENT. 1871.
WOODWORTH PLANERS
And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y., and 118 Liberty st., New York.

LATHE CHUCKS—HORTON'S PATENT from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks Conn.

PATENT BANDSAW MACHINES



Of the most approved kinds, of various sizes, to saw bevel as well as square, without inclining the table, by **FIRST & PRYIBIL,** 452 to 456 Tenth ave., New York. Price $250, $275, $350, and $400. At present (Oct. 16), there are in operation, in this city alone, 88 of our machines. Send for circular. Manufacture, also an improved saw-filing apparatus; price, $30. Have also on hand a large stock of best FRENCH BANDSAW BLADES.

Figures will not lie!
How Large Fortunes are made!
☞ **FACTS FOR THE PEOPLE.** ☜
☞ SEE the prices at which four of the leading Sewing Machines are sold in the UNITED STATES, and ENGLAND.

	Price in England.	In the U. S.
Wheeler & Wilson	**$45.00**	**$85.00**
New Singer - -	**32.50**	**65.00**
Elias Howe - -	**35.00**	**65.00**
Wilson Shuttle -	**40.00**	**45.00**

The above Prices are for exactly the same classes of machines as sold in both Countries. There is scarcely any difference in the cost of material and labor in any of the above named machines.
☞ AFFIDAVIT.—W. G Wilson, President of the Wilson Sewing Machine Co., personally appeared before me, and made oath that the above prices are correct, and taken by him from Circulars published in the United States and England under the corporate names of the Companies manufacturing said machines. FRED. SMITH,
Clerk of the Court of Common Pleas of Cuyahoga Co., O.
The WILSON SEWING MACHINES are for Sale in most every County in the United States, and
No. 707 BROADWAY, NEW YORK.

Washington Iron Works,
MANUFACTURERS of Steam Engines and Boilers, Saw Mills, Flouring Mills, Sugar Cane Mills, White's Patent Double Turbine Water Wheel, Gray's Patent Cotton and Hay Press, Baker's Anti-Friction Lining Metals, and American White Brass, Iron and Brass Castings, and general Machinery. Send for Circular to Office, 60 Vesey st., New York.

PATENT IMPROVED
VARIETY MOLDING MACHINERY,
And Adjustable
CIRCULAR SAW BENCHES.
For Machines and information, address
J. P. GROSVENOR, Lowell, Mass.

A DEAD STROKE
POWER HAMMER of SHAW & JUSTICE is the best and cheapest for all light forging, planishing, and cold hammering. Prices from $125 to $450. Send for circulars. PHILIP S. JUSTICE, 14 North 5th Street, Philadelphia, and 42 Cliff Street, New York.

STEEL CASTINGS
TO PATTERN; tensile strength equal to wrought iron; will rivet over, bend, or case harden. Heavy work at low prices. PHILIP S. JUSTICE, 14 North 5th st., Phila.; 42 Cliff st., New York.

ELECTRO-MAGNETS—Galvanic Batteries of all kinds—Telegraph Instruments, Wire, and every device in the Electrical line, manufactured by C. WILLIAMS, Jr., 109 Court Street. Boston, Mass
(ESTABLISHED IN 1856.)

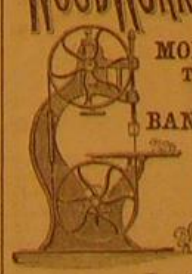
GREAT REDUCTION IN PRICES
OF LE COUNT'S PATENT HOLLOW LATHE DOGS, and his Machinist Clamps of both Iron and Steel.
His expanding Mandril is a first class tool, which has long been needed by every Machinist.
Send for latest circular.
C. W. LE COUNT,
South Norwalk, Conn.



RUSS PATENT
MONITOR MOLDING MACHINE,
MADE BY
R. BALL & CO., Worcester, Mass.
Manufacturers of the latest Improved WOOD-WORKING MACHINERY for Planing Mills, Car Shops, Agricultural Implements, Furniture, Sash, Blind, and Door Factories etc., etc. Send for Illustrated Catalogue and Price List.
RICHARD BALL. E. P. HALSTED.

Portable & Stationary
Steam Engines
AND HOISTING ENGINES. A good article at low prices. Every machine warranted. Send for descriptive Price List.
H. B. BIGELOW & CO.,
New Haven, Conn.

WOOD WORKING MACHINERY



MOLDING, MORTISING, TENONING & SHAPING MACHINES;
BAND SAWS,
SCROLL SAWS
Planing & Matching
MACHINES, &c.,
For RAILROAD, CAR, and AGRICULTURAL SHOPS, &c., &c.
☞ Superior to any in use.
J. A. FAY & CO.,
CINCINNATI, OHIO.

FOOT LATHES,
And all kinds of small Tools. Illustrated catalogue free GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.

WOODWORTH SURFACE PLANERS, $125. Woodworth Planers and Matchers, $350. HILLS & HOAG, 32 Courtlandt St., New York.

PROPELLER PUMPS.
Any capacity and elevation. See Sci. Am., Aug. 19, '71. W. B. HOCK, Sec., 67 N. Front St., Philadelphia, Pa.

THE CELEBRATED
Cold-rolled Shafting.
THIS Shafting is in every particular superior to any turned Shafting ever made. It is the most ECONOMICAL SHAFTING to buy, being so very much stronger than turned Shafting. Less diameter answers every purpose causing a great saving in coupling, pulleys and hangers. It is perfectly round, and made to Whitworth Gage. All who give it a trial continue to use it exclusively. We have it in large quantities. Call and examine it, or send for price list.
Address GEORGE PLACE & CO.,
126 and 128 Chambers st., New York.

Sturtevant Blowers.
THESE are in every particular the best and most perfect Blower ever made. A full assortment of every size on hand, ready to deliver.
Address GEORGE PLACE & CO.,
126 and 128 Chambers st., New York.

N. Y. Machinery Depot.
GEORGE PLACE & CO., Manufacturers and Dealers in Wood and Iron Working Machinery, of every description, Stationary and Portable Engines and Boilers, Leather and Rubber Belting, and all articles needful in Machine or Railroad Repair Shops. 126 and 128 Chambers st., New York.

Andrew's Patents.
Noiseless, Friction Grooved, or Geared Hoisters, suited to every want.
Safety Store Elevators. Prevent Accident, if Rope, Belt, and Engine break.
Smoke-Burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical. Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

P. BLAISDELL & Co.,
MANUFACTURERS OF FIRST CLASS **MACHINISTS' TOOLS.** Send for Circulars.
Jackson st., Worcester, 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, Kloman & Co., Union Iron Mills, Pittsburgh Pa.

SWIVEL HEAD ENGINE LATHES
GAGE MACHINE WORKS.
WATERFORD, N.Y.

WOODBURY'S PATENT
Planing and Matching
and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, 91 Liberty street, N. Y.;
Send for Circulars. 87 Sudbury street, Boston.

Machinist's Tools.
AT low prices, 97 to 113 R. R. Ave., Newark, N. J. E. & R. J. GOULD successors to Gould Machine Co.

WOOD-WORKING MACHINERY GENERALLY. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass.
WITHERBY RUGG, & RICHARDSON.

$150 A MONTH! EMPLOYMENT
EXTRA INDUCEMENTS!
A premium HORSE and WAGON for Agents. We desire to employ agents for a term of seven years, to sell the Buckeye $30.00 Shuttle Sewing Machine. It makes a stitch alike on both sides, and is the best low-priced licensed machine in the world. W. A. HENDERSON & CO., Cleveland, Ohio, or St. Louis, Mo.

MACHINISTS.
Illustrated Catalogue and Price List of all kinds of small Tools and Materials sent free to any address. GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.

Milling Machines.
STANDARD, UNIVERSAL, INDEX AND PLAIN, in every variety, of unequalled design and first class workmanship. Send for illustrated catalogue to the BRAINARD MILLING MACHINE COMPANY, 80 Milk Street, Boston. Works at Hyde Park.

AGENTS WANTED. Agents make more money at work for us than at anything else. Particulars free. G. STINSON & Co., Fine Art Publishers, Portland, Me.

$425 A MONTH! Horse and carriage furnished. Expenses paid. H. B. SHAW, Alfred, Me

To Electro-Platers.
BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction, manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield street, Boston, Mass. Illustrated catalogue sent free on application.

FOOT LATHES, best in the country. WOODMAN & PIKE, Lake Village, N. H. Circulars free.

CINCINNATI BRASS WORKS.—Engineers and Steam Fitters' Brass Work, Best Quality at very Low Prices. F. LUNKENHEIMER, Prop'r.

BURDON IRON WORKS.—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines and Boilers, of all kinds, Sugar Mills, Screw, Lever, Drop, & Hydraulic Presses, Machinery in general. HUBBARD & WHITTAKER, 10 Front st., Brooklyn.

RICHARDSON, MERIAM & CO.,
Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash, and molding, Tenoning, Morthing, 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 st. New York. 17 1

SHINGLE AND BARREL MACHINERY.—Improved Law's Patent Shingle and Heading Machine, simplest and best in use. Also, Shingle Heading and Stave Jointers, Stave Equalizers, Heading Planers, Turners, etc. Address TREVOR & Co., Lockport, N.Y.

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever Invented, with Overwhelming Testimony as to its favor, send for new Illustrated pamphlet (to go) to Messrs. BEALD, DISCO & CO. Baldwinsville, N. Y.

Subscribers—Who wish to have their volumes bound, can send them to this office. The charge for binding is $1 50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

VULCANIZED RUBBER

Adapted to Mechanical Purposes. New York Belting and Packing Co., 37 & 38 Park Row.

ASPHALTE ROOFING FELT.



A WELL test d article of good thickness and durability, suitable for steep or flat roofs; can be applied by an ordinary mechanic or handy laborer. Send for circular and samples to E. H. MARTIN, 70 Maiden Lane, and 9 Liberty Street, N. Y.,

PATENTED NICKEL PLATED
METAL SIGNS.

Far superior to zinc or other metal signs.

MADE WITHOUT ENGRAVING,

and therefore cheaper and better. Warranted not to peel off. Bright and attractive. Samples at office, No. 4 West 4th St. Attention of sign makers invited. Rights for sale.

Nickel Plating,

BY A NEW PATENTED PROCESS, proved by thorough tests superior for adhesion and flexibility to any in use. Answers admirably for knives, and all articles subject to jar, wear, or exposure. We invite closest examination. Orders solicited.

Send for circulars. Shop, Town, County, and State Rights for Sale.

N. S. KEITH & CO.
144 Greene St., New York.

HUTCHISON & CO.,

Commission Merchants for the sale of Steam Pumps, Engines, Boilers, Machinery, and Manufacturers' Supplies, corner of Wood Street and Second Avenue, Pittsburgh, Pa.

VENEERS,

HARDWOOD BOARDS.

Large and choice assortment of

FRENCH BLACK WALNUT, AMBOINE, THUYA, HUNGARIAN ASH;

Together with a complete stock of DOMESTIC FINE FIGURED VENEERS, BOARDS AND PLANK.

☞ Send for catalogue and price list.

G. W. READ & Co., 170 & 172 Center St., N. Y.

Factory, 186 to 200 Lewis st., between 5th and 6th sts.



FASTEN YOUR WINDOWS DOWN OR UP with the REISINGER SASH LOCK AND SUPPORT. No spring, no mutilation of sash; cheap, durable, easily applied—holds sash at any place desired, and automatically locks the window when down. Send for circular. On enclosing 25 cents, a circular and a japanned lock will be mailed to any address, post-paid.

The trade supplied. Agents wanted everywhere.

H. C. DEMMING, *Treas.*,
Harrisburg, Pa.

CREDIT & CAPITAL.

McKILLOP, SPRAGUE & CO.

will issue about the first of January, 1872, their Semi-Annual Volume of the

Commercial Agency Register.

It will be the most COMPLETE AND VALUABLE work of the kind ever published. This is the only *Reference Guide* giving a close estimate of the CAPITAL of each firm, in connection with their CREDIT ratings.

This Agency was established in 1842, and the COMMERCIAL REGISTER has become a *Standard Work* for the Bank and Counting Room.

ASSOCIATE OFFICES.

JOHN McKILLOP & CO., Philadelphia, Pa.
JAMES WM. KIMBALL, Boston, Mass.
JOHN McKILLOP & CO., Baltimore, Md.
TAPPAN, McKILLOP & CO., Chicago, Ill.
TAPPAN, McKILLOP & CO., Cincinnati, Ohio.
LATHROP, McKILLOP & CO., St. Louis, Mo.
TAPPAN, McKILLOP & CO., Milwaukee, Wis.
TAPPAN, McKILLOP & CO., Detroit, Mich.
TAPPAN, McKILLOP & CO., Toledo, Ohio.
MOORE & McKILLOP, Quincy, Ill.
WRIGHT, McKILLOP & CO., Kansas City, Mo.
STEONG & HEDENBERG, St. Joseph, Mo.
TAPPAN, McKILLOP & CO., St. Paul, Minn.
HOPE, McKILLOP & CO., San Francisco, Cal.
HOPE, McKILLOP & CO., Portland, Ore.
MURRAY, MIDDLEMISS & CO., Montreal, Canada.
MURRAY, MIDDLEMISS & CO., Toronto, Canada.
PURCELL, ROSS & CO., Albany, N. Y.

SECOND HAND LATHE WANTED, with 11 to 13 ft. swing. Address JAS. LEFFEL & CO., Springfield, Ohio.

WHITE BRASS, manufactured by DUPLAINE & REEVES, Philadelphia, Pa.

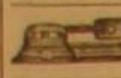
PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

American Saw Co., Manufacturers of



And Perforated Circular and Long Saws. Also Solid Saws of all kinds. No. 1 Ferry st., cor. Gold street, New York. Branch Office for Pacific Coast, No. 608 Front street, San Francisco, Cal.

IRON PLANERS, ENGINE LATHES Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO. New Haven, Conn.



BEST DAMPER REGULATOR for Steam Boiler. Send for Circulars.
MURRILL & KEIZER, Balt., Md.

NOTICE.

THE MONTREAL CITY PASSENGER RAILWAY COMPANY of Montreal offers the following premiums for an invention by means of which its Cars and Sleighs can be heated with perfect safety to Passengers and Vehicles:

First Premium.....$100 00
Second " 50 00

For further particulars, apply to the Company, at its office, in Montreal, Canada; and all decisions must be arrived at not later than the 10th March, 1872.

W. D. DUPONT, Secretary.

Montreal, 8th December, 1871.

PREVOST'S ELECTRO-
Magnetic Motor Co

To Telegraph Co's., Gilders, Silver Smiths, Physicians, Professors of Science, etc. A new recoil apparatus is presented for electric light for light houses and public works. The services of M. Meynial, maker of mathematical instruments, and former manager of the electric light at the Grand Opera of Paris, are secured. Also, Proprietors of Prevost's new battery, and Barjon's new galvanic field: No. 1 Battery, 6 in., $5—No. 2, 8 in., $6—Fluid in Carboys, 7c. per lb. Both possess continuity, economy, strength, and are odorless. Address Company, 36 Amity Street, New York. E. Prevost, Superintendent.

Working Models

And Experimental Machinery, Metal, or Wood, made to order by J. F. WERNER, 62 Center st. N.Y.

TODD & RAFFERTY, Manufacturers of Steam Engines, Boilers, Flax, Hemp, Tow Bagging, Rope and Oakum Machinery. Steam Pumps and Governors always on hand. Also Agents for the New Haven Manufacturing Co.'s Machinists' Tools. ☞ We invite especial attention to our new, improved, Portable Steam Engines. Warerooms, 10 Barclay st.; Works, Paterson, N. J.



MILLED MACHINE SCREWS of superior quality made to order from sample or drawing.
BROWN & SHARPE M'FG CO.,
Providence, R. I.

WIRE ROPE.

JOHN A. ROEBLING'S SONS,
MANUFACTURERS, TRENTON, N. J.

FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse No. 117 Liberty street.

CARBOLIC HEALING C.S. COMPOUND SALVE

CURES Cuts, Burns, Wounds, and all disorders of the Skin. Recommended by Physicians Sold by all Druggists, at 25 cts. JOHN F. HENRY, Sole Proprietor, 8 College Place, 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 lists mailed on application to JONES & LAUGHLINS,
120 Water street, Pittsburgh, Pa.

☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 126 Chambers street, N. Y.

L. L. SMITH & CO.,
Nickel Platers,
6 HOWARD ST., New York,
Between Elm and Centre.

Diamond-Pointed STEAM DRILLS.

THE adoption of new and improved applications to the celebrated Leschot's patent, have made these drills more fully adaptable to every variety of ROCK DRILLING. Their unequalled efficiency and economy are acknowledged, both in this country and Europe. The Drills are built of various sizes and patterns; WITH AND WITHOUT BOILERS, and bore at a uniform rate, of THREE TO FIVE INCHES PER MINUTE in hard rock. They are adapted to CHANNELLING GADDING, SHAFTING, TUNNELLING, and open cut work; also, to DEEP BORING FOR TESTING THE VALUE OF MINES AND QUARRIES. TEST CORES taken out, showing the character of mines at any depth. Used either with steam or compressed air. Simple and durable in construction. Never need sharpening. Manufactured by
THE AMERICAN DIAMOND DRILL CO.,
No. 61 Liberty St., New York

Canadian Inventors,

Under the new Patent Law can obtain patents on the same terms as citizens.

For full particulars address
MUNN & CO.,
37 Park Row, New York.

A. S. CAMERON & CO.,
ENGINEERS,



Works, foot of East 23d street, New York city.

Steam Pumps,

Adapted to every possible duty.
Send for a Price List.

McNab & Harlin Man'f'g. Co.

Manufacturers of
BRASS COCKS, PLUMBERS' BRASS WORK, Globe Valves, Gauge Cocks, Steam Whistles, and Water Gauges, Wrought Iron Pipe and Fittings,
BRASS AND COMPOSITION CASTINGS,
NO. 56 JOHN STREET, NEW YORK.

STEAM PIPE AND
BOILER COVERING.

ECONOMY, Safety, Durability. CHALMERS SPENCE Co., R. E. 96th st., N.Y., 1209 N. 2d st. St. Louis.

UNION
Spoke Works.

SPOKES, RIMS, AND PLOW HANDLES. All goods warranted seasoned, and of the best quality. JOHN G. DAVIS & SON,
Southwest cor. of Leonard and Otter sts., Philadelphia.



Vertical & Horizontal CORN MILLS.

30-inch grinds 30 bus. per hour, and 20-in. 15. Price $280 and $140.
EDWARD HARRISON,
New Haven, Conn.

Leffel's Improved Turbine.



NEARLY SIX THOUSAND of them in use; under heads from 1½ to 240 feet.

☞ Send for our pamphlet, one hundred and twenty pages.

JAMES LEFFEL & CO.,
Springfield, Ohio, and New Haven, Conn.

IRON STEAMSHIP BUILDERS.
NEAFIE & LEVY,
PENN WORKS,
MARINE ENGINES, BOILERS, AND BUILDERS OF COMPOUND ENGINES,
PHILADELPHIA, PA.

STEAM ENGINES & BOILERS

From 4 to 500 horse power, including Corliss Engines, Slide Valve Stationary Engines, Portable Engines, etc. Also, Circular Saw Mills, Shafting, Pulleys, etc. Wheat and Corn Mills, Circular Saws, etc.

Send for Price List.

WOOD & MANN,
Steam Engine Company
WORKS—UTICA, N. Y.

PRINCIPAL OFFICE—42 Cortlandt st., New York.

ORIENT SAFETY LAMPS,



Entirely of metal, are the only lamps in use which can neither break, leak, nor explode. Are ornamental and cheap. Adapted to all household uses; also, to stores, factories, churches, &c.

AGENTS MAKE $10 A DAY
SELLING THESE LAMPS.

Manufactured by
WALLACE & SONS,
89 Chambers St., New York.

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, the Lowell Tests.

For Report of tests at Lowell, with Diagrams and Tables of Power address
THE SWAIN TURBINE CO.,
North Chelmsford, Mass.



LUBRICATORS.

DREYFUS' celebrated Self-acting Oilers, for all sorts of Machinery and Shafting, are reliable in all seasons, saving 75—95 per cent. The Self-acting Lubricator for Cylinders is now adopted by over 80 R. R. in the U.S., and by hundreds of stationary engines. Send for a circular to NATHAN & DREYFUS, 108 Liberty St., N.Y.



BABCOCK
Fire Extinguisher.

"ABSOLUTELY THE BEST PROTECTION AGAINST FIRE!"
Send for "It's Record."
F. W. FARWELL,
Secretary.

OFFICES:
407 BROADWAY, N. Y.
656 WABASH AVENUE, CHICAGO.

Pennock's Patent
Iron Bending Machine,

INVALUABLE in Car and Machine Shops. Saves several times its cost in one year's use. Instantly adjustable to thickness, and bends at any desired angle. Price, $150. Address
THE PENNOCK MANUFACTURING CO.,
Kennett Square, Chester Co., Pa.

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

Fifteen Boiler Explosions

OCCURRED LAST MONTH IN THE UNITED STATES, killing and maiming a large number of persons, and destroying valuable property. Had the

Harrison Safety Boiler

been employed, instead of the dangerous flue, tubular and other styles of Steam Generators, the loss of life limb and property would have been saved.

THE HARRISON SAFETY

is the only Boiler that is perfectly safe from Disastrous Explosion. It is economical, easily managed, and a rapid steam generator. Manufactured at

THE HARRISON BOILER WORKS,
PHILADELPHIA, PA

JOHN A. COLEMAN, Agent, 110 Broadway, New York and No. 129 Federal Street, Boston, Mass.

TRADE MARK

Union Stone Co.,

Patentees and Manufacturers of
ARTIFICIAL STONE & EMERY WHEELS,
and Artificial Stone and Emery Wheel Machinery and Tools. Send for circular.
29 Kilby Street,
BOSTON, MASS.

WIRE ROPE.

STEEL, CHARCOAL and B. B., of the very best quality, suitable for Ships, Rigging, Suspension Bridges, Guys, Derricks, Inclined Planes, Hoisting purposes, &c. A Large Stock constantly on hand at
JOHN W. MASON & CO.'S,
43 Broadway, New York.

THE BEST SAW GUMMER OUT, ONLY $15; Emery Grinders, at $25, $40, and $100; Diamond Turning Tools, $15; Solid Emery wheels of all sizes; The above standard goods are *all* of our own manufacture Address THE TANITE CO., Stroudsburg, Monroe Co., Pa

L. W. Pond---New Tools.

EXTRA HEAVY AND IMPROVED PATTERNS.

LATHES, PLANERS, DRILLS, of all sizes; Vertical Boring Mills, ten feet swing, and under. Milling Machines, Gear and Bolt Cutters; Hand Punches and Shears for Iron.

Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.

A. C. STEBBINS, New York, Agent.

SCIENTIFIC AMERICAN

PROSPECTUS

For 1872.

A year's numbers contains over 800 pages and makes two volumes, worth as a book of references, ten times the subscription price

ENGRAVINGS

by our own artists, will not only be given, of all the best inventions of the day, but especial attention will also be directed to the description and illustration of

LEADING MANUFACTURING ESTABLISHMENTS, MACHINES, TOOLS AND PROCESSES.

Inventors and Patentees

will find in each number an official List of Patents, together with descriptions of the more important Inventions. We shall also publish reports of decisions in Patent Cases and points of law affecting the rights and interests of Patentees.

THE NEW VOLUME OF

SCIENTIFIC AMERICAN

commenced JANUARY FIRST; therefore, now is the time to organize Clubs and to forward subscriptions. Clubs may be made up from different post offices.

TERMS FOR 1872.

One copy, one year		$3.00
One copy, six months		1.50
One copy four months		1.00
CLUB RATES	Ten copies, one year, each $2.50	25.00
	Over ten copies, same rate, each	2.50
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress,"		10.00
One copy of Scientific American for one year, and one copy of "Science Record,"		4.00
Ten copies of "Science Record," and ten copies of the Scientific American for one year,		35.00

CLUB PREMIUMS.

Any person who sends us a yearly club of ten or more copies, at the foregoing club rates, will be entitled to one copy, gratis, of the large steel plate engraving, "Men of Progress."

Remit by postal order, draft or express.

The postage on the Scientific American is five cents per quarter, payable at the office where received. Canada subscribers must remit, with subscription, 25 cents extra to pay postage.

Address all letters, and make all Post Office orders or drafts payable, to

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.

14 Jan

SCIENTIFIC AMERICAN

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

Vol. XXVI.—No. 3. [NEW SERIES.] NEW YORK, JANUARY 13, 1872. $3 per Annum. [IN ADVANCE.]

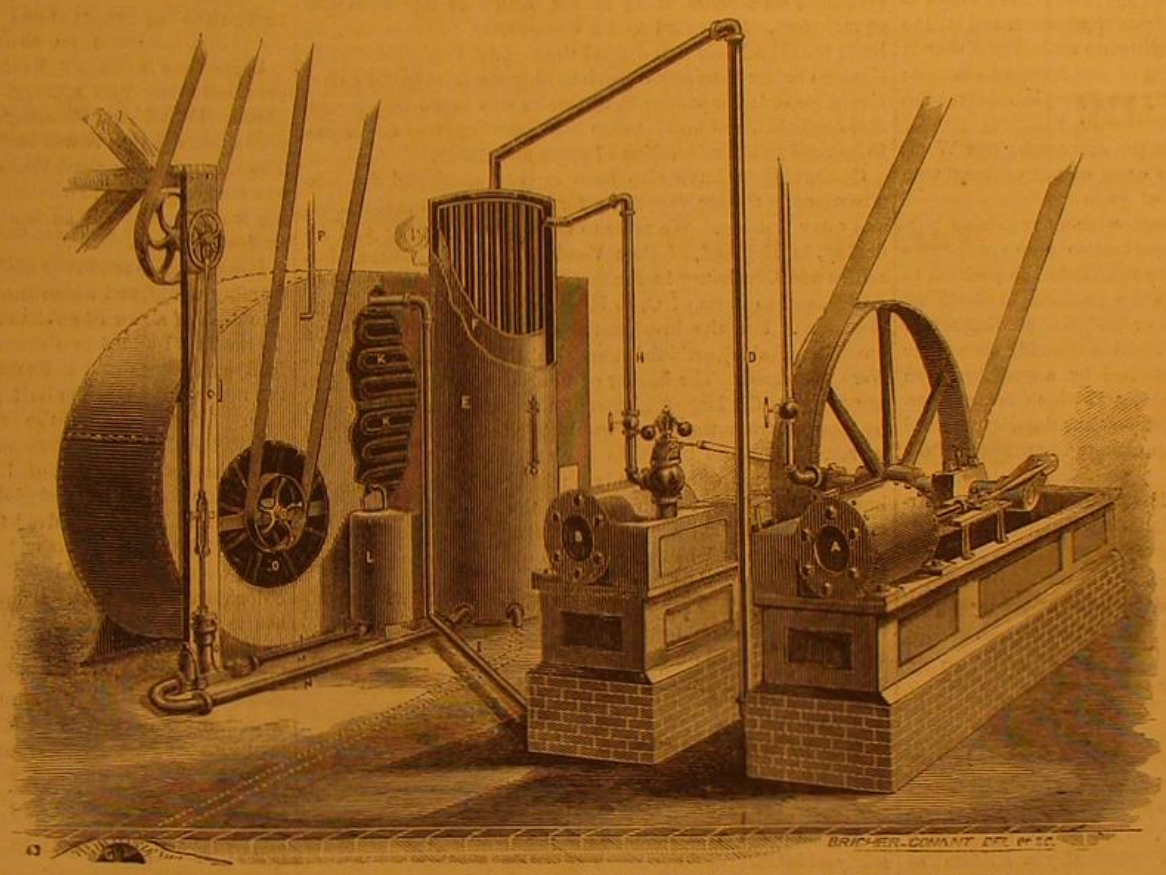
GREAT REDUCTION IN COST OF STEAM POWER—REMARKABLE RESULTS.

A trial is being made at the Atlantic Works, in Boston, of Ellis' method of using the latent heat in exhaust steam to produce power by the vaporization of bisulphide of carbon, which, according to information furnished us, is showing very surprising results. The remarkable statement is put put forth by the inventor that the fuel, now required to produce one hundred horse power, will, with a proper application of the heat in the exhaust steam, produce two hundred and sixty-six horse power; showing a gain of one hundred and sixty-six per cent amount of power obtained by the use of this method, which has been once before referred to in journal. (See Vol. XXIV., page 79.)

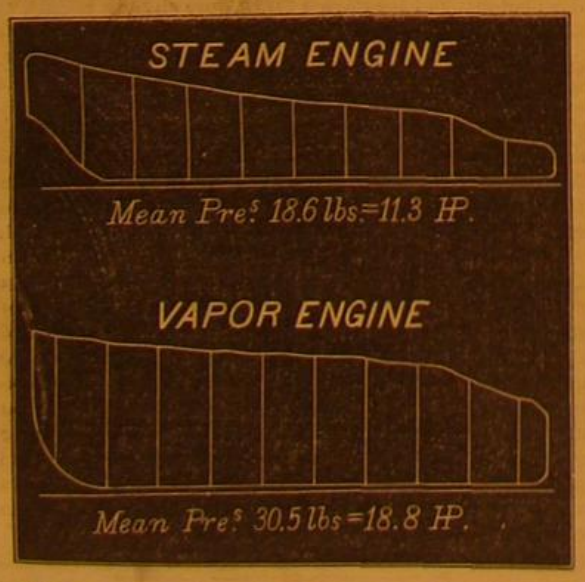
It is claimed that the exhaust from an engine of one hundred horse power can be taken to an adjoining building and used to heat a bisulphide of carbon boiler, which will furnish vapor sufficient to drive an engine of one hundred and sixty-six horse power to its full capacity. No back pressure or other injurious effect is produced on the first engine by using its exhaust to heat the boiler of the second one; or, by coupling these engines together, a machine of two hundred and sixty-six horse power is obtained, driven by the same fire previously required to produce one hundred horse power; as evidence of which, the subjoined indicator diagrams have been sent us.

For the purposes of experiment, two new engines, made from the same patterns in the same manner, are used, the arrangement of the engines being shown in the accompanying engraving.

They are ten inches internal diameter, and twenty-four inches stroke, with single valves. One of them is run by steam in the usual manner, and its exhaust is passed through the flues of a vaporizer, on its way from the cylinder to the atmosphere. This vaporizer is filled with a mixed volatile liquid, consisting principally of the bisulphide of carbon. The heat of the exhaust steam is sufficient to convert this liquid into vapor very rapidly under a pressure of 45 to 50 lbs. to the inch, and will carry the pressure up to 65 lbs. At this point the temperature on the vaporizer becomes equal to that of the exhaust steam, and no more heat will be imparted to it.



ELLIS' COMBINED STEAM AND BISULPHIDE OF CARBON ENGINE.



This vapor is used, in place of steam, to drive the second engine under a pressure of 45 to 50 lbs., as the temperature in the vaporizer is low enough at this pressure to completely condense the exhaust steam and absorb its latent heat, producing a larger amount of effective power than when used at a higher pressure; the vapor is superheated to the highest point that exhaust steam will carry it by passing it through a superheater, surrounded by exhaust steam, in its passage from the vaporizer to the cylinder.

The annexed diagrams, taken from these two engines at the same time, while at their regular work, by Mr. Snell, the mechanical engineer at the Atlantic Works, are the ones referred to as showing the amount of power developed by each.

It will be seen that the vapor engine, whose boiler was heated entirely by the exhaust from the steam engine, gave 18·8 horse power, while the steam engine gave only 11·3 horse power; and that the same fire, required to produce 11·3 horse power with steam used in the usual manner, produced 30·1 horse power when the heat in the exhaust steam was used in the method described, showing a gain of one hundred and sixty-six per cent in power, as above stated.

The exhaust vapor is condensed in a coil of inch iron pipe, over which a blast of air is thrown by a blower; a small jet of water is commingled with this blast by means of a perforated pipe that sprinkles a slight shower of water into the current of air as it passes over the coil; this water, being evaporated and absorbed by the heated air, carries away the latent heat of the vapor very rapidly, producing a complete condensation with a very small amount of water. The condensed liquid is pumped back into the vaporizer continuously, only thirty-five gallons of it being used to fill the vaporizer and run the engine continuously. It is claimed that not more than half a gallon of liquid is lost in running a twenty horse engine ten hours, and it costs only one dollar per gallon, making the cost, of running twenty horse power by this process, fifty cents per day. All the exhaust steam is condensed by this process, and pure hot water furnished for the steam boiler, dispensing with a heater and avoiding all scale and sediment in the steam boiler.

It is claimed that engines now in use can be arranged to use this process and made to produce more than double the power with the same fuel, or the same power with less than half the fuel, as may be desired. The steam from salt blocks sugar evaporators, etc., can be used to produce power by this process equally as well as the exhaust from an engine.

Where two establishments, using steam power, are near each other, the exhaust steam from one can be taken to heat the boiler of the other, and no fuel, fireman, chimney, fire box, or grate, will be required for this latter boiler; and its engine will run continuously, like a water wheel, without attention, as long as the supply of exhaust steam is furnished. There will be no risk of an explosion, as the heat of the exhaust will not carry the pressure in the boiler above 65 lbs. under any circumstances, and if all the liquid should be evaporated out of the boiler, no injury would be done, as it would not be overheated or injured by the heat of exhaust steam. The vapor engine does not require any oiling of the cylinder, valves, or rods, the fluid evaporated lubricating the parts, so that the friction and wear are, it is claimed, considerably less than that of a steam engine.

The Ellis Vapor Engine Company, of Boston, are manufacturing engines and fixtures constructed on this plan, and guarantee them to produce as much power as any other engine made, with less than half the fuel. Further information can be obtained by addressing them at 100 Summer street, Boston

The trial engines can be seen running at the Allaire Works in Boston, at all times. We give these statements as they have been made to us, simply remarking that the results claimed are theoretically possible, and that the practical difficulties which prevented their realization by previous experimenters have been ably met, and seemingly overcome, by the inventor and patentee, Mr. J. H. Ellis, who has protected his improvement by a number of patents, obtained through the Scientific American Patent Agency, in this country and Europe, and who now has other applications pending. The results shown by the indicator diagrams are certainly very remarkable, and will at once challenge the attention of engineers.

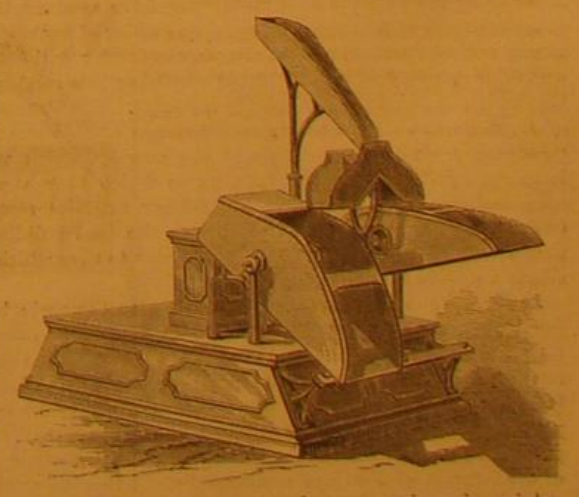
Novel Railway Signal.

Men are now engaged in erecting novel danger signals at every bridge and tunnel on the Hudson River Railroad, to warn brakemen, who are compelled at times to run along on the tops of trains, of their near approach to such dangerous places. A pole is erected by the side of the track, and an arm projects from it at the top over the track. From this arm hangs a wire fringe, low enough to strike a brakeman on the front piece of the cap or against the face if he is standing up as the train passes. This perceptibly notifies him that he is only one hundred feet from the bridge or tunnel, and must lie down at once. The blow inflicted by the fringe is momentarily a stinging one, but produces no evil results.

This is a novel way of compelling brakemen to protect their own lives. Cannot some ingenious inventor now devise something to make them careful of the lives of others?

POOLEY'S AUTOMATIC GRAIN WEIGHER.

An apparatus which, says Dr. Barnard's Report, attracted a great deal of attention of American visitors to the Paris Exposition, particularly of gentlemen from our agricultural districts, was a balance exhibited by Henry Pooley & Son, of Liverpool, for weighing grain and at the same time recording the weight of the grain which has been weighed. This



balance, called by the inventors the automatic grain weigher is self-acting throughout. The only force employed in the several acts of loading, weighing, discharging, and recording, is the weight of the commodity in process of being weighed. The results of any given period of work are exhibited upon the register.

To describe the mode of action by this novel machine more

in detail; the grain is introduced to the machine from the depot in any manner by which a continuous supply may be conveniently delivered into the feeder; then, when the first scale has received the principal part of its load, that scale falls through a portion of its descent, and in falling lifts a proportional weight equal to the partial load then in the scale, and at the same moment moves the feeder partly towards the second scale, which then begins to be filled while the first scale is receiving slowly the finishing part of its load. When the loading of the first scale is complete, that scale falls through the remaining part of its descent, and, in falling, releases the catch that till then had held it in position, whereupon the loaded scale immediately tilts and simultaneously shifts the full stream of grain over to the second scale, and moves the register figure. The operation thus described proceeds from scale to scale, alternately, as long as the supply of grain is continued. The flow of grain is never cut off or interrupted during the discharge of the scales.

What makes this invention specially interesting is the ingennity with which a very severe accuracy in the weight of each charge is secured without any consequent loss of time. In ordinary weighing, if great exactness is aimed at, the last additions are made slowly; and this, in fact, is always necessary, if one would avoid inevitable overcharge. Accordingly, as much time is spent in adding the last few grains or the last few ounces, as the case may be, as it had required to introduce the great bulk of the load previously. But by employing two balances, side by side, with a bridge, or doubly inclined shoot, between them, the inventors have made it possible to keep up a steady flow from the source, and still to finish off each load by so gently growing an increase that it is impossible an error should occur of any sensible amount; while, in the meantime, the nearly empty scale receives the main stream and rapidly fills.

This balance cannot fail to make its way among our Western farmers, and among the large class of our citizens who are engaged in the transportation of grain.

The engraving will be understood without requiring particular description. The parts important to note are the two scale pans, of which the one on the right is in the position to receive, and the one on the left in the position to discharge its load; the doubly inclined shoot or bridge extending across above the scales, and the supply shoot appearing above the whole. This supply shoot is sustained by a branched iron support, which is single at the base, and which forms a vertical axis, around which the supply shoot has the slight lateral movements, above described, which change the manner of delivery of the grain.

It is obvious that this balance is applicable to many purposes, in which accurate and continuous weighing is necessary, as well as to the weighing of grain.

HYDRAULIC CEMENTS--THEIR ADAPTABILITY FOR USEFUL AND ORNAMENTAL PURPOSES.

A Paper, read before the Polytechnic Association of the American Institute, by Adolph Ott.

PART II.

The Portland cement, as most artificial cements are now called, is at present manufactured, in England, Germany and France, on the most extensive scale. It forms a sharp, crystalline powder of a gray color, with a bluish or greenish tint. Chemically speaking, it is principally a silicate of lime and alumina, averaging 80 equivalents of silica, from 12 to 25 equivalents of alumina, and from 210 to 230 equivalents of lime. In being mixed with water to a stiff paste, it soon solidifies, forming a stone of a pleasing light gray color, which in its best quality acquires a hardness and durability, equal to the best limestones. Like the English Portland stone, the solidified Portland cement presents a crypto-crystalline texture; and, having no cleavage whatever, it yields evenly to the chisel. But this property can easily be dispensed with altogether, on account of the fact that, while soft, it can be adapted to any form.

You will pardon me for speaking of a composition stone of mine, of which I claim, all other conditions being alike, that it will continue to increase in solidity, while a stone merely composed of a mixture of hydraulic cement and sand (the latter being the common admixture) will have attained its greatest degree of firmness. Of equal quantities of my stone mortar and of Portland cement mortar, the former will bear a greater quantity of sand, without acquiring less solidity, that is, it will be of greater binding qualities. The *Journal of Applied Chemistry*, in a late number, says of this stone: "Judging from the appearance of the samples which we have seen, and from the several tests to which they were subjected, we would say that the felspar artificial stone (which is its name) is equal in solidity to the best building stones; while it is unquestionably superior to the artificial stones we have examined."

As regards the materials used, in addition to the main ingredients usually employed for the making of artificial stone, they are felspar or felspathic minerals (previously vitrified), quicklime and flint, in definite proportions. The chemical reactions taking place by this intermixture may be explained as follows: Hydrate of lime will, though slowly, replace the potash or soda in the felspar, and form a compound of the formula of Portland cement, of great binding qualities. This reaction is especially induced by the presence of flint, which, like several others of the chalcedonic varieties of quartz, (according to Fuchs), consists partly of soluble silica, which, having a strong affinity for the potash or soda set free from the felspar, will form a hydrosilicate of potash or soda. But, aside from the formation of silicate of lime and alumina (hydraulic cement), the final result of these reactions is an insoluble compound, probably of the formula of pectolite or acophyllite. Thus nothing remains that might be washed out; and again, through the formation of a cement (similar in composition to Portland cement) within the substance of the stone mortar, a slow but steady increase of the firmness of the stone is secured.

To speak more particularly of the application of hydraulic cements, they are especially useful for the manufacture of building stone. In Europe, especially in England, numerous buildings of the kind have been erected; in London, for instance, the celebrated College of Surgeons, in Lincoln's Inn Fields. In this country, buildings constructed of cement stone, made by the process of George A. Frear, have been erected in Brooklyn, Toledo, Buffalo, Chicago, and New Orleans. In the various cities of the West, upwards of three hundred buildings have been constructed of this stone during the last three years; and they have satisfactorily stood the test of the severe climate, which is more severe in the West than on the Atlantic coast. In Brooklyn, fifty-nine buildings are in process of erection at the present time. The novel feature in the process of Mr. Frear is, as we learn, a newly discovered solution of shellac, which is used in combination with the ordinary materials. The compound, when in the mold, is submitted to a pressure of thirty tuns to the square foot, which pressure, according to Professor Vander Weyde, is equivalent to placing a mountain mass of the same material 4,000 feet high on the top of the stone to be hardened. Concerning the solidity of this stone, it was found at the Washington Navy Yard to withstand 6,000 pounds, without breaking, on a cube of 1¼ inches, which is 432 tuns per square foot. In regard to its deportment towards fire, we learn that the Frear stone stood the test of the great fire in Chicago better than any other building material in that city. Every stone left standing in the walls was found to be in perfect condition, and builders are now drawing away the blocks to be used in the re-erection of other structures.

Cement stones have also been largely employed for constructions in the sea, especially for harbor dams, breakwaters, and quay walling. We refer to the moles of Dover and Alderney, in England, of Port Vendre, Cette, La Ciotat, Marseilles and Cherbourg in France, of Algiers and Port Said in Africa, and to those of Cape Henlopen at the mouth of the Delaware. For the breakwater at Cherbourg (one of the most remarkable), artificial stone blocks of 712 cubic feet each were immersed. The harbor of Cherbourg being exposed to heavy gales, the largest blocks of natural stone which could be brought from the shore would be mere play balls of the waves. There are instances known, where blocks of thirteen cubic yards were not only pushed far above the slopes, but also turned over at the head of the mole; hence the necessity of employing blocks of immense size. Such blocks can scarcely ever be obtained from quarries, to say nothing of the difficulty and expense of transporting them

To speak of other uses of hydraulic mortar, I will mention that the beautiful fortifications before Copenhagen are wholly constructed of *béton* or concrete, an aggregate of gravel or broken stone, lime, and hydraulic mortar. Walling of *béton* for fortifications, according to competent artificers, is far superior to any other work. This *béton* is more largely used for foundation walling, especially in water, for sluices, aqueducts, bridges, floors, sidewalks, terraces, roofs, cisterns, reservoirs, water pipes, etc. Entire buildings of two stories, with chimneys and cooking places, have been constructed solely of *béton*.

The first sluice which was entirely built of concrete is the Francis Joseph sluice on the Danube, in Hungary. This work forms a reservoir, the bottom and the sides of which consist of one piece. Its length is 360 feet, and width, 30 feet. Its construction, begun in 1854, was completed within ninety days, the work being pushed forward both night and day.

Of unusual interest in the line of structures of *béton*, because demonstrating their great strength, is the monolithic test arch of St. Denis, near Paris. This arch forms, like the Francis Joseph sluice, one piece. The material used is known at the *béton agglomeré, système Coignet*, the last being the name of the inventor. The span of the arch is 196 feet, its elevation 19 feet, and length 49 feet. The stone possesses a fine texture, and is perfectly impervious to water.

M. Coignet's system of "monolithic construction" has also been applied for the erection of the aqueduct of La Vanne, which now carries pure water from the river of La Vanne in the department of the Aube and of the Yonne to the city of Paris. The distance from Paris to La Vanne is over 135 miles; and as there were hills, valleys, woods, rivers, etc. to be crossed, it is easy to understand that the construction of an aqueduct through that country required many fine works of engineering. The section which traverses the forest of Fontainebleau alone comprises three miles of arches, some of them as much as fifty feet in hight, and eleven miles of tunnels, nearly all constructed of the material excavated on the spot. So successful has M. Coignet been in his undertaking that other sections of the work, formerly intended to be built of masonry, of cast iron, and of boiler iron plates, have been allotted to him, to be made entirely of his *béton agglomeré*.

Hydraulic cement, instead of copper sheets, has been applied to cover the bottoms of ships. Railroad sleepers are being replaced by sleepers of cement. For ornamental work, (statues, fountains, etc), compositions of hydraulic cement have certainly a great future, since the most elaborate forms of art, of great durability and strength, may be most artistically and economically produced in them. For this purpose, only the very best qualities of cement can be used. By the admixture of proper colors, variously colored stones may be obtained. Although this industry, like everything new, had at first to struggle against suspicion and prejudices, it has gradually made its way by the excellence, beauty and durability of its products, and is now carried on in many places. In the Paris Exposition of 1867, there were statues of Socrates after Tabacchi, the bust of Raphael after Magni, and gothic church windows of immense size. Most in demand are, however, door and window caps, ashlars, stoops, window sills, door sills, chimney tops, bowls and tables for wash stands, etc. Artificial rocks, grottoes, inclosures for wells or springs, and cataracts for parks, gardens and hot-houses are also now being produced in cement. Parks which present not a single rock can thus be converted, within a few weeks, only into the most romantic and picturesque scenery.

Although it may seem that the application of hydraulic cements was exhausted, many new uses for it will doubtless be discovered. Scarcely any technical journal of importance reaches this side of the Atlantic without containing new information on this topic, and its literature amounts already to scores of volumes. In view of the paramount importance of artificial stone, is it not rather strange to see how little there is known concerning it in this country, while buildings of such stone have been erected in Europe for more than forty years? And with what feelings of surprise do we note the fact that the illustrious city fathers of this metropolis forbid the use of artificial stone as a building material, although its superiority over ordinary stone in point of economy, safety and health is a fact established beyond doubt! Might we not exclaim: "Science, forgive them, for they know not what they do?"

Influence of Medicines on Larvæ and Animalculæ in Standing Water.

Some time in August, having occasion to use rain water, I procured some from a barrel standing at the corner of the house. It had been standing there for a few days, and I at once observed that it was literally crowded with animal life. The mosquito *larvæ* and those of the gnat, and all the curious creeping, flying, swimming creatures that inhabit standing water during the summer, were revealed by a glass of moderate power.

It occurred to me to try medicines on the inhabitants of the teeming world, and watch the physiological effects. I poured into each of a row of goblets four fluid ounces of the water. To the first I added two grains of carbolic acid in solution. In five minutes every animal and animalcula was dead. Into the next glass I put one half grain of carbolic acid in solution. All were dead at the end of an hour.

Into the third glass were put two drops of chloroform. In two minutes every form of life was still, and on agitating the water the undissolved globules of chloroform caught up a large number of the dead forms, and rolled them up with itself. The minute forms of life, especially the microscopic ones, were all killed in less than a minute, when one drop of chloroform was added. Some of the larger forms remained at the top of the water, and did not seem to be affected with so small a quantity. Putting a gallon of water into a glass jar, I poured into it a drachm of chloroform, stirring the water with a spatula. Before the motion of the water had ceased, most of the lesser forms were dead, and were gathered into the globules of chloroform that were rolling at the bottom. Some of the larger *larvæ* lived for a little time at the top of the water, but soon afterwards they sunk to the bottom dead, and at the end of thirty minutes only one or two of the largest were alive, and no life could be discovered elsewhere with the naked eye, or by the magnifying glass.

Into another glass was put sulphuric ether, at first a few drops which seemed to have little effect; but when half a drachm was added, the larger forms died very soon, but the more minute lived for two hours. Into the next glass was put a drachm of Fowler's solution, liquid arsenite of potassa. At the end of an hour most of the smaller animalculæ were dead but the larger forms were alive at the end of two hours.

A solution of sulphate of morphia, five grains was put into another glass, and none seemed affected by it at the end of three hours. Into another was put a strong solution of common salt. The larger *larvæ* seemed affected by it in a short time, but many of the minute forms were alive at the end of three hours.

A solution of compound tincture of iodine, twenty drops, destroyed all appearances in three hours. A solution of soda sulphite destroyed the inhabitants of one glass in two hours. Ten drops of sulphuric acid seemed to have little effect on them. A large amount of alcohol only seemed to increase their activity. I repeated the experiment with chloroform several times, with the same uniform result. I did not have another opportunity to repeat the experiment during the fall.

The most remarkable effect was produced by the chloroform and carbolic acid. It suggested itself to me that, for certain purposes, water might be purified in small quantities with either of these substances. The addition of a small portion of chloroform would not injure water for many purposes; the chloroform would remain at the bottom of the vessel, and the rest might be filtered for use. The small amount of carbolic acid would not injure the water for many purposes, and it might be put into standing water to prevent its being populated. In any light the experiments were interesting, and I hope to repeat them on some future occasion.—*P. J. Farnsworth, M.D., in the Medical and Surgical Reporter.*

A DELAWARE correspondent proposes to anchor balloons, and let the world turn under them, by which means he expects to sit still and yet travel a thousand miles an hour. He does not state what he anchors to, but we suppose it is what Archimedes sighed for when he stated that he could move the world if he had a proper fulcrum. Perhaps the spirit of Archimedes inspired the ingenious inventor with this brilliant idea, and pointed out the fulcrum.

MINERAL WATERS.

Waters which contain unusually large quantities of any of the ordinary impurities, or which are characterized by unusual constituents, are known as mineral waters. Such waters may be valuable for their medicinal properties, or as sources of the special substances which they contain. As examples of medicinal waters, we have sulphur springs, which contain sulphuretted hydrogen; chalybeate springs, which contain iron, etc.; while brines and borax waters are valuable for the extraction of salt and borax.

SULPHUR WATERS.

Waters containing sulphuretted hydrogen gas are found in many parts of the world. Those of Harrogate, Croft, and Aix la Chapelle are renowned in Europe, while we have in the United States numerous examples, among which are the White, Red, and Salt Sulphur springs of Virginia, the White Sulphur springs of Ohio, and the Richfield, Sharon, Chittenango, and Florida springs of New York State.

The sulphuretted hydrogen gives these waters a sweet taste and a very peculiar odor, which some consider offensive. These waters have the property of blackening silver; persons who visited these springs in the earlier days of the republic, when specie was current, noticed a gradual darkening of their "change," which finally became quite black, owing to the formation of a black sulphide of silver.

SALINE WATERS.

The chlorides of sodium, calcium, and magnesium often occur in spring waters in such quantities as to cause a decided saline taste, agreeable in the case of the first mentioned salt, if not too intense, but bitter and disagreeable when caused by either of the others.

Sulphate of soda (Glauber salt) or of magnesia (Epsom salt) may also be the cause of a saline taste. Brines, which are important sources of national wealth in many countries, belong to the first mentioned class. Nearly all the salt manufactured in the United States is obtained from salt springs or wells.

You will realize their importance when I tell you that 9,000,000 bushels of salt have been manufactured in the neighborhood of Syracuse in a single season. The brine is here pumped up, through artesian wells, from a depth of 400 or 500 feet. It is undoubtedly derived from beds of rock salt, such beds having been already discovered in Canada, not very far distant. The famous St. Catherine's spring, in Canada, contains larger quantities of the chlorides of calcium and magnesium, which give its waters a bitter taste. The Kissinger bitter water illustrates the class of waters that owe their peculiar qualities to the sulphates of soda and magnesia.

ACIDULOUS SPRINGS.

Waters charged with such quantities of carbonic acid as to cause them to sparkle and effervesce as they flow from the spring, are called acidulous. Owing to the solvent power of this acid upon limestones and some other rocks, such waters generally hold considerable quantities of lime, magnesia and iron in solution, in the form of bicarbonates; when the latter is present in quantities of a grain or more to the gallon, the spring is called a chalybeate, from the name of an ancient people who worked in iron at an early day, the Chalybes. These waters often contain considerable quantities of chloride of sodium, and frequently bromide and iodide of sodium, as well as bicarbonates of soda and lithia.

Such is the character of the most celebrated mineral waters in this country, the well known springs of Saratoga and Ballston in this State. These waters are so well known to you that I will take the liberty of dwelling upon their peculiarities for a few moments. In the first place, I will call your attention to this section of the Saratoga valley, which shows you the position of the rocky strata there:

Beginning with the uppermost, the rocks of Saratoga county are: 1. The Hudson river and Utica shales and slates; 2. The Trenton limestone; 3. The calciferous sand rock, which is a silicious limestone; 4. The Potsdam sandstone; and, 5. The Laurentian formation, of gneiss and granite of unknown thickness. The northern half of the county is occupied by the elevated ranges of Laurentian rocks; flanking these occur the Potsdam, calciferous, and Trenton beds, which appear in succession in parallel bands through the central part of the county. These are covered in the southern half of the county by the Utica and Hudson river slates and shales. The most remarkable feature is, however, the break or vertical fissure which occurs in the Saratoga valley.

The mineral waters probably underlie the southern half of the entire county, many hundred feet below the surface, the accident of the fault determining their appearance as springs in the valley of Saratoga Springs, where, by virtue of the greater elevation of their distant source, they reach the surface through crevices in the rocks produced by the fracture.

Their common origin is also shown by analysis; all the springs contain the same constituents in essentially the same order of abundance; they differ in the degree of concentration merely. Those from the deepest strata are the most concentrated. The constituents to which the taste of the water and its most immediate medicinal effects are due, are: chloride of sodium, bicarbonate of lime, bicarbonate of magnesia, bicarbonate of soda, and free carbonic acid. Other important, though less speedily active, constituents are: bicarbonate of iron, bicarbonate of lithia, iodide of sodium, and bromide of sodium.

During the great petroleum excitement, a New York capitalist conceived the idea of finding oil at Ballston; so he selected a spot on the margin of the Kayaderosseras creek, a stream which flows through the village of Ballston into Saratoga lake. Here this patient but ill advised seeker after petroleum bored down through sand, clay, and hard pan, fifty-six feet, till he struck the solid rock. He tubed the well down to the rock with an iron tube six inches in diameter, and then continued the boring with a five inch drill. For a considerable distance the drill passed through the Hudson river shales; then it penetrated the Trenton limestone, then the calciferous sand rock, and probably passed some distance into the Potsdam sandstone. At a depth of 571 feet, a vein of mineral water burst into the well, but, as oil was the object of the search, it was not heeded. Finally, our zealous borer was spared further labor in this direction by the steel reamer, which became so firmly fastened in the rock, at the depth of 651 feet, that it could not be extricated. No oil making its appearance, and further progress in the well being out of the question, attention was directed to the mineral water, when it was found that the most remarkable water of the county had been discovered. While the strongest natural springs of the county contain from 600 to 800 grains of mineral matter per gallon, this water contained over 1,200 grains. It is so concentrated that it will actually bear dilution with an equal volume of Croton water, which is more than one can say of our city milk, though the experiment is often made by the milkmen.

Like the enterprise of sending warming pans to Cuba, this venture turned out an unexpected success. The well is now known as the "Ballston artesian lithia spring." Soon after, the "Franklin" and "Conde-Dentonian" wells were bored at Ballston, and more recently the "Geyser spouting well" at Saratoga. All these have been successful in bringing up very concentrated waters of the same chemical character as the natural springs. It is probable, therefore, that water can be obtained anywhere in the southern portions of the county by tapping the underlying Potsdam sandstone. In all of these wells, the water rises to and above the surface. Down in the rocky reservoir, the water is charged with gases under great pressure. As the water is forced to the surface, the pressure diminishes and a portion of gas escapes with effervescence. The wells deliver, therefore, enormous volumes of gas with the water, a perfect suds of water, carbonic acid, and carburetted hydrogen.—*Professor Charles F. Chandler.*

FRICTION GEARING VERSUS BELTS AND COG WHEELS.

Experiments in the use of friction gearing—that is, of pulleys transmitting power, by direct frictional contact between the smooth faces of the driving and the driven pulley instead of by means of belts or by cogs meshing into each other—have been very frequently made, and in many cases with remarkable success. So emphatic, are the recommendations of this method of gearing, given by men who have tried or witnessed its operation, that it is somewhat a matter of surprise that it has not been more generally adopted. It is claimed by many such persons to be equally well adapted to the propelling of gang, mulay or circular saws, mill burrs, or in fact almost any description of machinery, and to the transmission of any amount of power with the same or even greater useful effect than when belts or cog wheels are employed.

In the vicinity of Clinton, Iowa, some years ago, friction pulleys were introduced in a saw mill with such complete success in point of economy and convenience that they soon became an established institution throughout that entire region, superseding belts altogether, the latter being in some instances thrown out at heavy expense to give place to the new order of things.

The pulleys used in this case were built of soft and tough wood, strongly put together by their segments in such a manner as to present the least possible end grain of wood to the surface. They were placed on the main shaft, to which the power was applied by the engine crank or taken from the water wheel, as the case might be, in the ordinary manner. The faces of the pulleys were either parallel to the shaft or beveled at any angle required, according to the direction of the counter shafts to which the power was communicated. The segments of the pulleys were glued or painted together and their faces turned off perfectly true. It was found that they required about one third more width of face than would be necessary if belts were used. In one case, two gangs were run, each with a friction pulley three feet in diameter and having 24 inches face. For a mulay or rotary saw mill, a pulley of from 12 to 16 inches face was found sufficient. A friction pulley, ten inches in diameter with six inch face, was described as giving more useful effect and heating the boxes less than when the same pulley was used with a four inch belt. From the numerous experiments made, the conclusion was reached that a pulley of 20 inches face would successfully transmit 50 horse power without undue wearing or heating.

The special advantages claimed for this method were the saving of the expense of providing belts and loose pulleys and keeping them in repair. The mills were so arranged that each machine was run with its own counter shaft, geared either to the engine shaft or to one of the main counter shafts, so that each workman could control the operation of his own machine independently of the others, and with no throwing off or putting on belts. The pulleys on the counter shafts were of iron and very strong, each having the same face, of course, as the driving pulley, but being of any desired diameter, according to the motion to be obtained. By means of a movable bearing operated by a lever, the iron pulley was readily brought in contact with its driver, the motion necessary for this purpose being less than one eighth of an inch.

The statement that, for the proper working and durability of a friction pulley, it should be so made as to present as little end grain as possible to the surface, is emphatically disputed by experienced workmen, who claim that the precise opposite to this is the true method, and that the pulley should be so made as to offer the end grain to the contact of the other pulley to the utmost practicable extent.

To accomplish this purpose, the pulley is made of segments of wood cut out of a plank in the shape of a fan, the grain running parallel with one side of the fan, and the end grain being presented in a slightly oblique manner at the outer or circular edge. These segments are put together strongly, and so arranged that the grain shall not run in the same direction in two pieces in contact with each other, but cross in much the same manner as the furrows in the upper and under millstone. The object of this is to prevent the face of the pulley from too great tendency to wear in any given direction.

The rim of the wheel, as it may be called for convenience is built up by laying the first tier of segments, making a complete wheel of the thickness of the plank, flat upon the bench, and placing the other layers successively upon this, breaking joints and crossing the grain as already indicated. The layers are very strongly secured to each other with wrought nails, beside which glue or white lead is laid on between them. The rim being complete, mortises or gains are made to receive the pads of the spider at the end of the radial arms, these gains being somewhat larger than the pads, and the space thus given being filled by the insertion of keys, one on each side of the pad, entering from opposite directions and overlapping each other, the whole length of the pad. Bolts are also inserted, passing through the pad in a radial direction, with countersinking on the face of the pulley and a nut on the inner end. The countersink is afterward filled by plugging, over the head of the bolt.

The conflict of testimony in regard to the comparative efficiency of the pulleys in which the end grain is presented to the surface and those in which it runs lengthwise with the circumference is somewhat surprising, as the point is easily subjected to a practical test. Most mechanics will take ground without hesitation in favor of end grain, as less liable to yield and curl or "broom" up, when subjected to powerful and constant pressure.—*Leffel's Illustrated Mechanical News.*

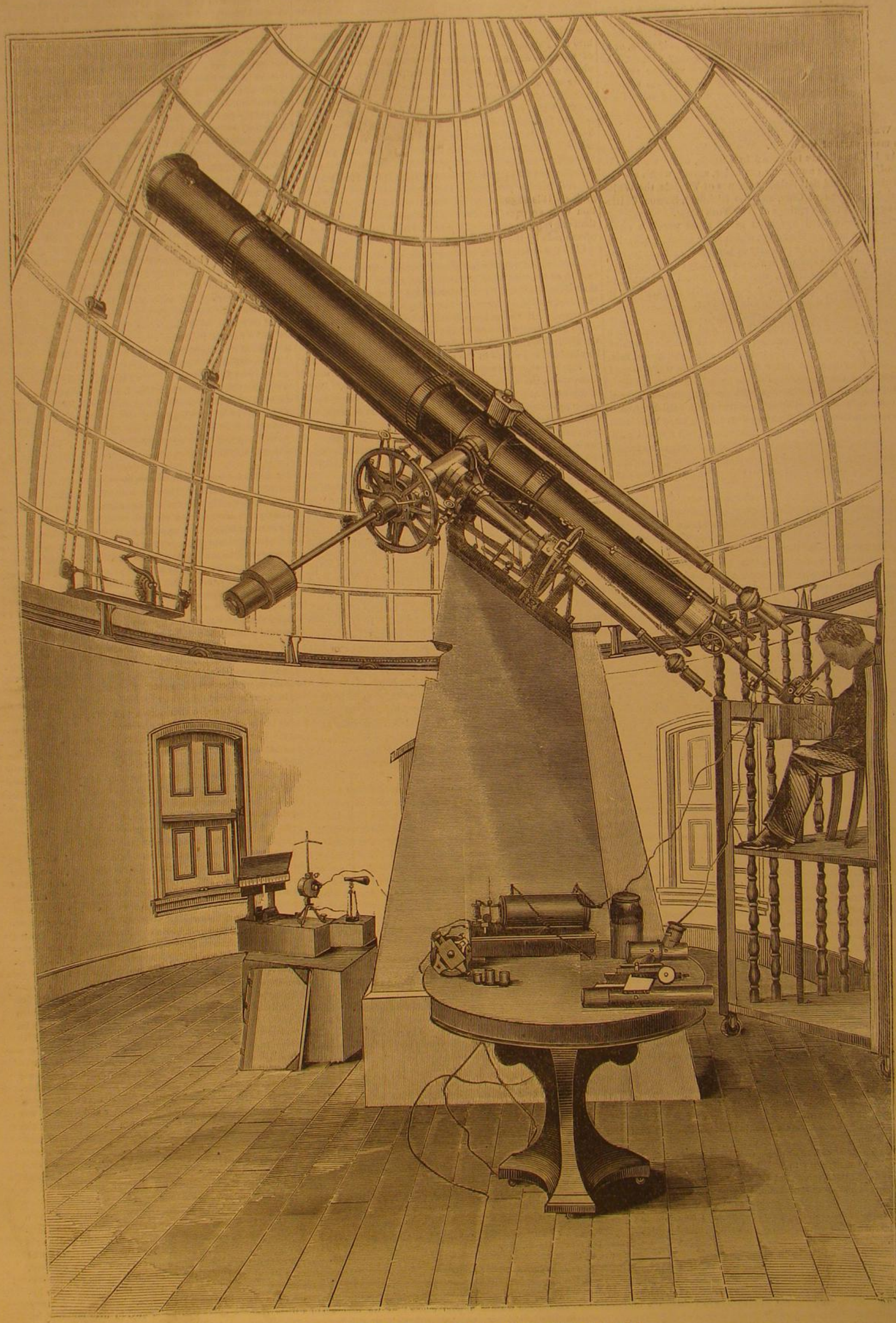
Painless Extraction of Teeth.

Dr. A. C. Castle (*Dental Cosmos*) observes that he has for thirty years adopted the plan of obtunding or benumbing the extremities of the temporal nerves, for painless extraction of teeth from their sockets, with complete success, never having used or countenanced the exhibition of chloroform, ether, or nitrous oxide gas for this minor surgical operation. The benumbing, or *mechanical anæsthesia*, of the temporal branches of nerves, obtunds the whole nerve to a sufficient extent to allow the teeth to be removed, with sensation so slight that, if not attending a special surgical operation, it would scarcely be noticed by the patient. One of two modes may be adopted. By application of ice to the temples, which is somewhat distressing, the sensation of cold striking deeply. The other, to which he gives the preference, is done by an assistant, with each of his middle fingers pressing with persistent firmness into the *fossa* or hollow behind the ridge or the temporal bone, which forms the external bone circle orbit of the eye. Pressure for one minute is all that is necessary. The practice is as simple as it is harmless, and leaves no after unpleasant sensation to annoy the patient. It is an instinctive method often adopted by people themselves, who press their temples with their fingers to relieve themselves temporarily of the acute paroxysms of nervous headache. This temporary pressure, with sufficient force, is all that is required to remove teeth painlessly.

Effects of Ice at St. Louis.

In consequence of the grounding of a field of heavy ice, covering over twenty-five hundred acres in extent, upon a bar in the Mississippi, at St. Louis, the current of the river has been thrown to the east side, and a new channel is cutting out which threatens to take in its way a large section of bottom land just below Brooklyn, and to carry away a portion of Bloody Island. Below an artificial promontory known as Long Dyke, extending fourteen hundred feet into the river from the Brooklyn landing, the current swings around almost at right angles with its former course, and has made a new channel, by cutting away lands of the Wiggins Ferry Company, with a deep, curving indenture to the east. For half or three quarters of a mile the current hugs the eastern bank, which at the last accounts was continually caving in. At one or two points, the river has worn its way within fifty or sixty feet of the Chicago and Alton Railroad track. The current does not leave the East St. Louis bank, except in cases of resistance by local obstructions, until it reaches a coal dyke opposite the foot of Chouteau avenue, where it resumes its old course. The result of this is that all that portion of St. Louis lying between the elevator and the new waterworks is now virtually without a practicable landing for the ordinary wants of commerce, except in case of very high water, with a prospect that, unless the current is turned back by artificial means, the lower part of the city may be in a similar predicament, in which case St. Louis would find itself on the wrong side of the Mississippi.

WORKING A TRAMWAY BY STEAM.—At Edinburgh a steam train has made a successful trial on the horse tramway just opened between Haymarket and Leith, a distance of several miles. The *Scotsman* says that, although it was the busiest hour of the day, and traffic was at its greatest, tramway cars with young horses fresh from the country constantly passing, no horse was frightened, nor were the bystanders annoyed by steam or smoke. The whole journey of a little over six miles was performed in fifty minutes, including all stoppages. The average speed maintained, exclusive of stoppages, was about nine miles an hour, and, it is said, might as safely and easily have been at the rate of twelve.



THE ALLEGHENY OBSERVATORY.—[See next page.]

Miscellaneous Health Notes.

The following health hints are from the November number of *Home and Health*, published by De Puy & Brother, 805 Broadway, N. Y. While the facts may not be new, to many of our readers they are worth treasuring:

EXPANDING THE LUNGS.—Step out into the purest air you can find, stand perfectly erect, with head and shoulders back, and then, fixing the lips as if you were going to whistle, draw the air through the lips into the lungs. When the chest is about half full, gradually raise the arms, keeping them extended with the palms of the hands down, as you suck in the air, so as to bring them over the head just as the lungs are quite full. Then drop the thumbs inward, and, after forcing the arms backward and the chest open, reverse the process by which you draw your breath, until the lungs are empty. This process should be repeated immediately after bathing, and several times during the day. It is impossible to describe, to one who has never tried it, the glorious sense of vigor which follows this exercise.

SLEEPLESSNESS.—The cure of sleeplessness is sometimes difficult, particularly in those who carry grave responsibilities. The habit of sleeping well is one which, if broken up for any length of time, is not easily recovered. Often a severe illness, treated by powerful drugs, so deranges the nervous system that sleep is never sweet after. Or perhaps long continued watchfulness produces the same effect; or hard study, or too little exercise of the muscular system, or tea and whisky drinking and tobacco using.

TO PURIFY THE BLOOD.—A well known physician says that he considers the following prescription for purifying the blood as the best he has ever used: One ounce yellow dock, one half ounce horseradish, one quart hard cider. Dose, one wine glassful four times a day.

A WORD ABOUT CIDER.—Alexander Frear, in the *Independent*, says: "For many bilious complaints, sour cider is a specific, and in such cases is one of the good things to be received with thanksgiving. Cider guzzlers are an abomination, but, if dyspeptics will take a little with their dinner, they will find digestion greatly aided. We go in for the manufacture of a good, pure article, and, in the use of it, to let our moderation be known to all men."

OAKUM AS A DRESSING FOR BURNS.—Mr. Robert L. Snow says of oakum, as a dressing for burns, that it induces the healing of extensive sores with remarkable rapidity; it induces healing action in those indolent ulcers that are the result of defective hygienic conditions; it prevents all smell; it is cheap, saves time and trouble; and, most important of all, the resulting scars do not contract.

THE EARTH CURE FOR ULCERS.—I dried and pulverized some clay, says a writer in *The Country Gentleman*, and recommended it as a valuable remedy to a neighbor woman who had for ten years had a very bad ulcer on her ancle. She had paid our best physicians over fifty dollars for treatment, without any relief. She applied the dried clay almost constantly for about six months, and a perfect cure has resulted. The first effect of the preparation was to remove inflammation and relieve pain, and now she says there is no scar remaining, and her limb, which was stiff and lame, is as elastic as when she was a girl. The woman is a very large, fleshy person, about forty years of age. I considered the test a very severe one, and the result very satisfactory. About a gallon of pulverized clay was used.

PAPER COMFORTABLES.—The mode of making comfortables warmer, by lining them with newspapers, is good as long as they last, which cannot be long, especially after washing a few times. I have tried a similar way of attaining the same object on cold nights, when I have not had sufficient bedding over me, especially at hotels, where we cannot always get just what we want. Throw off one or two of the top covers from the bed, then pull from the pocket or satchel two or three large newspapers—one very large one will do; spread them on the bed and replace the cover, and you will have a warm and comfortable night, without any perceptible increase in the weight of the bedding. Again, when you have a hard, cold ride in a cutter, of ten or twenty miles against the wind, place a spread newspaper over your chest before you button up your overcoat, and you will not become chilled through. Nothing can be cheaper, and, as far as it goes, nothing more efficient.

DARKNESS IN THE TREATMENT OF SMALL POX.—If a patient, in the beginning of the attack, be put in a room from which absolutely all light is excluded save that of a candle, the effect is to arrest the disease in the papular or vesicular stage; the skin between the vesicles is never inflamed nor swollen; the large scabs of matter never form over the face; there is no intense pain, and only trifling itching, and the smell is either very slight or altogether wanting.—*London Lancet.*

PERSONS afflicted with eruptive diseases should not use salt fish.

Cleanliness.

A neat, clean, fresh-aired, sweet, cheerful, well arranged house exerts a moral influence over its inmates, and makes the members of a family peaceable and considerate of each other's feelings and happiness. The connection is obvious between the state of mind thus produced and respect for others, and for those higher duties and obligations which no laws can enforce.

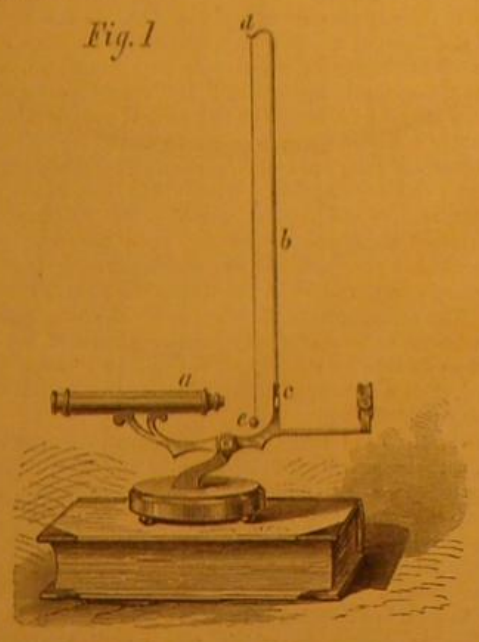
On the contrary, a filthy, squalid, noxious dwelling, in which none of the decencies of life are observed, contributes to make its inhabitants selfish, sensual, and regardless of the feelings of others; and the constant indulgence of such passions renders them reckless and brutal.

THE ATTRACTION OF THE MOON.

BY JOHN C. DRAPER, PROFESSOR OF CHEMISTRY, UNIVERSITY MEDICAL COLLEGE, NEW YORK.

Many ingenious methods for the measurement and illustration of the attraction of masses for each other have from time to time been described; it is therefore with a certain degree of hesitation that I offer a description of a method that I have of late employed in the illustration of this property of matter.

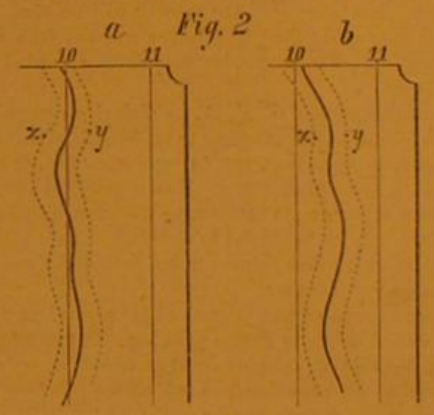
Fig. 1



A microscope being turned into the horizontal position as at *a*, Fig. 1, a glass tube, *b*, 20 inches in length, was attached to the stage *c*, so that it occupied a perpendicular position. The upper end of the tube was bent as at *d*, and from the extremity, *d*, a small plummet, *e*, was suspended by a filament of silk. The microscope was then placed on a large book to prevent as far as possible the action of the vibrations caused by passing vehicles, and the movements of the plummet, as indicated by the filament, *d e*, watched through the instrument under a power of fifty diameters, with a micrometer eyepiece.

The oscillations of the plummet being recorded for a short time as at *a*, Fig. 2, in which a pair of dots, as *x y*, mark the extent of such a movement, a large mass of metal was placed in close proximity to it and to one side, when at once its effect was shown by the change in the oscillatory movement, the plummet being drawn toward the metallic mass;

Fig. 2



the filament no longer moved over the distances bisected by the curved line, *a*, which nearly corresponds to the line or division 10 on the scale, but followed the record shown at *b*, in which the curved line, *b*, occupies a position intermediate between the divisions 10 and 11 of the scale.

The delicacy of this method of investigating such attractions may be greatly increased both by an increase in the magnifying power used and by an increase in the length of the suspensory filament, and, if employed in localities where there is less vibration caused by the unceasing passage of vehicles than in New York, might be so developed as even to show and measure the variation in the attraction exerted by the moon, as she changes her position in regard to any given locality on the earth's surface.

PENDULUM EXPERIMENTS FOR DETERMINING THE GRAVITY OF THE EARTH are about to be made in the Mont Cenis Tunnel by Father Secchi, M. Diamiller-Müller, and M. R. P. Denza. These will be made first in a lateral chamber about the center of the tunnel, and will be afterwards repeated at the corresponding vertical point on the mountain, the difference of level being about 1,600 metres. In addition to these observations, they propose to determine the earth's magnetism and the temperature of the strata to which they can obtain access. By preliminary observations, they have ascertained that the movement of the trains will not, to any serious extent, interfere with the precision of the observations. Telegraphic wires will be laid down for the purpose of chronographic registration, and the observing chamber will be ventilated by special air conduits.—*Comptes Rendus*, Vol. LXXIII. p. 1,192.

THE ALLEGHENY OBSERVATORY.

Our engraving is a view of the interior of the dome of the Allegheny observatory, at Allegheny, Pa., for which we are indebted to our excellent cotemporary, the *People's Monthly*, published by McKnight, Lowry & Co., Pittsburgh, Pa. In the center of the dome, and supported by a massive pier of stone, is the equatorial telescope. The optical part of this instrument was made by the late Henry Fitz, of New York, who also furnished the equatorial for the Dudley observatory at Albany, of which telescope this is a duplicate. The object glass is 13 inches in aperture, or rather more than an inch larger than that of the great refractor, placed by Mitchell in the Cincinnati observatory, and so well known from his popular lectures. Like all large instruments of its class, the telescope revolves about an axis, inclined so that its motion around it may be parallel to the equator, and it can be caused to follow the stars as they move in the sky. This is effected by clockwork of peculiar character attached to the other side of the pier, but temporarily dismounted for repair, and not here shown.

The figure of a person seated in the observing chair will give an idea of the size. The observer is represented as using the spectroscope, the instrument nearest the eye, the rays being bent at right angles to their original direction in the telescope tube by prisms. On the table and nearest to the pier are the induction coil (built by Rhumkorff, of Paris) and a Leyden jar, from which wires pass up to the spectroscope, while others connect the coil with a galvanic battery in a lower room.

If the large telescope be directed, for instance, to the sun, its rays are first concentrated by the object glass of the telescope upon a very narrow slit within the spectroscope, through which they pass to the prisms, which are of flint glass of especial purity, and by which they are spread out into the beautiful solar spectrum, with which all are more or less familiar. The spectrum in this instrument is observed to be filled with thousands of narrow black lines, which are known to be caused by incandescent metals in the sun.

Whatever the distance of an object, its light, when thus analyzed, gives certain indications of the nature of the substance emitting it. Thus, if the telescope be directed to the chimney of any glass works in Pittsburgh, the soda, there employed, will cause the flame from the chimney to indicate the presence of sodium, and if the sodium be as far off as the sun, the evidence of its existence is no less certain. To illustrate the use of the induction coil, as it is shown in our engraving, we may suppose the observer to note certain lines in the sun, which he suspects are due to iron existing there. Iron, if it is subjected to such an enormous heat as to not only melt but turn it into vapor, is known to give light which shows several lines, but so do gold, copper, tin, and in fact every metal. It is necessary to know that it is this particular line, however, and no other of the thousands in the spectrum (of which each, it is noted, has its own place) to be certain that only iron can have caused it. Clearly there can be no test more conclusive than to examine, at the same time and with the same instrument, the lines coming from the sun and from iron heated for the purpose, and to verify by such actual trial their exact coincidence of position.

To do this, two particles of iron are fixed at the end of the wires which pass from the coil to the spectroscope, besides a little mirror which will reflect their light in, together with the sun's, but just above it. Now, when a galvanic current has traversed the coil, it is caused to leap across from one bit of iron to the other, tearing off minute particles of the metal as it crosses, and generating a heat so intense as to turn them instantly to brilliant vapor, whose light is found to contain the lines in question, each line—for there are several—*exactly* over the corresponding one in the sun.

The observer's hand is represented as grasping the micrometer, an instrument attached to the spectroscope, by which the position of the lines is determined to the ten-thousandth part of an inch. It is with such minute precision that the absolutely perfect coincidences of these lines are verified, one set coming from a source within arm's length, the other from across ninety million miles of space.

On the left of the table is another micrometer, used chiefly for such purposes as measuring the positions of the double stars, the diameters of the planets, the hight of lunar mountains, and generally, for all celestial measurements of very small distances. The apparatus on the right is the solar eye piece, one of the latest improvements in its kind, and capable of diminishing the light and heat of the sun indefinitely, without the use of darkening glasses. Its light may be thus enfeebled till it is fainter than moonlight, while every part remains distinct. When the telescope is turned toward the sun, and its rays suitably condensed by the great lens at one extremity and smaller ones at the other, the heat is sufficient to melt iron, and a jet of flame bursts as suddenly from a piece of hard wood passed before it as though it were struck by lightning. It is into this very focus, of otherwise intolerable light and heat, that the polarizing eye-piece enables the observer to place his eye without more pain from gazing on the sun than from gazing on a newspaper.

Beyond the pier is the reflecting galvanometer, used, among other purposes, for investigating the heat from the sun or stars when their rays are directed by the telescope into the thermopile beside it.

The spectroscope can be removed and its place supplied by the micrometer, or by various eye-pieces which vary the magnifying power of the telescope from sixty to twelve hundred times: and the whole instrument, which weighs some thousands of pounds, is so poised that it can be directed by the pressure of a finger to any quarter; while the dome revolves above it by separate machinery.

In the western wing of the observatory is the transit instrument, built for it by Troughton & Simms, of London, in 1868. It rests on piers formed of single blocks of stone, which repose on foundations built up from the bed rock of the hill. As stable as it is possible to make its supports, the power of such an instrument is so great that the almost inconceivably slight jar induced in one of the great masses on which it rests, by a tap of the fingers, is magnified sufficiently to cause a tremor, through these tons of stone, which is visible when it is directed to a star. To prevent the footsteps of any person moving near it, therefore, from causing a displacement, which, though otherwise quite invisible, would impair the accuracy of its observations, the floor is built so as not to touch the supporting piers.

Every portion of its construction demands the highest class of skilled labor. The axles of such an instrument are required to be as nearly as possible mathematical cylinders of equal size, and are ordinarily turned with a diamond; and a corresponding care is employed in the finish of all its parts. The sidereal clock was built for the observatory by Frodsham, of London, and the mean time clock by Howard, of Boston, whose work does not suffer by the comparison. A chronometer by Frodsham and other instruments are also supplied.

Time from these clocks is now distributed by electricity through Pittsburgh and through nearly all the railroad system of Pennsylvania.

A part of the work done in observatories consists of measurements of extreme accuracy of the positions of the heavenly bodies by means of clocks of unusual exactness, not differing in principle from good "regulators," such as our watchmakers keep for reference, but of a more thorough finish, and proportionally exact performance. The measurements are made by these, together with the transit instrument just described, in whose focus is a series of lines formed by stretching at regular distances threads of the finest cobwebs, and which are illuminated artificially at night; so that when the instrument is directed to the heavens, they appear like black lines drawn over the bright background of the sky, and across which the stars are seen to pass. As the motion of the earth carries these threads steadily and swiftly by from star to star, the *time*, that elapses from the crossing of one of them by the thread to its passage over another, may evidently be made to measure their apparent *distance*, and for such measurements observatories engaged in star investigations will evidently need time of the greatest exactness for their own purposes, quite independently of any wants outside. It is not the least of the practical uses of an observatory that this time can now be applied by electricity to the convenience of the community in regulating public and private clocks, and enhance the public safety by communicating unity and exactness to those of our railways.

The precision, with which such instruments as these described are employed for the purely scientific demands of modern astronomy, is surprising. "Exact to the very second" would be considered as expressing the highest possible accuracy outside of an observatory; but there an error of a far smaller amount in the place of a star would be considered as a gross one. The probable error of the position of the stars measured by clocks in the way already indicated, is, as a matter of fact, within such a limit, and does not in some cases exceed one one-hundredth part of a second of time. Such minute intervals are really as non-existent to all ordinary use as the infinitesimal motions we have spoken of above are to our unaided senses; and many will be disposed to question not only the utility of such minuteness, but its possibility. But not to stop to explain the utility, the possibility can at once be demonstrated: If we follow certain wires which lead from the clocks to the other extremity of the building, we shall find there, among other instruments which we pass without description, one—the chronograph—where each swing of the pendulum is caused to write itself down through electricity, which, with every beat, pulsates along the wire and moves a recording pen above a sheet of paper travelling under it with absolute uniformity, by peculiar and beautiful mechanism. Here the time is measured by the foot like a ribbon, and the space corresponding to the hundredth of a second made visible.

From the mean time clock, go other wires, which pass outside the building to the telegraph connecting it with various points in Pittsburgh and Allegheny, and thence to the stations of the Pennsylvania Central and other roads.

At Altoona, Harrisburg, Philadelphia, Erie and other important stations, are little silvered bells through which the wires pass and are made to connect with the tongue, so as to cause it to ring with a single stroke when the electric current is interrupted at any part of the long circuit of wire which stretches all over the State.

We cannot give an exact explanation which would be clear to any but an electrician, but the general reader will get a good idea of what we want to describe by supposing himself to follow these wires from any distant city up to their end in the clock at the Allegheny observatory. Here they terminate in small plates of gold. These rest in light contact, and will be separated by the slightest motion of a jewel with which they are connected.

This jewel is struck every second by the tooth of a wheel, which, by moving it, pushes apart for an instant the gold points, and interrupts the current. At the instant the current is broken here, it ceases to pass through the distant bells, and so is broken and renewed every second in the day and night at points stretched over more than a thousand miles of road. At certain hours of the day the railroad telegraphs suspend other business to allow the observatory clock to be thus heard, ticking as it were in the furthest corner of the State. Of course every station gets *identically* the same second of time, the hour and minute being distinguished by a simple contrivance.

This system was arranged by Professor Langley, the director of the observatory, after personal examination of those used in Europe; and it somewhat differs from any employed there, chiefly in the direction of a greater simplicity in its details. It is believed to be already (with the exception perhaps of that from Greenwich) the most extended system of control from any observatory *in the world*, and it is apparently only beginning to be used as it will be hereafter.

When it is adopted by the Western roads, there will be *one time* on them from the Atlantic to the Mississippi, in place of the different systems which cause a change of time with every road one rides over. That will be *Pittsburgh* time, if the city sees fit to put the clock on the New City Hall and those of the fire alarm into this great circuit.

Its use at Pittsburgh began some two years ago, in 1869, when Messrs. J. B. McFadden & Co., a well known firm of watchmakers and jewelers in Pittsburgh, applied to the observatory to enable them to obtain by electricity its time for the benefit of their customers, proposing for this purpose to put up a line of telegraph. Such a line was subsequently erected, and for the general benefit of the community, the observatory undertook to supply, upon payment of the proportionate costs incurred, any watchmaker or jeweler in Pittsburgh or the adjacent cities with the time in this manner. The actual costs of the observatory in this matter were not expected to be met by any possible return, it being enabled to do this by the gift, of the special instruments required, from a generous friend who desired to enable it to confer a public benefit.

Observations are taken every fair night throughout the year, with the exception of the Sabbaths, and every pains that interested attention can bestow, to render the system as useful as it is general, is given.

A great many beautiful accessory instruments have been recently built to order for the observatory, by the best European makers.

An honorable exception is to be made in favor of the time distributing apparatus, which was supplied chiefly by Messrs. E. Howard & Co., of Boston.

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

To Smoke or not to Smoke.

To the Editor of the Scientific American:

Having read the two articles, published in your most valuable paper, entitled "To Smoke or not to Smoke," and being much interested in the subject, also being encouraged by your willingness to give both sides of a question a fair hearing, I submit this in corroboration of the article published page 375, last volume of your paper.

If the proof in the article just referred to is not sufficient to convince any one that smoking is injurious, let such a person ask, of as many smokers as he can, the effects of smoking upon them; and invariably the answer will be that it hurts them and they wish they had never smoked (the concluding sentence of all smokers), but they have not mind enough to leave it off.

The communication of V. B., published on page 388, in which he would prove smoking to be beneficial rather than detrimental, is ingenious, but, in my estimation, proves but very little in favor of smoking. Now a practical test, in this matter as in all others, is better than the supposition of V. B. that tobacco may be beneficial to man, although it kills a rabbit, because some other poisons fatten animals of one species and kill those of another.

I am a young man who has smoked for several years, and I wish to make known its effects upon me. It has injured my eyesight, and also my memory; and at one time, my nervous system was nearly prostrated. I left off the habit (by the advice of a physician), for several months, and I rapidly gained until I felt quite well. My eyes did not trouble me as before and my weight was much more than ever before; but my appetite was so strong for it, that, no sooner than I found myself well, I again took up the habit, and I gradually fell away in flesh; my eyes began to trouble me again, and my nerves began to shake. I again left it off, and, as before, I gained rapidly. When I saw the communication of V. B., I thought I would give it another trial, the result being the same as previously obtained.

V. B's. article tends to encourage young men in the practice of this habit, and it is to and for the young men that I write. My love for it was such that I have tried every means to prove to myself that it was not injurious to me, and so I caught at the ideas of V. B., taking more rest as advised by him. And the evidence of nearly all the smokers of my acquaintance is substantially the same as here stated. One thing more in reference to V. B. I think his comparison of the practical application of the weed out of place; we cannot arrive at anything definite by comparing two different nations in different countries. There are other reasons more potent to be ascribed for one nation being so much in advance of another. The Germans might be even more powerful than now without the use of tobacco, and the Chinese, in a still worse state; so the test applied to different nations proves nothing. Granted that it was not injurious, it is still useless and expensive, and had better be discouraged in young men than encouraged. V. B. expressed a wish to hear what the laymen say; in this letter he has the evidence of one. I hope you will not reject the evidence of a young man, in case of so much importance to the interests of young men.

E. F. S.

Cheap Method for Oxygen.

To the Editor of the Scientific American:

I think those interested in the production of cheap oxygen will find the following process of obtaining it cheaper than any other heretofore applied means for obtaining it in large quantities, except the German method of getting it by compressing air over water until the latter absorbs the oxygen thereof and drawing it out by means of suction or a vacuum, this being too slow and requiring too cumbersome apparatus for industrial use.

It is well known that certain substances like charcoal, oil of turpentine, etc., have a property of absorbing large quantities of ozone from the atmosphere; (this accounts for the bleaching action of bone black in refining sugars.) My idea is to force the air that has been ozonized by artificial means into a chamber or vessel filled with some such absorbent, giving the air so forced sufficient compression to cause the ozone to penetrate the mass of the absorbent, and, after the absorbing material is sufficiently saturated therewith, to draw it out by an exhaust apparatus, pass it through some caustic alkali, like caustic potash, to remove the remaining nitrogen, as nitrogen in presence of ozone will combine with such alkalies and form nitrates; the remaining ozone is then heated to a sufficient temperature to reconvert it into oxygen, and the process is through; the only thing remaining is to collect it in a receiver.

Naphtha exposed to ozone under pressure will become oxidised to such a density that it can be made perfectly safe for burning in lamps, even safer than the adulterated kerosene sold in the shops.

New York city. C. F. DUNDERDALE.

Remarkable Explosion.

To the Editor of the Scientific American:

On the 22d Dec., while employed in making tools in the establishment of Mr. Perkins, in Norwalk, Ohio, I met with an accident of so singular a character as to excite the most lively curiosity as to its cause.

I was about to temper a common reamer or rimer, by plunging it into sulphuric acid. The moment the heated steel came in contact with the acid, an explosion took place, throwing the acid in all directions, accompanied by a report equal to that made by a well loaded shot gun. The acid was thrown against the ceiling, about sixteen feet high, and over my clothing, face, and left arm, causing very painful sores, and threatening me with a loss of eyesight. The vessel containing the acid was a wide mouthed crockery jar, and there was about two gallons in it at the time. The jar was not broken, but the reamer was blown away from me, and was found much sprung, or twisted. I have used this acid very frequently, and have seen many others use it for tempering purposes; but this is the first instance, that I have ever heard of, of an explosion occurring. Indeed, the same lot of acid was afterwards used for tempering, without any indication of a blow up.

I send you this imperfect description of the occurrence, hoping that some of your correspondents will explain the mystery. So many persons are using this acid for tempering steel, that any danger attending its use should be pointed out and understood. The lucky escape I had, from being made blind for life, prompts me to ask you to call attention to this point in your widely circulated and eagerly read columns.

Norwalk, Ohio. GEORGE A. STANBERY.

[We think a possible cause for the explosion may have been the generation of hydrogen during the oxidization of some metallic fragments, introduced into the tempering pot through accident or design. This gas, mixed in the proper proportions with the air above the acid, would form a violently explosive mixture.—EDS.]

Photo-Mechanical Printing Process.

Captain Waterhouse, Assistant Surveyor General of India, describes in the *Photographic News*, Vol. XV. p. 556, a very simple method, of printing with ordinary printing ink from gelatin plates, that he has recently invented. He dissolves one ounce of gelatin in six ounces of hot water; then dissolves ten grains of tannin and thirty grains of soap, each in one ounce of water; mixes the two together, and adds them to the hot gelatin solution, very gradually, stirring all the time. The whole solution is then filtered through a coarse cloth into a jug, and, while still hot, is poured over the glass plates to be used. When the film of gelatin is quite set, the plates are turned upside down to dry. They are sensitized by being left for five minutes in a bath consisting of one ounce bichromate of potassa to twenty ounces of water. When dry, they are ready to be placed under a reversed negative. The time of exposure varies, from five minutes for clear line subjects to half an hour, or even longer if the negatives are very intense. Experience alone can decide. The back of the plate is next exposed to the sun for a few minutes to harden the gelatin, and it is then put in a dish of clear water, and washed till the whole of the bichromate is removed. The water is wiped off, and the plate is at once ready for printing from. After the plate is inked in, the superfluous ink is removed with a damp cloth, the paper is laid on, and pulled through the press in the ordinary way.

MR. WILLIAM SANDERSON, C.E., is engaged at present in making experiments with the object of trying how far it would be possible to utilise water power on the Himalaya Mountains in connection with the light mountain tramways.

THERE is no rule of health more important than "keep the feet dry and warm, and the head cool." An old story, but worthy of being often repeated.

[For the Scientific American.]

THE MODERN THEORY OF HEAT APPLIED TO THE PHENOMENA OF LATENT HEAT, COMBUSTION, ETC.

BY P. H. VANDER WEYDE.

If we accept the hypothesis, now raised into a theory, that heat is nothing but a peculiar mode of motion of the molecules of ponderable matter, it becomes much easier than ever before to correlate, under a single principle, the different phenomena presented in the effects of heat. In the first place, then, as all bodies possess a certain temperature, and we have not yet been able to cool any substance to the absolute zero point (which is very probably 460° below the zero of Fahrenheit), we must conclude, therefore, that the molecules of all solid bodies are in a condition of oscillation around their own centers or around a point in their vicinity; that, by rise of temperature (more motion), the amplitude of this oscillation increases; and, by a descent of temperature, (decrease of motion), the amplitude decreases; and as oscillations of greater amplitude require more space than those of a less amplitude, it is clear that bodies when heated must occupy more space, must expand.

These oscillations take place in simple bodies around a point situated between or near the single, double, or triple atom, in proportion to their allotropic condition; but, in compound bodies, the compound molecules oscillate; after the chemical decomposition of a compound body, the oscillations of the compound molecules are changed into the separate oscillations of the constituent atoms.

When the temperature is raised to a certain point, which differs for each substance, the amplitude of the oscillations becomes such that it reaches half or perhaps rather a whole revolution; and the oscillatory to and fro motion changes into rotation, and the substance becomes liquid or melts. We must, therefore, conclude that in water the compound molecule of H_2O is in a continuous rotation, at a velocity between that of the electric and luminous waves; and that, when water congeals, this rotary velocity is lost and changed into an oscillation, the remnant of the rotation, in the same way as a short pendulum will behave when, after rotating a while around its point of suspension, it is left to itself and to gravitation. This force of rotation, being abandoned by the congealing body, is communicated to the molecules of the surrounding bodies, and, increasing the amplitude of their oscillations or the eccentricity of their rotation, constitutes that which we mean when we say that latent heat is set free.

When substances crystallize during congelation, it proves that their molecules or atoms have poles, giving them definite positions in regard to each other, in which positions they continue their oscillations, as long as they possess a trace of that force which we call heat, and which, of course, like all motion or force, is as indestructible as is matter.

Notwithstanding this oscillatory motion, the molecules or atoms of solids are kept together by a polar attraction, overreaching the space occupied by the oscillations; this is the cohesion of bodies, and is, for the greater portion, lost when the oscillation is changed into rotation, that is, when the body melts. Then the poles are so intermingled that no polarity manifests itself, except in peculiar circumstances; for instance, the transmission of polarized light and its application to the saccharometer gives a proof that, even in the fluid condition, this polarity of the molecules is not always destroyed.

In order to explain the expansion of water during congelation, we have only to accept the hypothesis that the center of oscillation of the ice molecule is further removed, from the center of the molecule itself, than the center of rotation of the water molecule; it is then evident that the oscillation of the ice molecule must require more space than the rotation of the water molecule.

When now we heat the liquid obtained, that is, increase the velocity and consequently the eccentricity of the revolving molecule, these motions will occupy more space, and the liquid will expand. In the case of water, however, it appears that, at 40° Fahr., the center of rotation is the nearest to the center of the molecule itself, as the rotation occupies less space at that temperature, proved by the fact that the water then possesses its greatest density; below that temperature, there is a slight eccentricity at one side of the center of the compound molecule; by the rise of temperature, this point is driven through the center to the other side, where, at 47° Fahr., it is as far beyond the center as at 32° on the other side; with increasing temperature, the distance, of the center of the molecule from the center around which it rotates, increases continually, and its small remnant of the originally strong cohesive force of ice is soon destroyed when not kept together by pressure, ordinarily the atmospheric pressure; when, however, the point is reached where this pressure is not able to assist the feeble cohesion of the liquid to maintain itself in its liquid state, it is lost, and the liquid becomes a vapor; that is, applying the language of the modern theory of heat: when the velocity of molecular rotation and consequent eccentricity of this motion become so great as to overcome internal cohesion and external pressure, the molecules will fly off in very elongated ellipses or nearly straight lines, strike the walls of the vessels confining them, and cause what we call the pressure of steam or of vapors in general. It is thus the impact of the molecules which is the cause of what we call steam pressure; they make up for their infinitesimal small weight by their enormous velocity. As the result of impact increases in the ratio of the square of the velocity, it becomes at the same time clear why the pressure of steam increases in a much more rapid rate than does the temperature by which it is generated.

When we succeed in changing all the force of this molecular impact into motion of masses, we have the perfect steam engine; in all steam engines, however, this force is to a great extent communicated as molecular motion to surrounding bodies; that is, in common language, a great deal of the heat of the steam is lost by conduction and radiation; and this can, by our present system, not be entirely avoided. In the meantime, one of the best tests for the value of a steam engine is the determination of this heat, carried off by the water of condensation, which years ago was carried out in a crude way by experienced engineers, who dipped their hands in the hot well of the engine, to ascertain if it worked satisfactorily. This method has recently been perfected by Farey and Donkin in London, who measure the amount of condensation water carried off and its temperature, determine the number of heat units lost, and even have the same recorded by photographic and mechanical means.

The heat, made latent in volatilization or set free by condensation, is therefore, in the language of the new theory, nothing but the motion stored up in changing molecular rotary into molecular rectilinear motion, or the motion given out again by the reverse operation.

When raising the temperature still higher, that is, increasing the velocity and amplitude of these molecular rectilinear or very elongated elliptical motions or vibrations to the degree of 400,000,000,000,000 in a second, the body becomes luminous, red hot, whatever be its nature; this corresponds with a temperature of about 1,000° Fahr., and is equal in velocity to the vibration of the caloric ray at the extreme visible red end of the solar spectrum; when we raise the temperature still higher, we add vibrations of greater velocity, which finally correspond to those of the blue and violet or chemical rays of the spectrum, which have the capacity of decomposing certain substances, and are the rays to which we are indebted for the possibility of the photographic art; in which, however, the activity of these rays may be, and commonly is, used without the help of heat. In the rise of temperature to the point of dissociation, however, we have vibrations of these velocities, and of all lower velocities, that is, all lower degrees of heat, combined with the higher; and when the dissociation, that is, the decomposition by intense heat, takes place, the vibratory motion of the combined atoms HOH of steam is changed into the separate motion of two atoms of hydrogen and one of oxygen, and each sets up for itself; this consumes so much molecular force that 3,000 units of heat are made latent; and it is this latent heat or molecular motion, stored up in the uncombined hydrogen and oxygen gases, set free by their mutual combination or combustion, which is the source of the enormous heat produced by this process.

We may then compare the heat, successively produced by the processes of combustion, condensation, and solidification of H_2O, as the fall from so many precipices, each similar to the evolution of heat produced by the descent of a certain number of foot pounds. The first fall is that of each oxygen atom in the embrace of two hydrogen atoms, setting free 8,000 units of latent heat, we now have steam of 5,072°; by allowing its temperature to descend, we reach a second precipice at 212° Fahr., where the rapidly moving vapor molecules will fall together to one 1,700th part of their former volume, and form a liquid, setting free 962 units of latent heat; causing the temperature of this liquid to descend; or, in other words, decreasing the velocity of the rotation of its molecules, we reach another point, where the force is not sufficient to carry each molecule over its center of rotation, and an oscillation, with the poles of each atom in a definite mean direction, remains, evolving another amount of latent heat of 142 units.

I have thus traced the conversion of solid ice into gaseous oxygen and hydrogen, and back again into solid ice, by accepting the beautiful and simple theory of heat as a mode of molecular motion; if, in the view of some, the existence of these motions appears improbable, or merely fanciful, by reason of the smallness of their extent and their extreme rapidity, I point only to the extreme smallness and rapidity of the luminous waves, and the infinite smallness of the atoms of matter, which are facts proved beyond the possibility of contradiction.

[For the Scientific American.]

EXPOSE OF THE TRICKS OF THE DAVENPORT BROTHERS.

BY P. H. VANDER WEYDE.

Two reasons induce me to listen at once to the appeal made on page 340, last volume, to explain the wonderful (?) performances of the Davenports; one is, that any tardiness in my reply might perhaps cause some one to doubt if I really had done all that the Davenports did; and the other is, that it will give me an opportunity to illustrate forcibly how necessary it is to see such kind of performances personally, if we wish to explain them; and how by hearing a mere account from those who have seen them, the most important parts, giving the key to the whole, are lost. All the surrounding circumstances, even the merest trifles, must be considered if we will rationally explain it, without taking recourse to the method by which the savage imagines he explains every phenomenon of nature which excites his amazement. The Indian accepts a Spirit of the thunder and lightning, a Spirit of the winds, a Spirit of every waterfall, etc.; in fact, this belief in spiritual interference in the affairs of our material world is nothing but a remnant of barbarism, which must be rooted out if we would lay claim to be called an enlightened people in this nineteenth century.

The main apparatus used by the Davenport brothers is a wardrobe or cabinet, with three doors, all locking with bolts on the inside. It is six feet high, three feet deep, and some seven or eight feet long. A wooden seat or bench occupies the whole of the back and sides, while the performers occupy the side seats, so that they cannot be seen by the audience when the middle door alone is opened. When each is tied up by one of the audience, the assistant or manager closes the side doors and slides the inside bolt in place, by passing the hand through the open middle door; he then pushes the middle door, when the bolt on this is immediately closed by the persons inside, notwithstanding their hands and feet are tied; they do this of course with their mouths, in reach of which this bolt is situated.

Before closing the doors, he places a speaking trumpet on the middle seat, also within reach of the mouths of the performers inside, when this, immediately after the closing of the middle door, is thrown out through a small window, situated in its upper portion; the box is placed a little forward, so that the middle door, as soon as the bolt from its inside is withdrawn, falls open of itself; this happens immediately after the throwing out of the speaking trumpet; then the manager steps forward, withdraws the bolts from the inside of the two side doors, opens them, and exposes the brothers to the full view of the audience, when, of course, they are seen tied up, head and feet, as they were a moment before; of course they have not used their hands, but one of them did throw out the trumpet with his mouth, by taking hold of the mouthpiece with his teeth, lifting it up till the other end reaches the little window, thrusting it through, and letting go, the other end being heavier it of course tumbles outside. When this trick is appreciated by the audience it is repeated a few times, and then other performances are proceeded with.

Before describing these, I cannot omit to mention an incident proving the obtuseness of the public. On the first occasion when I saw them perform, I had the distinguished honor (?) of being selected by the audience to go on the platform and tie one of them up, to guard the audience against deception, and testify afterward that no deception was used. I saw at once that, in the performance of this trick, the mouth had been used in place of the hand; now, in order to give the audience the key to this apparently surprising feat, that the trumpet was thrown out while their hands and feet remained tied up, I took the trumpet between my teeth, went with it thus to the front of the platform, so that all could see me, and then threw it forward; I kept my hands on my back, so as to make all understand that such a thing may be done without the use of hands, or with the hands tied up. I supposed that this ocular demonstration would suffice for my purpose without further oral explanation. Imagine my surprise, when, after the exhibition was over, a few apparently intelligent gentlemen came to me and declared that the most wonderful thing they "had seen, during the whole performance was that trumpet sticking to your nose!"

I ask, when there are such people to see this kind of performances, is the wonder that they are taken in?

As at that time I occupied the chair of Natural Philosophy and Chemistry in the Cooper Institute, and lived in the building, where also the Davenports performed in the large hall, while their cabinet remained there, during the whole time of performance (about a fortnight), I had easy access to it, and could practically verify all my theories in regard to every item of the performances, of which this is a first specimen.

Are the American Women Deteriorating?

R. R. McIlvaine, M. D., formerly of Cincinnati, in remarks before the Ohio State Medical Society, 1871, on the Special Report of the Committee on Sanitary Science, gave the following statistics as proofs that women are not deteriorating. He said: In 1850, if I remember rightly, in every 2,178 of the entire population of the United States, there was one over 90 years of age, and in every 25,000, in round numbers, there was one over 100 years of age. Mr. President, it is not I who speak, it is history. It is the Bible of politics and progress, the census of the United States for 1850, that I credit with these facts.

But further, the State of New York in 1860 had a white population of 3,831,500; of this number there were 1,646 persons over 90 years of age—namely: 704 men and 942 women; thus, in every 2,327 there was one over 90, and in every 41,647 there was one over 100 years; in both cases women being in the majority.

In the State of Ohio, in 1860, with a white population of 2,302,808, there were 760 over 90 years of age; of this number there were 366 men and 394 women, and therefore there was, in every 3,030, one over 90 years of age, and in every 33,864, one over 100 years of age. In this case, as in that of New York, aged women are in the majority.

In Virginia, in 1860, with a white population of 1,047,299, there were 245 men and 296 women over 90 years of age (total 541), which gives one over 90 in every 1,935, and in every 15,178 there was one over 100 in her entire white population.

In 1860 the white population of the State of Vermont was 314,369. In this small population there is evidence of vitality; there were, over 90 years of age, 146 men and 180 women; and here, as in all the States named, women have the majority. In every 961 there was one over 90, and over 100, 13, being one in every 24,182 of her entire population.

This tabulated view of each section, east, west, north, and south, proves conclusively that we are not deteriorating.

The entire white population in 1860 of the United States was 26,690,206. Of this number, one in every 2,775 and a fraction was over 90 years of age. Of this population, there were 902 over 100 years of age, making one in every 29,578 and a fraction.

RUBY glass is produced by the addition of suboxide of copper to the glass. This ingredient can be got by adding grape sugar in solution to sulphate of copper, then adding caustic potash in excess, then boil. The deposit of suboxide of copper is separated by filtering and washing.

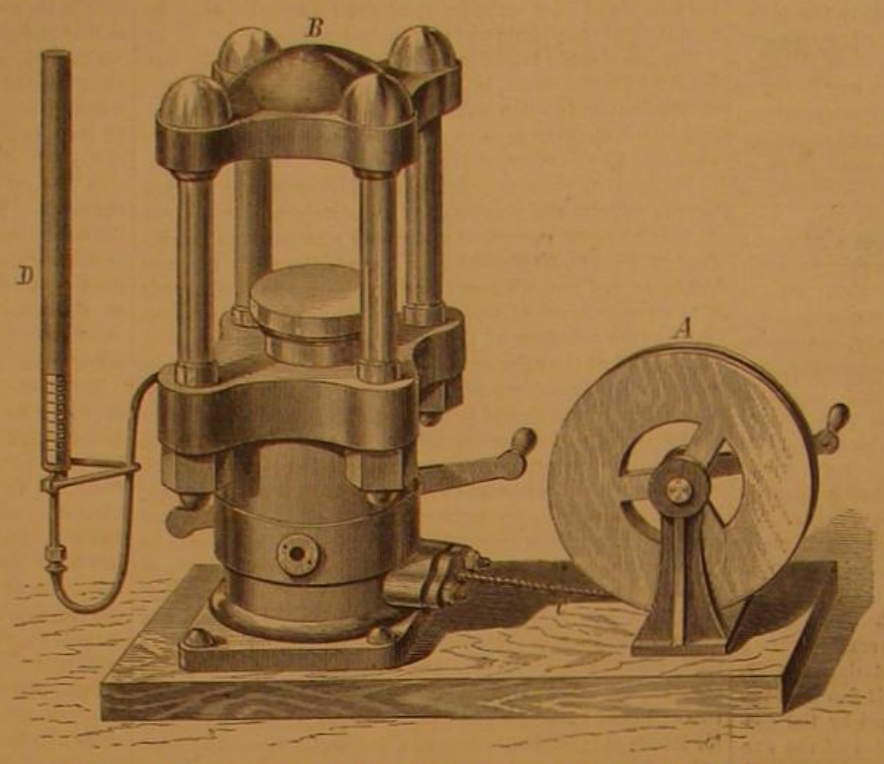
STERHYDRAULIC APPARATUS.

Barnard, in his report on the Paris Exposition, styles this the most ingenious and most decidedly original form of hydraulic press and hydraulic pressure apparatus exhibited. These presses are called by their inventors—Messrs. Desgoffe and Ollivier—their "*Appareils Sterhydrauliques.*" It is from the report alluded to that the substance of this article is extracted. If the etymology of its name does not explain the principle of the contrivance, it will be seen to be at least in harmony with it, when the principle is known. The object of the apparatus, in all its several forms, is to produce a powerful hydrostatic pressure by introducing, into the cylinder of a hydraulic press already filled with liquid, not an additional amount of liquid by successive impulses, as is the case in the common hydraulic press, but a solid substance, by a steady, unintermitted movement. Or, in the words of the inventors themselves, the *Appareils Sterhydrauliques* have for their objects—

"1. To obtain a gradual pressure, without jars, by means of a liquid hermetically enclosed in a recipient which it fills, and to do this by the forcible introduction of a solid body into the recipient.

"2. To utilize this pressure by means of one or of several pistons."

The sole difference—but it is a radical difference—between the old and the new forms of hydraulic press, consists in the manner of applying the power. In the common hydraulic press, the force exerted through the piston of a small forcing pump is intermittent, and acts by fits or jolts. But in these contrivances, the motive power is employed in introducing continuously a flexible cylinder or solid cord, by winding it on a pulley which is enclosed within the apparatus, while it is operated by a crank or a band wheel on the outside. The pressure produced is therefore gradually and uniformly raised; and it acts upon a piston moving watertight in a cylinder, as usual.



DESGOFFE & OLLIVIER'S STERHYDRAULIC APPARATUS.

The construction of a press of this kind is illustrated in our engraving. A is an external pulley on which is rolled the solid cord, B, which is represented as at the same time partially rolled on the internal pulley. This internal pulley is enclosed in a strong metallic chamber which communicates with the cylinder in which moves the large plunger, B. The driving power acts on the internal pulley, increasing the volume of the mass rolled upon it, and thus, through the confined liquid, acting upon B. By applying the power to the pulley, A, and reversing the motion, the cord may be unwound and withdrawn; thus relieving the hydraulic pressure and causing the piston, B, to reenter under the ordinary pressure of the atmosphere. Although the pressure is thus applied gently and gradually, it may nevertheless be much more rapidly raised than it is usually convenient to raise it, in the ordinary form of the pump. For, by deriving the force applied from the motor of a manufacturing establishment, the pulley may be driven with a velocity which would probably soon derange a forcing pump of corresponding capacity. The packing of the piston and of the axis of the pulley is made of raised or upset leather, as is usual in air pumps. That of the cord is simply combed hemp. The liquid in the interior of the chamber is oil, and the material of the cord is catgut. This material is easily fashioned to a uniform diameter; it takes a high polish; it is nearly incompressible and inextensible: it is unalterable in oil; and finally, its flexibility adapts it admirably to the purpose to which it is here applied. A diameter is generally given to this cord of four tenths of an inch. As to the security of the joint formed between the cord and its hempen packing, though some apprehensions were at first entertained, they have been entirely removed by experience. The hemp itself becomes after a time so compacted as to form something like a tube of horn, exactly fitting the cord. For five months a press of this description in daily use has lost nothing by leakage, nor has it been found necessary to tighten the joint.

In the construction of this press, as the chamber for the liquid is formed of a single casting, the pulley has to be introduced through the opening left for the piston. Its size being too great to allow this to be done in a single piece, it is originally formed of two equal parts, which are united on the axis.

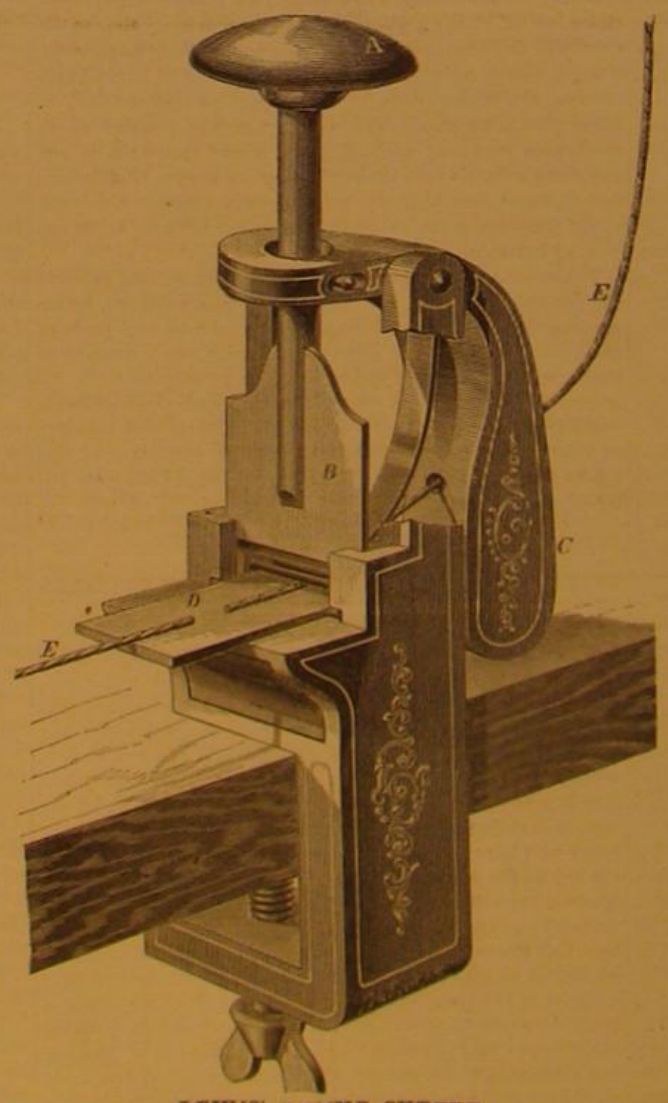
A pump of this kind has been constructed for Mr. Tresca, of the *Conservatoire des Arts et Métiers*, to be used by him in the course of his investigations on the resistance of materials of construction, and the flow of solid bodies. It received, for the convenience of these experiments, the horizontal position, and was designed to exert a force of 50,000 kilogrammes. In these investigations, the hydraulic press presented the only available means of applying the immense pressure necessary; but the intermittent and jerking action of the press, as operated by a forcing pump, had the effect of determining fracture of the masses compressed before the limit of their resisting power to dead pressure had been reached. The perfectly steady action of the sterhydraulic press completely remedied this imperfection, and eliminated the irregularities which had disturbed the exactness of the determinations.

The ordinary form of the press with vertical movement is shown in our engraving.

In this figure, a manometer, D, appears attached to the press, to serve as an indicator of the degree of compression. This is important in experiments on the resistance of materials to crushing weights.

There is one consideration which requires attention in presses constructed on this principle, when it is necessary that the piston shall have a large movement. As the quantity of cord accumulated on the pulley increases, the resistance to the driving force increases in virtue of the enlargement of the radius by which it acts. And this unfavorable effect occurs at that part of the course where the pressure on the piston is greatest; and where, accordingly, the mechanical advantage of the motive power ought rather to be increased than diminished. To provide for such cases, the inventors have devised a form of construction where the pulley is smaller but the chamber is elongated, and a second pulley is introduced at the opposite extremity; the cord being in this case rolled about both the pulleys, while much the larger part of its mass occupies the interval between them.

A case may, however, occur in which a very large piston may have to make so long a course as to render it inconvenient or practically impossible to meet the exigency by the expedients thus far described; inasmuch as the quantity of cord required for the purpose might be a troublesome encumbrance. Should, therefore, this difficulty present itself, the sterhydraulic apparatus is constructed in the form of a continuously acting pump, and is employed to introduce liquid into the cylinder of the press, as is done in the ordinary hydraulic press, only that the entrance of the liquid takes place still in a steady and uniform flow, and not by the spasmodic action which it is so desirable to avoid.



LEWIS' TWINE CUTTER.

Progress and Popular Science.

M. Sogg, of Neufchatel, writes to the editor of *Les Mondes* as follows:

"Since the world is inclined to ridicule your attempt to popularize science, permit one to sit down by your side and induce you to read what I have written on page 128 Vol. II, of my "Treatise on Chemistry," which you must have received long since. What is the science, which loses itself in the clouds of thought without a desire ever to come down to the practical, other than an error, the glory of standing by the side of those other honors which elevate the individual and debase the nation? What would astronomy be if it did not serve to measure time and to guide us on our way upon the land and the sea? To separate pure science from applied science, is to condemn each to sterility; they can no more exist alone than our heads can exist without arms and legs.

"Thénard would be forgotten if he had not found the cobalt blue which bears his name; it is alkalimetry and alcohometry which have rendered popular the name of Guy-Lussac, and, in spite of all his admirable works, the name of Chaptal would be forgotten if he had not connected it advantageously with the manufacture of beet-root sugar.

"Consider how the intelligence of most of our great men is developed, and you will find always that they step upon the scientific stage with works as brilliant as they are useless to human society; later on and gradually, experience, the daughter of age, teaches them to devote themselves to practical application, and they are more pleased with and more proud of having perfected an industrial process, found the formula of a fertilizer, or discovered a new aliment, than if they had devised one of those brilliant theories which flash across the scientific heaven, like falling stars in the space of the firmament, and leave no trace behind."

LEWIS' TWINE CUTTER.

The accompanying engraving illustrates an ingenious and extremely convenient twine cutter, for use in stores, warehouses, etc., for cutting the cords employed in tying packages.

The construction and utility of this neat device will be apparent on reference to the engraving.

A knob, A, is attached to the stem of the blade, B, the latter working vertically in guides. When the blade is struck down by the action of the hand on the knob, it raises the outer end of the lever weight, C, the connection of the stem of the blade and the lever weight being made by a pin and slot. When the hand is removed from the knob, the outer end of C drops and raises the blade again.

The part of the twine, E, to be cut, rests on a movable table, D, during the cutting, and is fed from the ball or spool through a hole in the outer part of the weight, C, thence under the end of a spring which holds it firmly down upon the table, and thence under a small wire guard just behind the knife, which holds the end of the twine from lifting, when the knife rises. The end of the twine, being thus held to the table, moves with it. The table slides back and forth, being connected to the outer end of the lever weight by a link which draws it backward, as the knife descends and the outer end of the lever weight rises, and is thrust forward again when the weight falls, carrying the twine with it so as to place the cut end in convenient position to be grasped when wanted.

In use, the twine is drawn out, wound around the package, and tied, when a slight blow upon the knob cuts it off. The hand being removed, the instrument at once resumes the position for a successive operation; in other words, it holds the twine, cuts it, and hands it back to you.

Patented through the Scientific American Patent Agency, Nov. 7, 1871, also in England, by Chas. C. Lewis, Gainesville, Ala. [See advertisement on another page.]

LIQUID POLISH.—The preparation of blacklead ready for use in a fluid state, is a recent English invention. The composition adopted consists of black lead, such as is used for polishing stoves and for other uses, combined with turpentine, water, and sugar or saccharine matter, and the proportions which have been found to answer well are, to each pound by weight of the blacklead, one gill of turpentine, one gill of water, and one ounce of sugar; but these proportions may be varied, and in some cases all the ingredients are not necessary.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING) NEW YORK.

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

☞"The American News Co.," Agents, 121 Nassau street, New York.

☞"The New York News Co.," 8 Spruce street, New York.

☞A. Asher & Co., 20 Unter den Linden, Berlin, Prussia, are Agents for the German States.

☞Messrs. Sampson Low, Son & Marston, Crown Building, 183 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXVI., No. 3. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, JANUARY 13, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

Answers to Correspondents	42	Novel Railway Signal	31
Applications for the Extension of Patents	41	Official List of Patents	43
Are the American Women Deteriorating?	37	Painless Extraction of Teeth	33
Artificial Fuel	40	Pendulum Experiments in the Mont Cenis Tunnel	35
Business and Personal	41	Photo-Mechanical Printing Process	36
Cheap Method for Oxygen	36	Poisoning by Antimony	39
Cleanliness	35	*Pooley's Automatic Grain Weigher	31
Declined	42	Progress and Popular Science	38
Effects of Ice at St. Louis	33	Recent American and Foreign Patents	42
*Ellis' Combined Steam and Bisulphide of Carbon Engine	31	Remarkable Explosion	36
Exposé of the Tricks of the Davenport Brothers	37	*Sturhydraulic Apparatus	38
Friction Gearing versus Belts and Cog Wheels	33	The Agassiz Exploring Expedition	40
Health and Disease	39	*The Allegheny Observatory	35
Hydraulic Cements	32	The American Master Mechanics' Association	40
Influence of Medicines on Larvæ, etc.	32	*The Attraction of the Moon	35
Inventions Patented in England by Americans	43	The Modern Theory of Heat applied to Latent Heat, Combustion, etc.	37
*Lewis Twine Cutter	38	The Study of Alloys	40
Liquid Polish	38	To Smoke or not to Smoke	36
Loisean's Compressed Fuel	41	Water Power in the Himalayas	38
Mineral Waters	33	What is a Machine?	39
Miscellaneous Health Notes	35	Working a Tramway by Steam	33
New Books and Publications	39		
Notes and Queries	41		
	42		

Importance of Advertising.

The value of advertising is so well understood by old established business firms, that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of more than 40,000 copies per week, which is probably greater than the combined circulation of all the other papers of its kind published in the world.

WHAT IS A MACHINE?

We venture to say that nine out of every ten mechanics would be puzzled to give a satisfactory answer to the above question. We mean, by a satisfactory answer, such a definition as will clearly apply to a machine and to nothing else. This is no proof of lack of intelligence on the part of mechanics, since no less a lexicographer than Webster has failed to give a good definition of the term. At least one out of ten mechanics should be able to give as good, if not a better one.

Webster says a machine is "in a general sense anything used to *augment* or regulate force or motion. The simplest machines are those usually denominated the six mechanical powers, namely, the lever, the pulley, the axis and wheel, the wedge, the screw, and the inclined plane." "More properly, a machine is a complex structure, consisting of a combination or a peculiar modification of the mechanical powers."

Now the first of these definitions is simply absurd, since we know that no machine ever augmented or diminished a force, considered as a force, or ever regulated anything but motion. The second is defective because, to be defined by it, a machine must include all the mechanical powers above enumerated, and cannot include more. But we need not say to mechanics that endless chains, and belts, and flexible cords, are parts of some machines.

We shall find, if we succeed in giving a better definition, that we must get down to a broader foundation for it. We cannot describe machines in general so as to convey any idea of what is common to all of them without first clearly perceiving what is accomplished by the use of any machine. Practically, moving matter is all the force with which machines deal. Falling water, expanding steam, the movements of animals, air currents, molecular motion of magnets converted into mass motion in the armatures, etc., these are the moving agents of machinery. The direct application of what is called abstract force has never yet and never will be made to move a machine.

Beginning, then, with matter in motion, and applying this motion to machinery, let us see what is and what is not accomplished. First we find that the amount of motion applied, that is the weight of the primarily moving mass multiplied into its velocity, is not affected in any way by our machine. When we have summed up the amount consumed in friction, the momenta of the moving parts, the amount consumed in giving to the machinery its standard velocity, that consumed in overcoming resistance of the medium in which the machine moves, and that which is finally converted into useful work, we find the sum always equal to that part of the momentum of the primarily moving mass which we have used to impel our mechanism.

But we discover that whenever we use machinery, we change the direction of motion. If we throw a block of wood upon the bosom of a river, the block will be carried along to the ocean, and a certain amount of work will have been done. The wood, however, has not been an instrument in the accomplishment of the work; it has only been passive, acted upon, but not transmitting motion. It is not a machine. Let us make this block a means of transmitting the motion of the stream to other matter, and it becomes a machine. In order to do this we restrain its motion at some point,—say its center. It begins to revolve, because its movable exterior still is actuated by the current, while its central axis is kept stationary. It is now an undershot water wheel, and capable of performing work.

Let us try to do some work with it. The simplest thing we can do is to cause it to raise a weight on its ascending side. We have here the conversion of the horizontal motion of matter into vertical ascending motion. Strictly speaking, our machine has therefore only conveyed motion from one moving mass and imparted it to another *in a different direction*. And this being solely what the elements of machines do, our definition of a machine is, an instrument, or a combination of instruments, for transmitting power from one moving mass to another in a different direction. Whatever complex results may be produced, this, and this only, is the common characteristic upon which a definition can be based.

POISONING BY ANTIMONY.---THE WHARTON TRIAL.

An important trial, for an alleged murder by antimony, recently pending in Annapolis has attracted unusual notice in consequence of the conflicting character of the testimony offered by scientific men summoned as experts. One of the witnesses testifies in the most explicit terms to having found antimony, but, when cross-questioned as to the methods pursued for arriving at this knowledge, he gives such tests as are no longer regarded as of any value by chemists, and his testimony is flatly contradicted by experts who have kept up with the progress of modern research and are familiar with the best methods at present employed for the detection of poisons. "When doctors disagree, who shall decide?" We suppose the jury in this case, but upon what principles they are to weigh the evidence and determine who of the numerous learned men are to be believed and who discarded, is not stated. We suppose that nobody outside of the jury box, and we trust nobody in it, will be deceived by the mist and obscurity that the lawyers have attempted to throw around a very clear subject by dragging certain ignorant men upon the stand to take the position of experts. All of the chemists of learning and experience would agree, but it would be easy enough to find numerous charlatans who would testify to anything that was required of them. It is not a little curious that antimony should have been the occasion of bitter controversies ever since it was first made known. It was first described by Basil Valentine about the time of the discovery of America by Columbus. This worthy monk, residing in Erfürth, Germany, was wont to try numerous scientific experiments between his *aves* and *paters*, and is reported to have given some antimony to the convent hogs for the purpose of fattening them. The animals gained in flesh amazingly, and the benevolent father thought that it would be a kind act to repeat the experiment upon his lean and fasting brethren. This time the result was not so favorable, and several of the priests died. "What will cure a hog will kill a monk" was the verdict of the time, and the metal which caused the mischief was called *anti-moine*, death to monks; and we now call it antimony. Notwithstanding the unfavorable issue of Valentine's prescription, antimony became one of the most popular medicines of the day, and its use, or rather abuse, was carried to such an extent that in France in 1566 a special edict was promulgated against its employment as a medicine, which law was not repealed until after the lapse of a hundred years. Very few of our elementary bodies have been subjected to so much study and investigation as antimony, and one would suppose that by this time all of its properties and relations ought to be pretty thoroughly understood; and they are fully known to chemists of any claim to the title of scientific men. As the salts of antimony are frequently employed in medicine, and can consequently be purchased without exciting suspicion, they have long been the favorite agents, in the hands of evil disposed persons, to be used for poisoning. No doubt many persons have been the victims of this poison without suspicion; and in most cases where suspicions have been aroused, and the persons who gave the medicine have been tried before the courts, it has not been found very difficult to acquit the accused, chiefly on the ground that the deceased may have taken the antimony as a medicine. In the case of arsenic this remedy does not hold, as that dangerous substance can hardly be called a medicine. One of the most remarkable cases of the accidental employment of a large quantity of a salt of antimony occurred in Göttingen, Germany, in 1861, on the occasion of the annual fair in that city. It transpired on investigation that a baker had used a large quantity of tartar emetic instead of saleratus in mixing flour for a peculiar kind of gingerbread much coveted in that region of country. The number of persons poisoned by this cake was so great as to bring about a thorough judicial investigation which led to the discovery of the above facts. In 1865, Dr. Pritchard, of Glasgow, Scotland, poisoned his wife and mother-in-law by administering overdoses of tartar emetic; and in the famous case of William Palmer, there was also much talk of antimony.

It is not necessary for us to follow the evidence adduced by the prosecution at Annapolis to prove that death was caused by antimony, as the daily press has given full details of the trial; but it may be well to mention some of the properties of antimony, together with the tests that ought to be applied for its detection. A preliminary step in all such investigations is the previous examination of all of the utensils and re-agents to be employed. It often happens that re-agents, purchased as chemically pure, are on examination shown to be largely contaminated by foreign substances. This is particularly the fact with such common chemicals as sulphuric and hydrochloric acids. Even ammonia, derived as it now is from the dirty refuse of gas works, is nearly always impure, and liable to occasion disturbances in some of our most important remedies. The apparatus used in a search for poisons should be absolutely new and clean. After taking all of these preliminary precautions, the chemist is in condition to enter upon his examination. The modern chemist would be apt to make an early test with the spectroscope. This instrument reveals, with unerring certainty, the least trace of any volatile substance, and is invaluable in all cases of suspected poisoning. Antimony gives a multitude of brilliant rays more numerous than those afforded by the spectra of other metals; the most prominent lines are to be found in the orange, green, and violet portion of the spectrum.

It is somewhat remarkable that in the recent Annapolis tria so little stress should have been laid upon spectrum analysis. After the spectroscope, usually follows electrolysis, or the decomposition of the substance by electricity; in the case of antimony the product obtainable in this way depends upon the form of the experiment, strength of current, etc. Sometimes we find the metal at the negative pole in a crystalline condition, then again gray and hard, with a specific gravity of 6·6. The amorphous antimony obtained by electrolysis is characterized by its explosiveness on percussion. Passing from the action of light and electricity, the chemist would take up the tests described in so many books that we wonder where some of the Annapolis experts found the methods practised by them. Even traces of antimony can be found by any of the following methods:

1. By passing sulphuretted hydrogen through an acid solution and subsequent comparative tests to distinguish the precipitate from arsenic. 2. The copper test. 3. The Marsh test, to which however, in recent times, many objections have been raised. In all cases of importance, as in a trial for murder, the metal ought to be produced in court, and the specimens obtained, by the reactions described above, ought to be also kept for exhibition. The spectrum analysis would have to be taken on faith, unless the court room was provided with conveniences for throwing the lines upon a screen. Our knowledge of antimony is so accurate, and the researches into its propensities extend over so many centuries, that ignorance just now is wholly inexcusable, and all wrangling unnecessary.

We only need to turn to any standard text book on chemistry to obtain all the information that we may require on the subject.

HEALTH AND DISEASE.

In glancing over a medical journal, the other day, we stumbled upon the assertion that the lack of knowledge upon the treatment of cancer is a disgrace to the medical profession. If this be so, how much honor ought to be given to a profession which can neither determine cause nor cure of apparently far more simple diseases than cancer, and of which it may be said that the most intelligent and skillful physicians now cease attempting to cure? We seriously question whether there is one half of the diseases, enumerated in any good work on the practice of medicine, which the best practitioners dream of curing. They simply let these diseases have their course, taking care that nothing except the complaint shall obstruct the patient's return to health. Nature does the fighting with the malady, the physician sees that it is a fair fight, and that the recuperative power of the constitution shall not encounter bad nursing, bad diet, bad air, nor the bad companionship of depressing mental influences.

If you ask a skillful physician what is health, he will glibly run off a formula, of excellent sound and seeming sense. He has another equally well sounding formula which is his definition of disease. Ask him to apply these formulæ, and you will see that, while marked variations from the general standard of health are easy to determine, the precise nature of the variation is, in most cases, as absolutely unknown to him as to the laymen. There are certain characteristics of diseases to the majority of which, when they appear, he gives a name. He says such a patient has the small-pox, another phthisis, another measles, and so on. These names only characterize groups of appearances; they give no clue to the real nature of the complaint.

Notwithstanding what we have said, we assert that the medical profession is worthy of honor; and that no better advice can be given, to a patient who is sensible enough to distinguish between dosing and doctoring, than to obtain in sickness the counsel of a really able physician. For despite all the obstacles which have intervened to prevent accurate knowledge of the hidden characters of disease, there is something known. Physicians are beginning to know how little they know, which is a long stride toward rational practice.

A skilled practitioner, formerly a lecturer in a medical institution, said to us in a recent conversation: "The medical practice of the future is to be essentially hygienic." This statement is most significant. Physicians are gradually relinquishing their faith in drugs, and placing their trust more and more in the recuperative power of their patients. Less calomel, rhubarb and jalap, and more pure, sweet air, more

good food and drink, more cleanliness and good companionship to prevent mental depression and discouragement, with rest, are the medicines now fast becoming popular; and they are so good to take, that they are gratefully received rather than rejected by the sick.

It is true that antidotes to certain blood poisons have been found (quinine seems to be such an antidote), though the real nature of the poisons is yet unknown. In cases where such antidotes are ascertained, it may be wise to use drugs, though we cannot explain how they act to remove the cause of the malady; but there are comparatively few such remedies in the *materia medica*. Indeed, it has been one of the articles of faith of the allopathic school, that there is no such thing as a specific remedy. We believe that this dogma is destined to be replaced by just its opposite, namely, that any drug, in order to be styled a remedy, must be demonstrated to have a specific action upon the disease for which it is administered.

The present state of medical science is the natural result of the general progress of the time. Old superstitions are recognized in their true character through the light of modern science. The microscope, the spectroscope, the chemist's paraphernalia have given us some insight into the action of certain substances when introduced into the human system, that shows the belief in their efficacy to be unfounded. Through chemistry the science of pathology and therapeutics will advance, but the latter will doubtless advance by the elimination of a vast number of the agents hitherto employed in the healing art. If new ones are added, it will be on grounds more scientific than the blind empiricism of the past. Empiric conclusions hereafter must be of that positive character which leaves no room for doubt; and though sickness can never be pleasant, the coming sick man need not fear that artificial horrors will be added to the couch of pain, through the administration of nauseating medicines of uncertain value, and the deprivation of all external appliances that can sooth and comfort, and reconstruct his shattered system.

If he is thirsty, he will have cool drinks. He will have a nice clean bed, well aired. His parched skin will be well washed with pure water. His room will be thoroughly ventilated and infected. Instead of depletion by blistering, bleeding, and purging, he will be treated to nourishing and easily digested broths and viands; and regard will be paid to what were once called his abnormal cravings and desires. His apartment will, in short, be made a haven of peaceful rest, into which he puts for repairs, and from which, if not a total wreck when he enters it, he may emerge patched up in the most scientific manner, by the same hand that built him—Nature—the good old architect, who knows what she is about, and only asks, of doctors and nurses, that they should clear away the rubbish and let her have her own way in the matter of healing.

THE STUDY OF ALLOYS.

We have repeatedly called attention to the great importance of the systematic study of alloys, and have pointed out that the only way, to prosecute such a study with any hope of success, is in a well endowed metallurgical laboratory, supplied with ample apparatus, and a zealous corps of thoroughly trained investigators; the researches to be continued, if need be, through half a century, or until the field has been thoroughly worked over. The subject is so extended that few investigators will attack it single handed, except to make disconnected and unconclusive experiments. We have never realized this truth so forcibly as when reading Fesquet's translation of Guettier's "Treatise on the Manufacture of Alloys," which has recently been forwarded for notice by the publisher.*

In the introduction to this work, the acknowledgment of incompleteness is frankly made, and the impossibility of a strict and exact method is confessed. In the present state of knowledge upon the subject of alloys, we grant the impossibility, but are not willing to concede that our knowledge might not be so extended as to form a solid basis for such a method. Surely the number of possible combinations of metals is not so great as those of organic substances, nor are their properties so various. Yet we have an exact method in works on chemistry.

We object also to the classification of metals, adopted in the work, which is utterly unscientific. That the reader may understand the ground for this objection, we give the classification as found on page vii of the introduction:

1st. The metals especially industrial, that is to say, those which are most in use in all kinds of manufactures. They are: Copper, tin, zinc, lead, iron, steel, etc.

2d. The metals which belong to the arts, but whose importance is secondary. These are: Bismuth, antimony, nickel, arsenic, and mercury.

3d. The precious metals which belong to the arts, or more particularly to the manufacture of objects of luxury. These are: Gold, silver, aluminium, and platinum.

4th. The metals scarcely used in industry or in alloys, most of them being, at present, without any clearly demonstrated usefulness.

For the purposes of the work, this classification answers tolerably, but it fails to give the reader any idea of those properties possessed in common by certain metals, by which chemists have agreed to group them in classes. Without keeping these groupings constantly in view, we believe no study of alloys can be pursued that will be important to science. Isolated discoveries of peculiar combinations are possible, and, from time to time, will be made, but these discoveries can never lead to generalizations, and our knowledge will therefore remain in the crude, uncompacted state, of which this book is a striking example, until some such course as we have recommended be adopted.

We find nowhere in the work a definition of the term alloy, and though a distinction is made between alloys formed of definite proportions, (chemical alloys), and those which are defined by Mathiessen to be solidified solutions of metals in other metals, this distinction is nowhere sharply defined. In short, the reader may arise from the perusal of this book with scarcely more theoretical information than he had at the beginning.

If this criticism seems severe, we will strive to do equal justice to the merits of the work, which are so numerous as to render it of very great general value. As a practical guide which is all that is claimed for it in the title, it is far superior to anything we have ever met upon the subject. In fact, we do not believe another work exists, to which engineers, artizans, manufacturers and inventors, can turn with full confidence for the instruction afforded in this treatise. To the brass and iron founder, the model maker, the general mechanician, its aid must prove invaluable, especially that found in the chapter on the "Preparation and Composition of Alloys," which, if properly studied, is a chart by which the errors of inexperience may be easily avoided. The method of procedure is of great importance in the production of many valuable alloys. To throw the metals together hap-hazard is, in most cases, to insure failure. We are often asked by correspondents to set them right in matters of this kind, and know how general is the want of accurate information upon the subject.

The following quotation will illustrate more fully the necessity of pursuing a definite routine in the admixture and combination of metals:

"In general, it is advantageous to introduce into the alloys a certain number of elements, even in small proportions for many of them, and although several of these elements would not appear to possess an appreciable utility, or have an important effect. The results of affinity obtained by the new elements favor the mixtures, increase the density and the homogeneousness, at the same time that they sometimes counterbalance, with great advantage, the tendency to liquation or separation in the melted mass.

"Thus, for instance, a statuary bronze, which could be made entirely of copper and tin, acquires new and indispensable qualities by the addition of zinc and lead, even in small proportions.

"As another example, the alloy of copper and zinc, which as such might be suitable for certain uses in the arts, becomes much more valuable for these same uses, and is improved and completed, by the addition of a small proportion of tin or lead.

"The more complex an alloy is to be, the more important is it that its preparation should be effected by the union of more simple alloys, previously made. Outside of the considerations which guide the founder as to the order in which the metals should be melted, such as the peculiar conditions of affinity, the similitude in the specific gravities and the points of fusion, it is proper to examine the means and processes by which we add, to the final melting, those metals whose proportions in the alloy are comparatively small."

Of scarcely less value is the discussion of the properties of special alloys, and their applications to useful purposes in the arts. The list is very full, and the proportions are in all cases fully stated, and, when necessary, special directions are given. It would be strange if some alloys of recent date, and not yet generally introduced, had not been omitted, yet we have been able to recall very few not comprised in this department of the work.

*A Practical Guide for the Manufacture of Metallic Alloys, Comprising their Chemical and Physical Properties, With their Preparation, Composition and Use. Translated from the French of A. Guettier, Engineer and Director of Foundries, Author of "La Fonderie en France," etc., etc. By A. A. Fesquet, Chemist and Engineer. Philadelphia; Henry Carey Baird, Industrial Publisher, 406 Walnut street. London; Sampson Low, Son & Marston, 188 Fleet street. 1871. Price by mail, postage free, $5.00.

ARTIFICIAL FUEL.

We publish, in another column, the report of a committee of the Franklin Institute on a trial of artificial fuel. In connection with this report, some general remarks upon the subject may be useful.

It is commonly supposed that the primary object, in the production of artificial fuel, is the utilization of waste; but there are other important ends that may be secured, which ought not to be lost sight of in the general consideration of the subject. One of these is the production of fuel better suited to certain industrial operations than that obtained in the crude form. The process of coking coal for iron working is a striking example in point. By this process, the sulphur, in the coal, which is injurious to iron is removed, and the coke is made to approximate in purity to charcoal, with which the best iron is made.

The manufacture of charcoal is another familiar example of the artificial preparation of fuel. By this process, we get a fuel which burns with scarcely any smoke, is free from substances contained in the natural wood, and is thereby much better for many uses than wood previous to distillation.

We see then, that the artificial preparation of fuel does not necessarily look to cheapness as the sole end to be secured; in fact, this point may, in some cases, be entirely ignored with a large demand for the fuel produced, provided it has qualities that compensate for increased cost. To utilize waste and thus make a cheap fuel is, however, the chief end sought by inventors, who aim at reducing coal slack to a form convenient to use for domestic or manufacturing purposes.

There are, probably, very many ways in which this may be done, not yet hit upon by inventors. The one described, in the report alluded to, is undoubtedly a good one, and there are others in use which give excellent results. One important thing in domestic fuel is that it shall be comparatively free from dust. A slight increase in the percentage of ash is not to be regarded as a serious defect. Such increase gives little trouble, and does not lessen greatly the heating capacity of the combustible ingredients. It adds a little to the trouble of attending fires, but this is a trifling inconvenience.

We believe that the form of the lumps or blocks of artificial fuel is a matter of more importance than it is generally considered. If made with sharp corners and angles, as is usual, these corners break and crumble in handling and transportation, and a disagreeable and filthy dust is created, which might, we think, be avoided in a great measure by a different form. Some of this kind of fuel is also not sufficiently dense to make a fire that will keep sufficient time. Others are not sufficiently tenacious in texture to prevent crushing and crumbling.

In short, there is still room for much invention in this department, and we look to see the manufacture of artificial fuel take its place, in the future, among the great industries of the world.

THE AMERICAN MASTER MECHANICS' ASSOCIATION.

This association is proving itself a really working organization, and is as ably managed as anything of the kind in America. At its last annual convention, September 12, 13, and 14, 1871, held at Louisville, Ky., some very able papers were read, and much valuable information elicited. The following list of subjects for discussion shows that the association means business. The selection is most judicious, including

Boilers and boiler material.
Boiler incrustation.
Boiler explosions.
Safety valves.
Construction of valves and valve gearing.
Steel tires.
Best method of securing driving and truck brasses.
Best method of constructing tender trucks.
Is there any method or device for packing stuffing boxes, more economical than hemp?
Application of compression brakes.
Comparative performance and cost of operation of eight and ten wheel engines for freight service.
Comparative performance and cost of operation of ten wheel engines with six drivers coupled, and eight wheel engines with four drivers coupled.
Uniform system of computing mileage of engines doing switching service.
Uniform system of examination for promotion of locomotive firemen.
Advisability of establishing different grades of locomotive engineers according to length of service, character, etc.

THE AGASSIZ EXPLORING EXPEDITION—INTERESTING RESULTS ALREADY OBTAINED.

We recently chronicled the departure from New York of a deep sea exploring expedition, under the lead of the venerable Professor Agassiz, on a voyage round the world, authorized by the United States Coast Survey. We are already beginning to receive interesting accounts of results obtained by members of the expedition, some of which are narrated in the following interesting letter:

ST. THOMAS, W. I., Dec. 15, 1871.

PROFESSOR AGASSIZ TO PROFESSOR PIERCE.

My Dear Professor—For several days after we left Boston, I was greatly troubled by a sense of general weakness, so much so that more than once I thought I had undertaken more than I had strength for. But as soon as we got into warmer latitudes, I felt better, and now I am actually improving beyond my condition at the start. As soon as we reached the Gulf Stream, we began work. Indeed, Pourtalés organized a party to study the temperatures as soon as we passed Gay Head, and he will himself report his results to you, which are quite interesting. My attention was entirely turned to the Gulf weed and its inhabitants, of which we made extensive collections.

SEA WEEDS AND THEIR INHABITANTS.

Our observations favor the view of those who believe that the floating weed is derived from plants torn from the rocks, upon which sargassum naturally grows. I made a very simple experiment, which seems to me to settle the matter. Every branch of the sea weed which is deprived of its floats at once sinks to the bottom of the water, and these floats are not likely to be the first parts developed from the spores. Moreover, after examining a very large quantity of the weed, I can say that I have not seen a branch, however small, which did not exhibit distinct marks of having been torn from a solid attachment. You may hardly feel an interest in my zoölogical observations; but I am sure you will be pleased to learn that we had the best opportunity of carefully examining most of the animals known to inhabit the Gulf weed, and some which I did not know to occur among them.

DISCOVERY OF FLOATING FISH NESTS.

However, the most interesting discovery of the voyage thus far is the finding of a nest built by a fish, floating on the broad ocean with its live freight. On the 13th of the month, Mr. Mansfield, one of the officers of the Hassler, brought me a ball of Gulf weed, which he had just picked up, and which excited my curiosity to the utmost. It was a round mass of sargassum, about the size of two fists, rolled up together. The whole consisted, to all appearance, of no-

thing but Gulf weed, the branches and leaves of which were, however, evidently knit together, and not merely balled into a roundish mass; for, though some of the leaves and branches hung loose from the rest, it became at once visible that the bulk of the ball was held together, by threads trending in every direction among the sea weeds, as if a couple of handfuls of branches of sargassum had been rolled up together with elastic threads trending in every direction. Put back into a large bowl of water, it became apparent that this mass of sea weeds was a nest, the central part of which was more closely bound up together in the form of a ball, with several loose branches, extending in various directions, by which the whole was kept floating.

A more careful examination very soon revealed the fact that the elastic threads which hold the Gulf weed together were beaded at intervals, sometimes two or three beads being close together, or a bunch of them hanging from the same cluster of threads; or they were, more rarely, scattered at a greater distance one from the other. Nowhere was there much regularity observable in the distribution of the beads, and they were found scattered throughout the whole ball of sea weeds pretty uniformly. The beads themselves were about the size of an ordinary pin's head. We had, no doubt, a nest before us, of the most curious kind; full of eggs too, the eggs scattered throughout the mass of the nest and not placed together in a cavity of the whole structure. What animal could have built this singular nest, was the next question. It did not take much time to ascertain the class of the animal kingdom to which it belongs. A common pocket lens at once revealed two large eyes upon the side of the head, and a tail bent over the back of the body, as the embryo uniformly appears in ordinary fishes shortly before the period of hatching. The many empty egg cases observed in the nest gave promise of an early opportunity of seeing some embryos freeing themselves from their envelopes.

THE EGGS HATCH OUT.

Meanwhile, a number of these eggs with live embryos were cut out of the nest and placed in separate glass jars to multiply the chances of preserving them, while the nest as a whole was secured in alcohol, as a memorial of our unexpected discovery. The next day I found two embryos in one of my glass jars; they occasionally moved in jerks, and then rested for a long while motionless upon the bottom of the jar. On the third day I had over a dozen of these young fishes in my rack, the oldest of which begin to be more active and promise to afford further opportunities for study. The pigment cells of a young *chironectes pictus* proved identical with our little embryos. It thus stands as a well authenticated fact that the common pelagic *chironectes* of the Atlantic (named *chironectes pictus* by Cuvier), builds a nest for its eggs in which the progeny is wrapped up with the materials of which the nest itself is composed; and as these materials are living Gulf weed, the fish cradle, rocking upon the deep ocean, is carried along as an undying arbor, affording at the same time protection and afterward food for its living freight.

This marvelous story acquires additional interest if we now take into consideration what are the characteristic peculiarities of the *chironectes*. As its name indicates, it has fins like hands; that is to say, the pectoral fins are supported by a kind of prolonged, wristlike appendages, and the rays of the ventrals are not unlike rude fingers. With these limbs these fishes have long been known to attach themselves to sea weed, and rather to walk than to swim in their natural element. But now that we have become acquainted with their mode of reproduction, it may fairly be asked if the most important use to which their peculiarly constructed fins are put is not probably in building their nests.

LOISEAU'S COMPRESSED FUEL.

HALL OF THE FRANKLIN INSTITUTE, PHILADELPHIA, DECEMBER 19, 1870.

The committee on science and the arts, constituted by the Franklin Institute, to whom was referred for examination specimens of artificial fuel, prepared by Mr. E. F. Loiseau, of Philadelphia, have made the following report:

That they have made trials of the samples produced from anthracite and from bituminous coal.

The mode of manufacture, as related by Mr. Loiseau, is as follows:

1. Anthracite small coal and dust were mixed with (7) seven per cent of clay, and compressed into cylindrical molds about 4½ inches in diameter and 4 inches deep, or else into spherical masses about 3 inches in diameter.

2. The molded masses are placed for a few minutes in a bath of benzine, in which rosin had been dissolved, and from which they are removed, and dried by an exposure to a current of air.

The object of coating them with a film of rosin is to prevent the absorption of moisture and consequent softening of the clay; the solution in benzine penetrates the mass of coal and clay to a depth of about ¼ inch, and so efficiently closes the crevices, that samples immersed in water for twelve hours were found dry in the interior when broken up for examination.

Both the anthracite and bituminous fuels were burned in a furnace measuring 9 inches in diameter and 7 inches in depth; each variety of fuel burned freely, and was completely ashed, but the intensity of the combustion was less than that produced by anthracite or bituminous coals of small size, burned in the same furnace. These comparisons were made with a moderate and also with a strong draft.

The average amount of ash obtained from the anthracite artificial fuel was 16 per cent, and, from the bituminous artificial, was 18·5 per cent.

The heating powers, as obtained from trials in Thompson's apparatus, are as follows:

One pound of anthracite fuel, in each of four experiments, gave the results 4·30, 85·0, 7·86, and 6·76 lbs. of water evaporated, being an average of 6·85.; while one pound of bituminous artificial fuel, in each of four experiments, evaporated 9·35, 11·11, 12·88, and 10·61 lbs., averaging 10·99. The anthracite average is 7·40 lbs. of water. The average of bituminous is 14·88 lbs. of water.

The non-uniformity of result is partly due to the imperfect manipulation in mixing the coal and the clay, and partly to the varying amounts of solution of rosin absorbed in the bath to which the material is subjected; the imperfect manipulation can be remedied by the adoption of proper machinery for that part of the process.

The ability of the artificial fuel to bear transportation is less than that of anthracite or good lump bituminous coals, but the structure is firmer than that of many bituminous and semi-bituminous coals that are carried to market. The masses will generally break up with a fall of 3 feet upon a stone pavement, but are strong enough to bear ordinary handling and transportation; and should they become broken, will suffer no damage, unless exposed to wet.

The samples of artificial fuel examined are well adapted for use for purposes in which great intensity of combustion is not desired.

For the production of steam in stationary boilers, and for household purposes, it can be employed equally as well as any ordinary coal; and, whenever the cost of preparation is less than the cost of mining coal, this invention will make available the immense amounts of small coal now allowed to remain useless at the coal mines. It appears to work far better than the balls or bricks of coal dust and clay and lime that came into vogue in this city many years ago, when anthracite was brought to market without preparation by the coal breaker, which had not then been invented; the balls or bricks thus made not having the protection from wet secured by Mr. Loiseau, by his resinous coating.

We consider the method of preparing artificial fuel from waste anthracite and bituminous coals, as presented by Mr. E. F. Loiseau, as ingenious and well adapted to the purpose, and worthy of the attention of those interested in the production of a cheap fuel, adapted to a great variety of uses.

Respectfully submitted.

Charles M. Cresson, William H. Wahl, John Wise. } Sub-Committee.

By order of the Committee,
D. Shephard Holman,
Actuary.

[The samples of artificial fuel, presented to the Franklin Institute to experiment upon, were simply pressed by hand and could not be made as solid as they will be when pressed by appropriate machinery.

The percentage of ash is larger than in ordinary coal, as the clay is not consumed; but the other advantages of the artificial fuel, in point of durability, cleanliness, and cheapness, more than compensate this small disadvantage.

The cost of manufacture at the mines, including the coal and all the materials, will, it is stated, not exceed one dollar per tun.—EDS.]

TO CITY SUBSCRIBERS.

The SCIENTIFIC AMERICAN will hereafter be served to our city subscribers, either at their residences or places of business, at $3·50 a year, through the post office by mail carriers. The newsdealers throughout this city, Brooklyn, Jersey City, and Hoboken keep the SCIENTIFIC AMERICAN on sale, and supply subscribers regularly. Many prefer to receive their papers of dealers in their neighborhood. We recommend persons to patronize the local dealers if they wish the SCIENTIFIC AMERICAN or any other paper or magazine.

NEW BOOKS AND PUBLICATIONS.

SCIENCE RECORD FOR 1872. Being a Compendium of the Scientific Progress and Discovery of the Past Year. 400 pages, octavo. 100 Engravings, Steel Plate and Wood. Handsomely bound in muslin, $1.50: extra binding, half calf, $2. Munn & Co., Publishers, 37 Park Row, New York, Office of the SCIENTIFIC AMERICAN.

This new and elegant work presents, in convenient form, notices of the leading subjects and events, pertaining to science, that have occupied public attention during the past year. The progress of the more important public works is duly chronicled, with illustrative engravings. The leading discoveries, facts, and improvements, in chemistry, mechanics, engineering, natural history, and the various arts and sciences, are recorded and illustrated. Sketches of prominent scientific men, with illustrations, are given, and among the portraits are those of Faraday, Murchison, Darwin, Agassiz, Huxley, and Herschel. The Mont Cenis tunnel, the Hell Gate works, the Brooklyn suspension bridge, the Hoosac tunnel, the St. Louis bridge, the United States Patent Office, and other works are illustrated. A large amount of useful information, tables, descriptions of improvements, with engravings, are likewise presented. The book is one of much interest and value, and should have a place in every library.

APPLICATIONS FOR EXTENSION OF PATENTS.

SAWING MACHINE.—Harriet L. Low, Galena, Ill., administratrix of Henry H. Low, deceased, has petitioned for an extension of the above patent. Day of hearing, February 28, 1872.

TURNING AND SLIDING TABLE FOR RAILROAD.—William Sellers, Philadelphia, Pa., has petitioned for an extension of the above patent. Day of hearing, March 6, 1872.

COMBINATION OF LEAD PENCIL AND ERASER.—Hymen L. Lipman, Philadelphia, Pa., has petitioned for an extension of the above patent. Day of hearing, March 13, 1872.

MODE OF PROTECTING GILDING ON GLASS.—Peter V. Mathews, Philadelphia, Pa., has petitioned for an extension of the above patent. Day of hearing, April 10, 1872.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row,

Examples for the Ladies.

Mr. Lentz, Philadelphia, Pa., has had a Wheeler & Wilson Machine 16 years; for 8 years it supported a family of nine persons, two of these invalids running on an average of 19 hours a day, by different persons, without costing a cent for repairs; some of the original dozen of needles are still in use; no personal instruction was received, and a child ten years old learned its use thoroughly.

Whitcomb's Asthma Remedy.—"A single bottle gave relief."—J. D Cushing, *Toledo, Ohio.*

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.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. D. Bulkley, Patentee, Cleveland, Ohio.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 17c. a line.

Edson's Hygrodeik is the best Hygrometer in use. Send for circular. Geo. Raymond, Fitchburg, Mass., Gen'l Agent for United States.

The Improved Ingham or California Cleaner and Smutter Combined is beyond question one of the very best and cheapest in America. Send for illustrated circular, giving full particulars. It will pay you. Address M. Deal & Co., Bucyrus, Ohio, Manufacturers.

Wanted—350 feet of 3 in. Steam Pipe, and 250 ft. 1½ in. Boiler Tubes or Steam Pipe, New or Second Hand. Address A. & E. H. Sedgwick, Poughkeepsie, N. Y.

Valuable Patent Right for Sale. Lock Box 22, Camden, N. J.

For Experimental Machinery, Models, &c., address Wm. E. Cass, 61 & 63 Hamilton St., Newark, N. J., or agent, Jno. Dane, Jr., 95 Liberty St., New York.

J. McGee, of Lancaster, N. H., will send one of his Gold Collar Pins, $2.25; plated, $1.75.

Inventors' Co-operative Manufacturing Co., 21 Park Row New York. Send for circular. [State agents and patents wanted.]

Presses, Dies & all can tools. Ferracute Iron Wks, Bridgeton, N. J.

For Sale—A good Foundry Plow and Stove Manufactory in Mississippi. Cheap, and terms easy. All machinery necessary. Established 1854. Address Shaw & Son, Water Valley, Miss.

Cast Cast Steel Plow Shares, or Points are made by the Pittsburgh Steel Casting Co., which can be Worked and Sharpened as other steel. See advertisement.

Maine's Portable Ventilator—Adjustable to any window. Fresh air without draft. See Scientific American, Dec. 23. Send for Circular. Underhill & Co., 95 Duane Street, New York.

Chard & Howe's machinery oils, the best—try them—134 Maiden Lane, New York.

A practical Machinist, having first class Machinery for Iron Work, would like to hear of power, with inducement to settle in Virginia, Kansas, or intervening States. Address, J. D. A., Lock Box 91, Boston, Mass.

We will remove and prevent Scale in any Steam Boiler, or make no charge. Geo. W. Lord, 232 Arch street, Philadelphia, Pa.

Rubber Valves—Finest quality, cut at once for delivery; or moulded to order. Address, Gutta Percha & Rubber M'f'g Co., 9 & 11 Park Place, New York.

Engineering and Scientific Books. Catalogues mailed free. E. & F. H. Spon, 446 Broome St., New York, and Charing Cross, London.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

Williamson's Road Steamer and Steam Plow, with Thomson's Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

For Hand Fire Engines, address Rumsey & Co., Seneca Falls, N. Y.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca, Falls, N. Y.

Scale in Steam Boilers—To remove or prevent scale, use Allen's Patent Anti Lamina. In use over Five Years. J. J. Allen, 4 South Delaware Avenue, Philadelphia, Pa.

Stencil Tools & Steel Letters. J. C. Hilton, 66 W. Lake st. Chicago.

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N. Y. Send for Circular.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro., 414 Water st., N. Y.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N. Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

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

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

For Best Galvanized Iron Cornice Machines in the United States, for both straight and circular work, address Calvin Carr & Co., 26 Merwin St., Cleveland, Ohio.

Boiler and Pipe Covering manufactured by the Chalmers Spence Non-Conductor Co. In use in the principal mills and factories Claims—Economy, Safety, and Durability. Offices and Manufactories, foot E. 9th street, New York, and 1202 N. 24 street, St. Louis, Mo.

Peck's Patent Drop Press. For circulars address the sole manufacturers, Milo, Peck & Co., New Haven, Ct.

Photographs.—Rockwood, 845 Broadway, will make 8x10 negative and six photographs of machinery, in any part of the city, for $10.

Dickinson's Patent Shaped Diamond Carbon Points and Adjustable Holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24 and Nov. 20, 1869. 64 Nassau st., New York.

Railway Turn Tables—Greenleaf's Patent. Drawings sent on application. Greenleaf Machine Works, Indianapolis, Ind.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—FUSIBLE METAL.—Is there an alloy, fusible at a lower degree of heat than brass, suitable for small molds of machinery?—J. A. C.

2.—WATERPROOFING BOOTS.—Can any of the readers of the SCIENTIFIC AMERICAN inform me with what preparation I can make boots and shoes waterproof?—C. B.

3.—REMOVING INK STAINS.—Will some reader of the SCIENTIFIC AMERICAN give me a formula for making a preparation that will remove ink from books and papers without injuring them?—B.

4.—TELEGRAPH GROUND WIRE.—How deep should a ground wire be extended to insure a current of electricity at all times of the year? Should it terminate in a mass of metal? If so, how much surface should come in contact with the earth?—T. C. G.

5.—SHRINKING IRON SLEEVES.—Recently, at Albright and Stroh's iron works, Mauch Chunk, Pa., was cast an iron shaft, weighing twelve tuns, in two parts; and an internal and external sleeve was shrunk on to connect the two pieces. The sleeve weighed three tuns. Can any one aform me if any heavier pieces have been shrunk on, in the United States?—T. R. S.

6.—MARBLEIZED SLATE AND IRON.—It is stated by some persons that marbleized slate and iron mantles get damaged by frost and damp, when left without a fire in a house shut up for some months, or perhaps a year or two. Will some of your readers please say if it is true?—T. G.

7.—HORSE POWER.—Can any of the correspondents of the SCIENTIFIC AMERICAN tell me how small a circle a horse can travel in, on an upright horse-power, without injury to health, or making him dizzy? The amount of power required is insignificant. And will covering the horse's eyes make any difference?—L.

8.—STEAM ENGINE POWER.—I have a steam engine that I contracted for to perform a certain amount of work with a pressure of 70 pounds of steam per square inch. But upon trial, it failed to accomplish said work with a pressure of 80 pounds; but, by detaching one fourth of the work, it drives the remaining three fourths with apparent ease with a pressure of only 45 pounds per square inch. The cylinder is 12 x 24 inches, the fly wheel 8 feet in diameter and weighs 3,100 pounds; the latter is hung on a six inch cast iron crank shaft, running at a speed of 96 revolutions per minute. The steam ports give an opening of seven square inches each, the exhaust about fourteen. It is furnished with a Judson two and a half inch governor; the lead pipe from boiler to engine is two and a half inches inside diameter and twenty feet long. After its failure to do the work, the builders propose to replace the two and a half inch governor and valve with a three inch one, leaving on the two and a half inch steam pipe; also to put on a fly wheel en feet in diameter, weighing 4,200 pounds. With the above alteration they claim that the difficulty will be overcome, and it will do the work allotted (about 40 horse power). Whether the builders' idea of increasing the power is correct, and the true cause of the engine not doing one fourth more work with 80 pounds of steam than it will do with 45 pounds, is what I should like to know.—J. R. L.

9.—INDELIBLE INK.—Will some one please inform me how to make an indelible ink for marking linen with a common pen?—C. T. H.

10.—SUCTION PUMP.—The theory that the pressure of the atmosphere pushes the water up the suction pump and pushes the bot air up the chimney and the like, interferes with what a friend of mine is projecting just now. Will some correspondent please inform me how I can satisfy my friend that it is not the levity of the hot air that causes it to ascend, and so give place to the cold air; and that nature's abhorrence of a vacuum does not account for the water ascending in the suction pump and the like?—P. D.

11.—BRONZE PAINT.—How can I make a surface on smooth iron, in imitation of bronze metal? Is it possible that not one of your thousands of readers who know, will respond?—R. S. B.

12.—BLUEING IRON.—I would like to ask through "Notes and Queries" how the iron work of the most highly finished guns and revolvers is blued.—J. C. C.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at 1·00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

W. S., of Iowa.—The mineral you send is mica, but is an inelastic variety, and of no use in the arts.

BÉTON-COIGNET.—If J. H., query No. 2, January 1, read his SCIENTIFIC AMERICAN regularly, he would remember a full account of this artificial stone, given on page 248, Vol. XXIV.—D. B., of N. Y.

GUN SCATTERING SHOT.—H. W., query No. 3, January 1st, should make his powder and shot into hard, well packed cartridges.—D. B., of N. Y.

CEMENTING LEATHER TO IRON.—E. A., query No. 4, January 1st, can fasten leather to iron by putting pulverized rosin on the flesh side of the leather, and applying it to the heated iron.—D. B., of N. Y.

ATTACHING LEATHER TO IRON.—Can you inform me, through your valuable paper, how to cover the iron pulleys with leather without going to the trouble of riveting? I tried cementing with cement made of glycerin and litharge, but did not succeed.—L. P.—Answer: See No. 4 in this column.

SALT AND ICE.—M. A. wishes to know why salt is mixed with ice to freeze ice cream, while in winter we put salt in our pumps to keep them from freezing. The reason is as follows: The salt has a great attraction for water, and when mixed with ice, it tears down the crystalline architecture of the latter. At the same time the salt itself is dissolved, and both are reduced to the liquid state; but this cannot take place without heat, as it is a thoroughly established theory that matter cannot pass from the solid to the liquid state without absorbing heat; but where does the heat come from? From surrounding bodies, and that is why it freezes the ice cream, which is one of the surrounding bodies. When salt is put into a pump in which the water is *frozen*, the heat is abstracted from the surrounding pump barrel to melt the ice.—C. E. S., of N. H.

CASTING HOLED PATTERNS.—D. W. W., January 1st, asks what is the best method of making a casting with a hole 10 or 12 inches long, ¾ or ⅞ inch cross section? If it is possible to make the mold so that the core will stand vertically, a common dry sand core will answer; but if not convenient to do so, I would take a piece of ⅜ inch iron, the proper length, including core prints; take some melted tallow and draw two streaks, one on each side of the rod, dip it in clay wash, then cover with core sand to the proper shape and dry it; and as it dries, the tallow melts out, leaving two small vents to take the air off the core. I think a core made in this manner will be strong and safe, and will not blow.—R. J. McI., of N. Y.

TEST FOR CALOMEL.—F. D. H., query No. 1, January 1, will have some difficulty in detecting the presence of calomel, as distinguished from other salts of mercury. If he merely wishes to ascertain whether mercury in any form exists in his preparation, let him mix a little, of the compound to be tested, with ether, and rub it on a bright surface of copper. The amalgamation of the metals will produce a white film on the copper. Calomel is the submuriate of mercury, and to distinguish it, from corrosive sublimate (bichloride of mercury) or other mercurial salts, will require an investigation by an experienced analyst.—D. B., of N. Y.

BLACK INK.—Some time ago a querist asked how to make Arnold's writing fluid black when first written. I have not seen the question answered. Having written to the manufacturers about it, they reply: "It is impossible to manufacture our fluid so as to write black at first, without destroying the specialty of the ink altogether." But by mixing with Rhodes' (London) or Blackwood's (London) ink, it may be made quite dark when first used.—A. F. S.

ANNEALING LAMP CHIMNEYS.—R. L. B. asks if there is any simple process for annealing lamp chimneys. If he will put his chimneys into a kettle of cold water, and gradually heat it until it boils, and then let it as gradually cool, the chimneys will not be broken by the ordinary fluctuation of the flame of the lamp.—C. E. S., of N. H.

PLOW HANDLES.—Query No. 14, January 1st.—I have seen this thing done with entire success, but cannot explain without writing at length and using cuts. The main idea is, however, clamping a strip of band iron on the outer surface of the handle while bending, so as to prevent slivers from starting, or the grain of the wood breaking. The band to remain till the wood is cold.—R. S. B.

DETECTION OF CALOMEL.—Answer to F. D. H.—Place upon a piece of clean, bright copper one drop of any liquid suspected of containing any mercurial preparation, then add a few grains of iodide of potassium; upon stirring the liquid with the point of a steel blade, the mercury (if any be present) will be precipitated, forming a silver white spot. If pills are operated with, make a paste with water, and proceed as above.—C. D. F., of O.

LEATHER BELTING.—Dry or damp air will not affect belts if they are properly cared for. Thirty years experience in a woolen factory has taught me that leather belts should be filled with currier's oil, and should be slipped off and remain so during each night. Belts kept in that way do not require to be kept so tight as those which are used dry, to do the same work, thus saving friction and wear. I have in my mind now a belt which I put together twenty-five years ago—two, in fact—eight inches wide and thirty feet long, that, when made, I literally filled with oil, and they are doing good service now.—R. S. B.

BACK PRESSURE IN EXHAUST PIPE.—For the benefit of R. K., Vol. XXVI., page 9, I would say that: if the exhaust from an engine 12 by 22 inches, making 65 revolutions per minute, pressure of steam 80 pounds, cut off at 15 inches, passing through 18 feet of 4 inch pipe to a large tank or heater, then through 220 feet of 4 inch pipe with 11 elbows to a T, then through two lines of 3 inch pipe, one 210 feet long with 18 return bends and 10 elbows, the other 225 feet long with one return bend and 10 elbows: the back pressure at the engine is 1¼ pounds, which is imperceptible in the working of the engine. The exhaust is the most economical.—E. P. D., of Me.

FLOW OF WATER AGAINST ATMOSPHERIC PRESSURE.—There is a reservoir 500 feet square, situated on the top of a hill, 80 feet above a city. What would be the effect if an airtight head could be put in that reservoir? Could water be drawn from that reservoir? What would be the effect if an air pump were applied and all the air exhausted from the reservoir?—G. M., of Mass. Answer: If a vacuum be created above the water, the latter would flow till the pressure of the atmosphere on the outlet was exactly balanced. If there be some air above the water, the weight of that air would cause a corresponding additional quantity of water to flow before the equilibrium was arrived at.

REVOLUTION OF BODIES.—In answer to R. O. H.'s squirrel problem (query 18, December 16th), I would say that a person cannot pass round an object without passing all sides of said object. It seems to me, therefore, that the man does not go round the squirrel, from the simple fact that he is continually on the same side of the little animal. The man goes round every fixed object within the circle which he describes, but not round any object which may be moving in the same line of radius with himself. If myself and friend walk side by side round a circle—he being nearest the center—I cannot see how I can be said to go round my friend. The circle may be as large as a race course or as small as a few feet in diameter. I therefore conclude that the man does not go round the squirrel, but that man and squirrel both go round the tree.—H. L., of N. Y.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

CENTRIFUGAL FORCE.—G. W. T.
FIREPROOF BUILDINGS.—B. A. J.
FIREPROOF SAFES.—R. S. S.
FLIGHT OF BIRDS.—S.
FUZEE VS. GOING BARREL.—J. M.
MINERAL PAINT.—E. B. H.
PSYCHIC FORCE.—J. A. S.—P. J. C.
TRACTION ENGINES.—W. C. O.
WATER IN ICE HOUSES.—E. H. B.
ANSWERS TO CORRESPONDENTS.—L. N. L.—M. B.—W. H. R.—H. A. W.—S. C.—A. S. A.
QUERIES.—C. H.—J. C. P.—G. G.—J. E. R.—G. S.—E. R.—L. F. B.—N. S.—J. N. J.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

ADVERTISING ALBUMS.—William S. Gavan, of Savannah, Ga.—This invention relates to a new construction of a book for receiving pictorial decorations and advertisements, and has for its object to permit the cards, sheets, or pictures to be properly embedded in the leaves of the book, and to make said leaves strong and durable at the edges. The invention consists in making the leaves of blotting paper sufficiently soft to enable the cards to be embedded, and in binding the edges of the leaves with thin sheet metal, which is fastened in place by sewing.

DENTAL FORCEPS.—Leonard George Haskins, of Newport, N. Y.—This is an improvement which consists mainly in reversible jaws, constructed and arranged to operate in combination with the handles of dental forceps. By making the jaws thus detachable and reversible, a single pair may be adapted to most dental purposes; but a variety of jaws suited for all the purposes for which dental forceps are used may be fitted and made reversible in a single pair of handles.

WATERING DEVICE FOR RAILROADS.—Danforth Cheney, of Brookfield, Miss.—This invention relates to a new water crane for supplying locomotives on railroad tracks, and consists in a novel arrangement of parts whereby the discharge pipe is double jointed and extensible. The crane is to be set up between two tracks, and can be swung to either side to be used. The invention consists in a new construction of universal joint for the weighted discharge pipe, and in a new manner of making said pipe extensible, and packing the joint; also, in a new general combination of parts, calculated to render the crane more convenient in use than others hitherto employed.

PAPER FOR PACKING.—Albert L. Jones, of New York city.—The object of this invention is to provide means for securely packing vials and bottles with a single thickness of the packing material between the surfaces of the articles packed. It consists in paper, card board, or other suitable material corrugated, crimped, or bossed, so as to present an elastic surface by reason of such corrugated, crimped, or bossed surface, which is a protection to the vial, and more effective to prevent breaking than many thicknesses of the same material would be if in a smooth state like ordinary packing paper. Instead of wrapping the vials or bottles with the corrugated material, the latter may be made into packing boxes, so that the vial or bottle may be surrounded by the same elastic surface. This packing may be used to advantage for various purposes, and any material or substance, besides paper and past board, which can be corrugated for this purpose, may be used.

ROTARY ENGINE.—Truckson S. La France, of Elmira, N. Y.—This invention consists in an improved arrangement of packing for rotary engines, in which a pair of toothed wheels meshing with each other is employed, the packing being a concave plate for each wheel set into the case to act against the ends of the teeth and prevent the escape of steam from the receiving port over the teeth, the said pieces being arranged to be held against the said teeth by the elastic pressure of steam or springs.

APPARATUS FOR DISTILLING SPIRITS.—Gott-hard Kleiner, of Georgetown, Mo.—This invention relates to a new and important improvement in apparatus for distilling alcoholic liquors; and consists in a series of chambers, analyzers, and condensers, with the parts connected therewith and attached thereto arranged to operate as described, for which the inventor claims advantages as follows: "First, I can make stronger by first distillation than by the ordinary apparatus. Second, I therefore save much cooperage, which is expensive. Third, I further save a large amount of warehousing, which is a heavy item. Fourth, I further save, daily, gaugers' fees and warehouse stamps. Fifth, I am not troubled with low wines, which would require tubs, pumps, etc. Sixth, I can distil twice as much beer in the same time as by the ordinary method. Seventh, there will only one meter be needed, which also is a great saving. Eighth, I save money in handling a less number of barrels than would be required for a lower proof spirit. Ninth, I thus save freight in shipping. Tenth, it will be a benefit to the government, as more spirits can be manufactured. Eleventh, I can sell my spirits at the same price as other distillers can and make greater profits. Twelfth, it is much easier and pleasanter for the distillers to work this improved apparatus than the old.'

WASHING MACHINE.—James F. Cheesebro, of Trenton, N. J.—This machine is of the class in which a dasher is made to rotate vertically several times in one direction and then reverse its motion. The inventor claims great results, by his arrangement of the several parts of the machine, which are covered by four claims.

MANUFACTURE OF BARN FORKS.—Calvin T. Beebe, of Jackson, Mich., assignor of one half his right to Elihu Cooley, of same place.—The object of this invention is to produce a four tined hay fork from a suitable piece of steel, so that the fork shall have a solid shank and the tines be arranged so as to render the barn fork more convenient and more durable than it has hitherto been.

MACHINE FOR SAWING MARBLE DIAGONALLY.—Henry S. Gillette, New Preston, Conn.—This is an improvement in that class of marble sawing machines which created such a sensation among inventors several years ago by a reward of $10,000, offered by a Vermont quarryman, for a machine for accomplishing what this is alleged to perform, namely, the sawing of a block of stone or marble on both sides at once, the cuttings being oblique or parallel to each other as may be desired, each saw being independent of the other in its adjustment.

PISTON FOR PRINTING PRESS.—Calvert B. Cottrell, Westerly, R. I.—This invention consists in improving the construction of pistons which are reciprocated in cylinders, and employed to form air cushions to arrest, at each movement, the reciprocating table of a printing press bed. The object is to prevent stoppage by paper getting between the piston and cylinder, and to allow the piston to be wholly withdrawn from the cylinder, and yet readily re-entered. Thus it will be easily relieved of any obstruction. A flexible packing is clamped between disks and expanded by a flat spring coiled around one of the disks, the flat spring being controlled by the spring pins and auxiliary springs, combined and applied together as and for the purpose set forth.

SASH HOLDER.—Thomas R. Hubbard and William L. Hubbard, Brooklyn, N. Y.—To a screw plate, of rectangular or oblong form, designed to be secured to the window frame or casing, a hollow cylinder or tubular socket is attached, in a diagonal position. This cylinder is closed at its upper end, open at its lower end, and provided with a straight, longitudinal slot, which permits the application of the finger to move the ball upward out of contact with the sash when it is desired to lower the latter, and is yet sufficiently narrow to prevent escape of the ball. The lower end of the cylinder being cut diagonally or straight with the screw plate, the lower side thereof forms a rest for the ball when allowed to come into frictional contact with the sash, which, in turn, serves to prevent the escape of the ball from the socket so that, while the sash may be raised at any time without hindrance from the ball, it cannot be lowered until the ball be moved upward in the socket.

CLAMP FOR HOLDING TIMBER.—Peter Scholl, Cashtown, Pa.—This invention is a new and convenient device for holding timber to be sawed, tenoned, hewed, or otherwise shaped or prepared for use in fences or other purposes; it consists in the arrangement of a hinged jaw on a fixed post, and in the connection therewith of a lever for setting the jaw.

CHIMES FOR REED AND PIPE ORGANS.—Carl Lehnert, Boston, Mass.—This invention consists in having the steel bars or plates used for chimes in pipe and reed organs and other instruments flanged at each edge to improve and strengthen the tones of said plates, which have heretofore been only used in plane flat form.

PROPULSION OF CANAL BOAT.—Thomas James Burke, Virginia, Ill.—This invention is an improvement in the class of canal boats propelled by apparatus consisting of endless chains carrying vertical buckets, and running from end to end over the deck and under the bottom. The improvement pertains particularly to the means of imparting motion to such propelling apparatus; and to this end consists in the arrangement of a pair of rollers and chains thereon (the latter being provided with projections), in relation to the bucket chains. It is claimed to constitute a very simple, durable, strong, and efficient mechanism.

PITMAN CONNECTION FOR HARVESTER.—Amos Ketchum, Estherville, Iowa.—The object of this invention is to provide a pitman connection for harvesters and other machinery which will be positive in its action and cannot work loose. The crank pitman is provided with prongs and pointed screws at one end, and a bolt and tube at the other, combined with the sickle bar and crank wheel, all being constructed and arranged so as to operate in the positive manner claimed.

COMBINED FRICTION AND RATCHET CLUTCH.—Abijah Whitney Hall, Northfield, Vt.—The inner surface of the projecting rim of a pulley is made slightly conical to receive the slightly conical face of the head of a clutch. The clutch is connected with the shaft by a tongue and groove, so that it may be moved longitudinally upon the shaft; but both clutch and shaft must revolve together. The outer end of the clutch is grooved to receive the end of the lever by which it is moved. To the inner surface of the outer edge of the projecting rim of the pulley are attached two (more or less) lugs or ratchet teeth, upon which an equal number of lugs or ratchet teeth, formed upon the outer side of the head of the clutch, take hold.

HASP LOCK FOR CAR.—William D. Heister, Newton Hamilton, Pa.—This invention relates to the manufacture of car locks in which, by a combination of circular and vibrating tumblers, the lock is claimed to be made very safe, so that it cannot be opened by the ordinary fraudulent means.

BEE HIVE.—Wriley W. Dodson and John B. Bray, of Lynnville, Tenn.—The object of this invention is to simplify the construction of bee hives, and while adapting them to the habits of the honey bee, and rendering them convenient for the management of the bees, to greatly reduce cost in labor and material. This hive is very simple in all its parts, and may be constructed at slight expense by any one acquainted with the use of joiners' tools. The principal feature of the invention is a peculiar lever platform applied to a bee hive, for the purpose specified.

VAULT COVER LOCK.—Andrew Richardson, New Brunswick, N. J.—This invention consists in the application to a vault cover or trap door, or any like cover or top requiring to be fastened on the outside, of an automatically locking catch adapted to be locked by gravity when the cover or door is let down. The improved automatic fastenings or locks are more especially designed for locking the coal vault covers in sidewalks, and the trap doors on the roofs of houses. To the lower side of the round cover of the hole in the permanent cover, near one edge, is pivoted a T catch, so that one end will swing under a flange of the permanent cover, or other permanent stop to lock the round cover. To prevent it from tilting and swinging, a swinging locking catch, with a notch, is arranged to engage the arm of the T catch, as soon as said catch comes to a vertical position. This locking catch takes effect by the action of gravity, which maintains it in the locked condition, and makes it impossible to raise the cover at the upper side until the catch is lifted off by hand. This simple contrivance is less expensive than the chains commonly used, besides being altogether better.

BOLT AND NUT THREADING MACHINE.—Frank S. Allen and Charles F. Ritchel, of New York city.—By this arrangement of two sets of cutters or taps, two movable frames and holders, and the screws for operating the sliding frames, the capacity of the machine is doubled as compared with a machine having cutters or taps at one end only. The number of tools that may be used in each gang is almost unlimited; hence, by the employment of serial crank mechanisms and duplicate gangs of tools, this machine is calculated to greatly reduce the cost of this kind of work. It is immaterial whether taps are used with one gang of shafts and cutters with the other, or all taps or cutters; but, for providing threaded nuts to match the bolts, the machine is adapted for cutting bolts at one end and nuts at the other.

SASH HOLDER.—Raphael Morris Seldis, of New York city, assignor to himself and John H. Trusty, of same place; assignors to John H. Trusty.—This invention pertains to improvements in the class of window sash holders, wherein friction rollers are employed in connection with corrugated or notched plates, applied to the window frame. The invention consists in an arrangement of rubber rollers and corrugated metal strips in the window frame.

CHURN.—Wesley Fritts, of Flanders, New Jersey.—This invention relates to a new churn power, intended to reduce the labor of churning, by permitting it to be performed in a most convenient position of the operator. The invention consists principally in the combination of a vibrating frame, which is worked by the hands and feet of the operator, with a pitman and crank shaft, the operator being seated while at work.

COW BELL STRAP.—Joseph H. Hughs and Absalom Hughs, of Wautoma, Wis.—This invention relates to improvements in the construction of metal straps for suspending cowbells from the necks of animals; and it consists in making an elliptically shaped strap of two pieces of thin metal, bent into a semi-elliptical form, and joined at the inner axis by hanging one end of each and connecting the other ends, by a staple on one passing through a slot on the other

HORSE HAY RAKE.—J. George Lockwood, of West Davenport, N. Y.—This invention has for its object to furnish an improved device for raising the rake teeth from the ground to discharge the collected hay, and which may also be used for holding the rake teeth to the ground while collecting the hay; and it consists in the construction and combination of the various parts of the device with the parts of the rake, so that the driver, by pressing a crank forward with his foot, forces a crank arm up against the end of an arm, which thus holds the rake teeth down to the ground. By pressing the crank to the rearward with his foot, he raises the rake teeth from the ground as the machine is drawn forward and discharges the collected hay.

JAPANNED FURNITURE SPRING.—J. Joseph Eagleton, of New York city, Sarah N. Eagleton, administratrix, assignor to Eagleton Manufacturing Company, of same place.—The helical springs heretofore employed for furniture seats, mattresses, etc., have generally been made of iron wire, brass or copper; but steel wire, although a far superior material for such springs, has not been commonly employed, owing to the lack of means of protection from corrosion, and the difficulty in imparting to them the necessary stiffness or temper. The object of this invention is to produce steel furniture springs protected from corrosion, and suitably tempered and stiffened. A suitable quantity of steel wire, of the size of which the spring is to be made, is wound upon blocks in the usual manner, giving the wound spring the ordinary pressing or set. A suitable bath contains the ordinary preparation of japan varnish, in which the springs are placed, so as to cover them with the japan. They are then removed and strung on wires or put on pegs to drain, after which they are placed in a baking oven of the ordinary kind, suitable for the baking of japanned articles, in which oven the springs are subjected to a temperature sufficient to bake and harden the japan; after which the springs are removed from the oven and allowed to cool, when they are ready for use. The inventor claims that springs, thus prepared, are strengthened or stiffened, the application of heat to the springs in the oven having the apparent effect to temper the steel of which they are composed, making the springs stronger and more elastic.

COTTON PLANTER.—Henry A. Ridley, of Jacksonport, Ark.—This is an improved machine for planting cotton seed, dropping the seed regularly and uniformly and covering it to any desired depth. This invention consists in a bottomless hopper provided with notches on the lower edge of rear side, combined with a revolving cylinder serving as bottom of hopper, and provided with spirally arranged pins to produce an unbroken and continuous delivery of seed into the spout.

COTTON CHOPPER.—Ashley G. Powell, of Smithfield, N. C.—This invention relates to means for chopping or cutting out from the rows of cotton a portion of the plants, leaving such as it is desired to bring to maturity; also means for destroying weeds and raking them, as well as the destroyed cotton plants, from the soil. It consists in a combination of devices by which as the machine moves forward, the knife is given a vibrating motion in a direction at right angles with the advance motion of the machine. The knife strikes into the soil at each vibration, having much the action of a hoe used by hand, cutting out at each stroke a certain width in the row of plants at uniform intervals.

MECHANICAL MOVEMENT.—Alexander Wallace, Jacksonville, Fla.—This invention is an ingenious and beautifully working device for avoiding dead centers in the crank movement. The principle of action seems so mathematically correct and so mechanically effective that the only wonder is why it was not discovered before.

COMBINED TOOL.—John W. Currier, Newbury, Vt.—This invention consists of the combination in one instrument of the following tools, viz: A belt or eyelet punch, can opener, pipe tongs, pliers, screw driver, nail puller, wire cutting device, and wrenches.

PROPULSION OF VESSELS.—Charles Mickle, of Guelph, Canada.—The object of this invention is intended to overcome some of the objections to the ordinary side wheels of steamboats, as well as to provide efficient means for propelling canal boats without creating such an agitation of the water as to wash the banks of the canal. It consists in applying reciprocating reversible floats for that purpose either on the sides or beneath the stern, bow, or keel, the construction and arrangement being quite unique. In applying the improvement to a canal boat, the floats may be made to work through a well hole in the bottom of the boat, and the arrangement may be such that the floats may be raised and lowered, or adjusted, according to the depth of water or draft of the boat. The floats are, of course, intended to be submerged, and it is believed that they will work without producing such an agitation on the surface of the water as will wash the banks of a canal or be in any way objectionable. The floats may probably be made to work at the stern of a a canal boat to the best advantage, either through a well hole or beneath the bottom.

FEED DEVICE FOR HULLING MACHINE.—David Kahnweiler, of New York city.—Letters patent of the United States bearing date of March 29, 1870, were issued to this inventor for an improved hulling machine. Such a machine is adapted for use in the manufacture of cotton seed oil, for which purpose it was designed; but its construction is too complicated, and the adjustment of the cutting knives is too difficult for farm or plantation use. The object in the present invention has been to simplify the construction of the machine so that it would be managed, and the knives be adjusted, by laborers of ordinary intelligence, while greatly lessening the cost.

STEAM BOILER FLOAT VALVE.—John Peters, of Haverstraw, N. Y.—The object of this invention is to produce a simple and positively acting valve arrangement within a steam boiler for giving notice when the water is too high or too low. The invention consists in the arrangement of a screw valve connected with a float or weight in such manner that the up and down motion of the latter will turn, and thereby longitudinally adjust the valve.

ELEVATOR.—Henry S. Stewart, of Yreka, Cal.—This invention has for its object to furnish an improved elevator, so constructed that the buckets will discharge their contents centrally or close to the upper driving shaft, thus especially adapting it for raising water, dirt, and other substances in mines and other confined situations, and which may be conveniently taken apart for slackening or tightening the endless chains, detaching buckets, transportation, or other purposes. This construction allows any of the links to be taken out when desired, with their attached buckets, or the chains to be parted for transportation or other purposes. The construction of the buckets causes them to discharge their contents before they have quite reached the tops of the upper chain wheels instead of after they have come to the top, so that the spout, to receive and carry off the substance raised, may be placed within the upper part of the chains.

CHURN DASHER.—Andrew T. Still, of Baldwin, Kan City.—This is an improved dasher so constructed as, it is claimed, to bring the butter in a very short time, and with a comparatively small amount of labor, and which will keep the milk thoroughly mixed with air while being churned. With this adjustment, as the dasher is revolved, the milk will be forced through tubes, and will be projected upwards by the inclination of the tubes, and at the same time projected outwards by the centrifugal force engendered by the revolution of the dasher, so as to dash against the sides of the churn, thus throwing the milk into violent agitation, thoroughly mixing it with the air, and bringing the butter in a very short time.

PORTABLE FIRE ESCAPE.—George D. McCullen, of New Orleans, La.—This invention has for its object to furnish an improved fire escape, for the removal of women, children, and other feeble and timid persons from the burning buildings, so constructed that it may be conveniently kept in the house and moved from place to place with the same facility as any other piece of furniture. A box is made of such a size as to receive the car or chair. The box should be mounted upon casters so that it may be conveniently moved from one part of the room to another, and should be weighted or ballasted with lead, iron, or other heavy material to hold it securely in place when in use. The cover of the box is firmly hinged at one of its end edges, and is turned back to project from a window and rest upon the lower part of the window frame when the apparatus is to be used. The cover has rollers attached to the outer and inner parts of its under side for the lowering and hoisting rope to pass over. A roller is attached to the box to receive the said rope. The car is made of such a size as to receive one or more persons, and with its front, sides, bottom, and the lower part of its rear inclosed, the top and upper part of its rear being left open. The interior of the car or chair is provided with a seat for the convenience of the person or persons being lowered, and may also be provided with one or more short staves, finished like a boat hook, to enable the person or persons to push the car or chair back from the wall while being lowered. The rear edge of the sides of the car or chair are also recessed for convenience in passing over cornices, the edges of awnings, etc. The whole is lowered by a system of wheels and axles with a rope or chain.

SECTIONAL STEAM GENERATOR.—Dewitt C. Howell, of Goshen, N. Y.—The generating tubes are arranged in tiers in an inclined position, so that they cross each other. There may be more or less in number of these tiers, and more or less tubes, of any desired length and diameter. The tubes of each tier may be placed, as regards each other, nearer together or further apart, as may be deemed best. The heads or tube sheets are made in sections, so that the generator may be made wider and more capacious, or smaller, as may be required. Return chambers (above the two lower chambers) receive the water from two tiers of tubes, which conduct the water in opposite directions. These chambers are attached to the heads by means of bolts or screws, and are packed or fitted to a steam joint with the heads. The feed water is pumped into one or both of the two lower chambers, and is forced up through the different tiers of tubes; but the water which starts from the chambers of one head is returned to the lower chamber of the other head by means of the return tubes. The steam generated is discharged into two upper chambers through two upper tiers of superheating tubes, and finds its way into the steam drum. Diaphragms are placed between the tiers of tubes for controlling and regulating the passage of the products of combustion. There are vertical partitions in the steam drum against which the currents of steam or steam and water (in case of foaming) impinge as they are discharged into the drum. Any water which may be carried over through the pipes will, on striking the partitions, fall by its own gravity and settle in the bottom of the drum. A pipe may extend from the bottom of the drum and connect with the feed water pipe for conducting off this water. There is an outside vertical tube connecting with the steam and water spaces of the generator, so that the water therein will not be materially affected by the motion of the water in the generating tubes. The gage cock is placed this tube. The front end of the generator is stationary, and fixed in position by front arch plates.

TRUNK LID SUPPORT.—George H. Johnson and Fred. Bottner, of Bridgeport, Conn.—The object of this invention is to provide suitable and convenient means for supporting the lids or covers of trunks, chests, and boxes; and it consists in a hinged rod and guide plate for supporting the cover. The rod and the guide plate are let into the end of the trunk and the cover, so that they form no obstruction to tightly closing the trunk. When the cover is raised, the rod forms a brace which holds in both directions. To lower the cover it is simply necessary to raise the ends of the rod or rods from the recesses, when, as the cover closes, the ends of the rods slide in or on the guides and are brought down parallel with the top of the trunk.

AMALGAMATING ORES.—John Tunbridge, of Newark, N. J.—Two vessels are connected by a pipe and provided with screens at different altitudes. The ore pipe has a check valve, connected with a vertical discharge pipe having a cock. One of the two vessels is filled to the connecting pipe, or nearly so, with quicksilver, while balls of granulated amalgam, or some composition for the same purpose, are placed upon the sieves in the other vessel. The mode of operation is as follows: Power is employed in connection with the ore pipe to force the ore washings through it, the check valve opening inward and yielding to any force exerted through said pipe. The washings then pass up through the quicksilver in the first vessel, and are subdivided in passing through the screens; they are then forced through the connecting pipe into the second vessel and pass down through the amalgam balls and screens, and are discharged. The effect produced upon the ore is to abstract the principal part of the metal in the first chamber and the greater part of the residue while passing through the amalgam balls.

Inventions Patented in England by Americans.

From December 6 to December 11, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

BOOT SEWING MACHINE.—L. R. Blake, Fort Wayne, Ind.
CENTRIFUGAL DRYING MACHINE.—H. W. and R. Lafferty, Gloucester, N. J.
FIRE ESCAPE.—G. D. McCullen, New Orleans, La.
PREPARING GRAIN.—L. S. and C. F. Chichester, Brooklyn, N. Y.
ROTARY STEAM ENGINE.—M. Schwartz, Bangor, Maine.
SEWING MACHINE.—S. W. Wardwell, Jr., St. Louis, Mo.
WIRE WORK.—S. Colt, Hartford, Conn.

Foreign Patents.

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, *free* of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Re-issues.

A re-issue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co. 37 Park Row, for full particulars.

Trademarks.

Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row New York.

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto-relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Rejected Cases.

Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate Address MUNN & Co., stating particulars.

European Patents.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels Berlin, and other chief cities. A pamphlet pertaining to foreign patents and the cost of procuring patents in all countries, sent free.

MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an *honest opinion*. For such consultations, opinion, and advice, *no charge is made*. Write plain; do not use pencil, nor pale ink; be brief.

All business committed to our care, and all consultations, are kept secret *and strictly confidential*.

In all matters pertaining to patents, such as conducting interferences procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice,

Address

MUNN & CO.,

PUBLISHERS SCIENTIFIC AMERICAN,

37 Park Row, New York.

OFFICE IN WASHINGTON—**Corner F and 7th streets,** opposite Patent Office.

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted

FOR THE WEEK ENDING JANUARY 2, 1872, AND EACH BEARING THAT DATE.

Alloy for preventing friction, W. H. Saunders..... 122,408
Axle skein, H. C. Kochensperger..... 122,391
Bed bottom, spring, G. Lightfoot..... 122,325
Bedstead fastening, H. Gross..... 122,457
Bell chime, alarm and other, G. R. Meneely..... 122,397
Bell tightener, Albertson and Marmon..... 122,345
Boat, canal, C. W. Hermance..... 122,463
Boat, canal, E. C. Bancroft..... 122,351
Boat, propelling canal, G. A. Beidler..... 122,429
Boiler, culinary, R. Russell..... 122,407
Boilers, fire extinguisher for steam, W. E. Prall..... 122,489
Bolt and nut machine, J. N. Smith..... 122,411
Bolts, machine for heading, C. E. Hunter..... 122,385
Boot and shoe heels, machine for finishing, etc., G. C. Hawkins..... 122,462
Boring machine, Z. C. Phillips..... 122,402
Bottle siphon, T. Pimer..... 122,403
Bridle bit, N. Hayward..... 122,383
Brush, A. M. White, (reissue)..... 4,701
Brush, whitewash and paste, J. S. White..... 122,421
Buckle, N. D. Fowler..... 122,315
Buildings from fire, protecting, W. D. Baker..... 122,350
Burner, Argand gas, H. W. Hayden..... 122,382
Cages, mat for bird, O. Lindemann..... 122,472
Can, fruit, J. Grimes..... 122,455
Cans, apparatus for soldering tin, J. F. Merrill..... 122,477
Car brake, A. A. Weidemeyer..... 122,419
Car coupling, G. Worden..... 122,509
Car coupling, W. Williams..... 122,424
Car coupling, R. B. Morris..... 122,480
Car coupling, M. G. Farnam..... 122,375
Car coupling, Allen and Boyles..... 122,304
Car coupling, A. H. S. Davis..... 122,368
Car strap, H. S. Vrooman..... 122,417
Car wheel, F. W. Townrow..... 122,340
Car wheel, J. Raddin, (reissue)..... 4,702
Carpet lining, machine for making, J. R. Harrington..... 122,381
Carriage hub and axle, L. D. Cook..... 122,363
Carriage wheels, hub for, J. Kritch..... 122,322, 122,323
Carriage spring clip and plate, H. M. Beecher..... 122,428
Carriages, adjustable umbrella holder for, W. C. Doolittle..... 122,370
Cartridge, C. S. Wells..... 122,504
Cartridge, metallic, I. M. Milbank..... 112,399
Cheese hoop, E. Hodgkins..... 122,464
Churn dasher, rotary, H. L. Wells..... 122,505
Clothes drier, J. S. Gray..... 122,378
Clothes line fastener, M. McManus..... 122,476
Coal from sunken vessels, apparatus for raising, R. W. Dugan..... 122,309
Coffee, process of cleaning, W. H. Butler..... 122,306
Collar machine, paper, C. H. Denison..... 122,444
Column, iron, W. A. Gunn..... 122,379
Cop tube and machine, J. E. Coffin..... 122,362
Cultivator, O. L. Neisler..... 122,400
Cultivator, wheel, N. Earlywine..... 122,373
Curtain fixtures, C. Buckley..... 122,356
Derrick, double, A. M. Tomb..... 122,416
Diseases, vacuum apparatus for treating, S. Pasco..... 122,486
Dredge, ball, N. A. Williams..... 122,423
Drill, power rock, Walts and Mills..... 122,342
Drinks from fruits, manufacture of effervescent, A. Meucci..... 122,478
Dovetailing, machine for, Knapp and Clement..... 122,390
Ear ring, L. L. Northup..... 122,528
Electricity, apparatus for lighting gas by, W. Klinkerfues..... 122,389
Electro magnetic separator, A. Ross..... 122,493
Electro magnetic apparatus, S. Chester..... 122,437
Excavator, G. W. Williams..... 122,344
Extracts from dyewoods, apparatus for obtaining, I. B. Kirby..... 122,467
Eyeleting machine, O. G. Critchett..... 122,366
Fastener, sash, J. Andrews..... 122,348
File, paper, J. W. Foard..... 122,314
Fire place, J. Smith..... 122,410
Fire arms, breech loading, B. B. Hotchkiss..... 122,465
Fire arms, breech loading, J. Lee..... 122,470
Fuel, artificial, F. C. Epting..... 122,447
Furnace, metallurgic, Hamilton and McDonald..... 122,380
Furnace for steam generators, W. F. Cox..... 122,365
Furnaces, damper for hot air, A. H. Mershon, (reissue)..... 4,695
Gas generator, C. A. Stevens..... 122,499
Gas generating apparatus, Z. S. Durfee..... 122,311
Gin saw teeth, machine for punching and swaging cotton, J. M. Clough 122,307
Glove, A. J. Stevens..... 122,415
Grain cleaner and separator, G. S. Carter..... 122,436
Grain scourer and cleaner, A. B. Paige..... 122,330
Grate bar, H. Hartwig..... 122,460
Harvester, A. M. Ross..... 122,492
Harvester, H. C. Velie..... 122,501
Harvester, T. H. Dodge..... 122,445
Harvester, J. Bordwell..... 122,452
Hay tedder and rake, S. Perry..... 122,487
Heater for railroad cars, steam, Mabie, Whitcomb, and Brown..... 122,326
Heater and purifier, water, P. Almy..... 122,346
Hose coupling, Kennedy, Putnam, and Smith..... 122,388
Hose pipe, self packing patch for, J. B. Button..... 122,435
Hubs to axles, attaching, W. L. Williams..... 122,506
Huller, cotton seed, Trott, Torbett, and Pomeroy..... 122,341
Husker, hand corn, A. W. Brinkerhoff, (reissue)..... 4,687
Ingots, casting, Z. S. Durfee..... 122,310
Iron and steel, manufacture of, Z. S. Durfee..... 122,312
Jack, horse power, S. Perry..... 122,488
Lamp for streets, etc., T. A. Skelton..... 122,409
Last, J. C. Toot..... 122,338
Lead, etc., apparatus for drying white, J. B. Pollock..... 122,404
Leather, machine for dressing, C. A. McDonald..... 122,395
Lock, J. Sargent, (reissue)..... 4,696
Lock, permutation, I. H. Gano..... 122,452
Lock, seal, F. C. Hamilton..... 122,459
Lock for pipe coupling, G. A. McIlhenny..... 122,396
Lounge, bed, F. H. Lamb..... 122,469
Lubricating axle for vehicles, J. S. Eggleston..... 122,374
Lubricator, W. A. Clark..... 122,361
Lubricator, Barnett and Eckford..... 122,427
Lubricator, car axle, J. S. Sanson..... 122,495
Mechanical movement, A. Wallace..... 122,503
Mechanical movement for operating throttle valves, E. Nicholson,. 122,484
Medical compound, J. C. Wills..... 122,507
Medical purposes, rubbing apparatus for, G. H. Taylor..... 122,500
Metallic bars, mode of strengthening, etc., C. F. Hawley, (reissue).. 4,694
Mill, cider, D. T. Willson..... 122,508
Mill, mixing, W. Martien..... 122,393
Millstone, balancing, S. Culver..... 122,367
Millstone dress, E. Deer..... 122,369
Molding machine, wood, N. Jenkins..... 122,321
Motion, apparatus for transmitting, Merhoff and Healy..... 122,398
Nail button, E. Kolben..... 122,468
Nail cutting machine, T. M. Laurence..... 122,324
Oils, treating vegetable, R. T. Clark..... 122,439
Paper pulp from wood, apparatus for manufacture of, J. Bridge..... 122,353
Paring machine, fruit, A. G. Batchelder..... 122,305
Pavement, combination, Filbert and Taylor..... 122,448
Pavement, concrete, W. H. Smith..... 122,497
Pavement, wood, L. Caldwell..... 122,358
Pavements etc., manufacture of concrete, W. H. Smith..... 122,498
Piano pedal stool, J. H. Wells..... 122,345
Pin, shawl or other dress, H. C. Strong..... 122,336
Pipe or tubing, metallic, P. Naylor..... 122,482
Piane, bench, C. E. Torrance..... 122,339
Planter, seed, T. Snow..... 122,412
Plow, wheel, W. G. Crossley..... 122,442
Poke, animal, S. C. Leonard..... 122,392
Portfolio, G. Harvey..... 122,461
Press, baling, J. Randolph..... 122,406
Press, cotton, J. H. Groves..... 122,458
Press, cotton and hay, J. L. Nelson..... 122,483
Pump, J. H. McGowan..... 122,475
Rack, hay, W. P. Jones..... 122,387
Railway switch, Masterman and Jackson..... 122,327
Railway switch, operating, Hickman and Stauffer..... 122,319
Rein, check, R. B. Robbins..... 122,491
Roaster, coffee, C. C. Butt..... 122,357
Roaster for nuts, D. T. Gale, (reissue)..... 4,689
Roofing, M. J. Earl..... 122,372
Saddletree, harness, Tompkins and Maclure, (reissue)..... 4,699
Sash holder, C. C. Shepherd..... 122,496
Saw, J. Ruther..... 122,320
Saw mill, circular, Etches and Wilson..... 122,313
Scraper, dirt, H. Warren..... 122,502
Screen, window, A. B. Magoun, (reissue)..... 4,698
Sewing machine, hemmer for, J. V. D. Eldredge (reissue)..... 4,693
Sewing machines, feeding mechanism for, N. S. C. Perkins..... 122,401
Sewing machines, treadle for, J. H. Whitney..... 122,422
Sewing machines, needle setter for, W. Raeuchle..... 122,490
Sewing machines, tuck creaser for, W. E. Barnum..... 122,352
Shaft coupling, M. L. Andrew..... 122,426
Shears, F. Schoettle..... 122,333
Shear and bolt cutter, combined, G. A. Howe..... 122,466
Shoe soles, etc., machine for nailing, L. Goddu..... 122,377
Signal for railway cars, breakage, S. Jackson..... 122,386
Skate, roller, J. H. Fenton..... 122,376
Sleigh runners to vehicles, mode of attaching, A. Gregg..... 122,454
Smut machines and hullers, scouring case, N. C. Page..... 122,329
Sower, broadcast, Price, Johnson, Truman, and Hamilton..... 122,405
Spinning rings, holder for, S. S. Shorey..... 122,335
Spinning, self-acting jack for, W. H. Brothers, (reissue)..... 4,688
Spring, door, F. Gardner..... 121,316
Stalk cutter and cultivator, combined corn, S. T. Miller..... 122,479
Stand, cabinet wash, N. H. Thomason..... 122,337
Steam generator, J. B. Root, (reissue)..... 4,690
Steam generator, base burning, A Catchpole..... 125,360
Steel for tools, cutlery, etc., manufacture of, T. Brooks, (reissue).... 4,692
Stove, cooking, C. Gage..... 122,451
Stove, heating, J. W. O. Webb..... 122,418
Stove, heating, P. Brecher..... 122,433
Sugar, manufacture of, Drummond and Hunt..... 122,371
Telegraph apparatus, G. Little..... 122,474
Telegraph instrument, automatic, G. Little..... 122,475
Thrashing machine, G. Westinghouse..... 122,420
Thrashing machine, L. Bronson..... 122,354
Thrashing and separating machine, sieve for, T. Nicholson..... 122,485
Tongs, pipe, W. H. Downing..... 122,308
Tool, combined, J. W. Currier..... 122,443
Toy, Hall, Ritchel, and Lovd..... 122,317
Trace carrier for harness, E. A. Cooper..... 122,364
Track lifter, J. Morton..... 122,481
Trap, mouse, G. L. Hart..... 122,318
Truck, hand, B. W. Tuthill, (reissue)..... 4,700
Truss, J. A. Sherman, (reissue)..... 4,697
Tweer, S. Williamson, (reissue)..... 4,691
Tweer, T. Birch..... 122,430
Umbrella and parasol, G. H. Gossip..... 122,453
Valve, stop, E. Russell..... 122,494
Valve, balanced slide, J. Chris iansen..... 122,438
Valve, steam and air, T. H. Dodge..... 122,446
Vehicles, spoke and wheel for, W. A. Lewis..... 122,471
Vehicles, mode of attaching sleigh runners to, A. Gregg..... 122,454
Vessels, apparatus for raising coal from sunken, R. W. Dugan..... 122,309
Wagon wheel, C. Anderegg..... 122,347
Wagon pole, device for steadying, R. A. Seaders..... 122,334
Wagons, king bolt protector, anti-rattling attachment to, H. L. Taylor, 122,415
Washing machine, A. Paine..... 122,331
Washing machine, C. B. Broadwell..... 122,434
Washing machine, L. I. Bodenhamer..... 122,431
Washing and wringing machine, combined, S. Conklin..... 122,441
Watches, mainspring attachment for, Taxis and James..... 122,414
Water conductor, J. W. Brown..... 122,355
Water wheel, J. M. Case..... 122,359
Water etc., cooler for, G. A. Higgins..... 122,384
Water elevator, steam, G. B. Roe..... 122,332
Wells, sand pump and reel for artesian, J. A. Fleming..... 122,449
Wheel, fifth, R. D. Wilson..... 122,425
Wheel and pulley, W. D. Grimshaw..... 122,456
Wheels, machine for making, E. A. Archibald..... 122,349
Whiffletree, safety, A. H. McAllister..... 122,394
Winding machine, guide and cleaner for, J. Fullan..... 122,450

EXTENSIONS GRANTED.

18,882.—IMPROVEMENT IN SNOW PLOWS, granted to Newcomb Demary, Jr., December 15, 1857.

18,969.—IMPROVEMENT IN SEEDING MACHINES, granted to William Coggeshall and Bennet B. Warner, December 29, 1857.

18,872.—Reissue No. 3,133.—IMPROVEMENT IN BORING MACHINES, granted to Lafayette Stevens, December 15, 1857, and reissued September 22, 1868.

18,945.—MODE OF LIGHTING GAS BY ELECTRICITY, granted to Samuel Gardiner, Jr., December 22, 1857.

18,943.—IMPROVED METHOD OF GOVERNING THE CUT OF CIRCULAR SAWING MACHINERY, granted to A. C. Martin and William H. S. Ewell, Administrator of M. M. Wombaugh, deceased, December 22, 1857.

18,975.—Reissue No. 3,460.—IMPROVEMENT IN MOWING MACHINES, granted to Silas C. Jackson and Morgan P. Jackson, December 29, 1857; reissued May 25, 1869.

18,906.—Reissue No. 4,171.—MACHINE FOR ROLLING CORNICE, granted to Asa Johnson, December 22, 1857; reissued November 1, 1870.

DESIGNS PATENTED.

5,452.—STOVE PLATE.—Philo D. Beckwith, Dowagiac, Mich.

5,453.—HEATING STOVE.—Philo D. Beckwith, Dowagiac, Mich.

5,454.—FIRE POT OF A COAL STOVE.—Philo D. Beckwith, Dowagiac, Mich.

5,455.—BLACKBOARD.—Malcomb McVicar, Potsdam, N. Y.

5,456.—TYPE.—Richard Smith, Philadelphia, Pa., assignor to MacKellar, Smiths & Jordan, same place.

5,457.—FRAME FOR A MIRROR.—William G. Cross, Philadelphia, Pa., assignor to Hall and Garrison.

5,458.—TRIMMING.—Frederick A. Kursheedt, New York city.

5,459.—TRIMMING.—Frederick A. Kursheedt, New York city.

5,460.—TRIMMING.—Frederick A. Kursheedt, New York city.

5,461.—SHOW CASE.—William H. Reiff, Philadelphia, Pa.

TRADE MARKS REGISTERED.

608.—COFFEE POT.—John Ashcroft, Brooklyn, N.Y.

609.—PERFUMES, SOAPS, ETC.—Deniker & Melville, New York city.

610.—BOOTS AND SHOES.—Hosea B. Edgerly, Farmington, N. H.

611.—MEDICINE.—H. G. G. Fink, Pittsburgh, Pa.

612.—BIBLES.—Andrew J. Holman, Philadelphia, Pa.

613.—SHIRTS.—Miller and Brother, Philadelphia, Pa.

614.—SUBSTITUTE FOR LINSEED OIL, ETC. E. Murdock Jr., Winchendon Mass.

615.—DRESSING FOR LEATHER.—Elihu B. Palmer, Boston, Mass.

616.—GIN.—Seth E. Pecker & Co., Boston, Mass.

617.—OIL OR SOAP.—J. M. Rall & Co., St. Louis, Mo.

618.—SPICED SALMON.—Isaac Rich & Company, Boston, Mass.

619.—WROUGHT IRON GOODS.—J. Rogers, Jay and Au Sable Forks, and J. Rogers, Black Brook, N.Y.

620.—WINES AND LIQUORS.—E. Simpson & Co., New York city.

621.—ARTISTS' MATERIALS.—Charles P. Staab, New York city.

622.—PASTILLES.—Stowell & Co., Charlestown, Mass.

623.—WHEAT.—James E. Weaver, Havelock, Pa.

624.—STOVES.—William J. Keep, Troy, N.Y.

625.—STOVES.—William J. Keep, Troy, N.Y.

SCHEDULE OF PATENT FEES:

On each Caveat $10
On each Trade-Mark $25
On filing each application for a Patent, (seventeen 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 application for Extension of Patent..... $50
On granting the Extension..... $50
On filing a Disclaimer..... $10
On an application for Design (three and a half years)..... $10
On an application for Design (seven years)..... $15
On an application for Design (fourteen years)..... $30

For Copy of Claim of any Patent issued within 30 years..... $1
A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from ..... $1 upward, but usually at the price above-named.
The full Specification of any patent issued since Nov. 20, 1866 at which time the Patent Office commenced printing them..... $1.25
Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.
Full information as to price of drawings in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors. 37 Park Row, New York.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

19,119.—STEAM ENGINE.—Granted to Edward D. Barrett, January 19, 1858; reissued August 29, 1865. Hearing January 3, 1872.

19,206.—HYDRANTS.—Granted to Washburn Race and S. R. C. Mathews, January 26, 1858; reissued July 18, 1871. Hearing January 10, 1872.

19,347.—INDIA RUBBER DOOR MATS.—Granted to Edwin M. Chaffee, February 16, 1858. Hearing January 31, 1872.

19,147.—ICE CREAM FREEZERS.—Granted to H. B. Masser, January 19, 1858. Hearing January 3, 1872.

19,137.—HARVESTERS.—Granted to Ezra Emmett, January 19, 1858. Hearing January 3, 1872.

19,490.—METALLIC TIES FOR COTTON BALES.—Granted to Frederick Cook, March 2, 1858. Hearing February 14, 1872.

19,222.—SEED PLANTERS.—Granted to James D. Willoughby, January 26, 1858. Hearing January 10, 1872.

19,191.—MAKING BLADES FOR PENCIL SHARPENERS.—Granted to Walter K. Foster, January 26, 1858. Hearing January 10, 1872.

19,528.—CANE GUNS.—Granted to J. F. Thomas, February 9, 1858. Hearing January 24, 1872.

19,252.—PLATE FRAMES FOR PHOTOGRAPHIC CAMERAS.—Granted to William Lewis and William H. Lewis, February 2, 1858. Hearing January 17, 1872.

19,200.—STRAW CUTTERS.—Granted to Jacob H. Mumma, January 26, 1858; reissued September 6, 1859, March 29, 1864, and March 7, 1865. Hearing January 10, 1877.

19,465.—CARPET BEATING MACHINE.—Granted to Joseph Harris, Jr., and Daniel Holmes, February 23, 1858; reissued May 13, 1862. Hearing February 7, 1872.

19,258.—FLASKS FOR CASTING WHEELS.—Granted to Frederick Nishwitz, February 2, 1858. Hearing January 17, 1872.

19,321.—PLOWS.—Granted to George Watt, February 9, 1858; additional improvements August 2, 1859; reissued August 4, 1868. Hearing January 24, 1872.

19,696.—GRINDING ATTACHMENT TO PUG MILLS.—Granted to David R. Gage March 23, 1858. Hearing March 6, 1872.

19,318.—LAP JOINTS FOR BELTING.—Granted to Henry Underwood, February 9, 1858; reissued January 1, 1867. Hearing January 24, 1872.

19,384.—BANK CHECK CANCELER.—Granted to William M. Simpson, February 16, 1858. Hearing January 31, 1872.

19,370.—KNITTING MACHINES.—Granted to Joseph K. Kilbourn, and Edward E. Kilbourn, February 16, 1858. Hearing January 31, 1872.

19,346.—PROPELLING CANAL BOATS.—Granted to Herman Camp, February 16, 1858. Hearing January 31, 1872.

19,398.—HYDRAULIC VALVES.—Granted to Calvin Woodward and George M. Woodward, February 16, 1858. Hearing January 31, 1872.

19,377.—HARVESTERS.—Granted to Frederick Nishwitz, February 16, 1858; reissued March 5, 1861, and again reissued in two divisions April 13, 1869. Hearing January 31, 1872.

19,349.—SHINGLE MACHINES.—Granted to George Craine, February 16, 1858. Hearing January 31, 1872.

19,420.—HORSE RAKES.—Granted to William Horning, February 23, 1858. Hearing February 7, 1872.

19,462.—STRAW CUTTERS.—Granted to Thomas H. Willson and Daniel T. Willson, February 23, 1858. Hearing February 7, 1872.

19,412.—SHOVEL PLOW OR CULTIVATOR.—Granted to Paul Dennis, February 23, 1858; reissued August 4, 1863. Hearing February 7, 1872.

19,417.—COTTON GINS.—Granted to Benjamin David Gullett, February 23, 1858. Hearing February 7, 1872.

19,461.—SHOE PEG MACHINE.—Granted to Abijah Woodward, February 23, 1858. Hearing February 7, 1872.

19,555.—SPLICE FOR JOINTS OF RAILROAD RAILS.—Granted to Mark Fisher March 9, 1858. Hearing February 21, 1872.

19,979.—SEWING MACHINES.—Granted to Charles F. Bosworth, April 20, 1858. Hearing April 4, 1872.

19,487.—CONTINUOUS METALLIC LATHING.—Granted to Birdsall Cornell, March 2, 1858. Hearing February 14, 1872.

19,517.—MACHINE FOR FORMING SHEET METAL PANS.—Granted to E. A. Smead, March 2, 1858. Hearing February 14, 1872.

19,483.—HARVESTERS.—Granted to Jesse S. Butterfield, March 2, 1858; reissued in two divisions January 15, 1867. Hearing February 14, 1872.

19,572.—MACHINES FOR PACKING FLOUR.—Granted to J. Mattison, March 9, 1858. Hearing February 21, 1872.

19,610.—RAISING DOUGH.—Granted to James Perry and Elisha Fitzgerald March 9, 1858. Hearing February 21, 1872.

19,638.—COMBINED FLOATING ANCHORS AND LIFE PRESERVERS.—Granted to Joseph Humphries, March 16, 1858. Hearing February 28, 1872.

19,719.—STOP MOTION FOR HAIR CLOTH LOOMS.—Granted to Rufus J. Stafford, March 23, 1858. Hearing February 6, 1872.

19,741.—RAILROAD CAR AXLE BOXES.—Granted to R. N. Allen, March 24, 1858; reissued December 20, 1864. Hearing February 6, 1872.

19,548.—MODE OF TIGHTENING AND SECURING THE KEYS OF JOURNAL BOXES OF CONNECTING RODS OR PITMEN.—Granted to Levi Dederick, March 9, 1858. Hearing February 21, 1872.

19,619.—MACHINE FOR PLANING BLIND SLATS.—Granted to Charles Carlisle and Leonard Worcester, March 16, 1858. Hearing February 28, 1872.

20,235.—FLY NETS.—Granted to Robert Wilson, May 11, 1858. Hearing April 24, 1872.

20,238.—SASH FASTENERS.—Granted to Frederick W. Brocksieper and Joseph B. Sargent, May 11, 1858. Hearing April 24, 1872.

19,594.—VALVES FOR STEAM ENGINES.—Granted to Isaac Van Doren, March 9, 1858. Hearing February 21, 1872.

19,787.—WINDLASSES.—Granted to Joseph F. Manton, March 30, 1858. Hearing March 13, 1872.

19,806.—ROTARY CUTTERS FOR TONGUEING AND GROOVING.—Granted to James A. Wood ury, March 30, 1858. Hearing March 13, 1872.

19,667.—GRAIN SEPARATORS AND CLEANERS.—Granted to Simeon Howes and Gardner E. Throop, March 16, 1858. Hearing February 28, 1872.

19,634.—MACHINES FOR TRIMMING BOOKS.—Granted to A. C. Semple, March 16, 1858. Hearing February 28, 1872.

19,626.—PHOTOLITHOGRAPHY.—Granted to James A. Cutting and L. H. Bradford, March 16, 1858; reissued July 31, 1860. Hearing February 28, 1872.

19,663.—HOT AIR FURNACES.—Granted to John Child, March 23, 1858. Hearing March 6, 1872.

19,747.—WIRE STAPLES.—Granted to Byron Boardman, March 30, 1858; reissued March 6, 1866. Hearing March 13, 1872.

19,813.—LIGHTNING CONDUCTORS.—Granted to Oren White, March 30, 1858. Hearing March 13, 1872.

19,820.—HUBS OF CARRIAGE WHEELS.—Granted to James M. Whitney, March 30, 1858. Hearing March 13, 1872.

19,641.—SAWING MACHINES.—Granted to Henry H. Lowe, March 16, 1858. Hearing February 28, 1872.

Advertisements.

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the amplest rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page - - - - $1.00 a line,
Inside Page - - - 75 cents a line

for each insertion.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

ELGIN WATCHES.

"It is generally known that *American* Watches are, all things considered, the *best in the world*; but the public may not be aware that the *best of these*, such as are specially adapted to the use of railway men, travelers, and those to whom *absolutely accurate* time is a matter of necessity, *are made at Elgin, Ills.*"—*Forney's Weekly Press*, Philadelphia.

The Elgin Illustrated Almanac for 1872, printed with original pictures, and in a superior manner, by the Adline Press, of New York, is now ready for distribution.

Jewelers throughout the country are supplied with them, for gratuitous circulation, or copies will be sent free to any address upon application to **NATIONAL (Elgin) WATCH CO.**, West Washington St., Chicago, Ills., or No. 1 Maiden Lane, New York.

"A model periodical; a credit to American periodical literature."—*Philadelphia Press.*

THE LEADING NEWSPAPERS PRONOUNCE

THE GALAXY

The Best and Most Ably Edited American Magazine.

It can be had for $4.00 per year, or 35 cents per number.

A sample copy will be sent for 25 cents.

Each number contains as much reading matter as an ordinary $2 book.

Subscribe at Once.

In no other way can you get so much pleasure and instruction for $4.00.

SHELDON & COMPANY,
NEW YORK.

$21 for $5.25. THE ILLUSTRATED PHRENOLOGICAL JOURNAL a year, $3. THE CHRISTIAN UNION a year, $3; two fine Oil Chromos, "*Wide Awake*" and "*Fast Asleep*," mounted, worth $10; and *Marshall's Engraving of Washington*, worth $5, will all be sent for $5.25, by S. R. WELLS, 389 Broadway, New York. Local Agents wanted. N.B.—SCIENTIFIC AMERICAN, and all the above, for $7.75.

Cable SCREW WIRE
BOOTS AND SHOES
never rip or leak.

Silver TIPPED SHOES
WEAR TWICE AS LONG
as shoes without.

Sheffield Scientific School of Yale College.
☞ *Programmes sent on Application.*

PATENT TWINE CUTTER.—The patentee of the Twine Cutter illustrated on another page of this paper, desires to sell, on reasonable terms, a portion of the patent for the United States and Great Britain, or will license to manufacture on royalty. Eastern and Middle State Manufacturers will be treated with liberality, if they engage in the manufacture. It is believed to be the most convenient implement for the purpose invented. The feature of always having the end of twine at hand after cutting, ready to regrasp, is very important. For terms and further particulars, address CHAS. C. LEWIS, Gainesville, Ala.

LIGHTNING ROD POINTS AND NUTS, Metal Patterns, Taps, Dies, &c., manufactured by J. R. GILCHRIST, Mt. Pleasant, Iowa. Also, Copper, Brass, and Zinc Castings finished and plated. Point samples free to Dealers.

PATENTS BOUGHT AND SOLD.
E. H. GIBBS & CO., 11 Wall St., N.Y.

ARTIFICIAL STONE OR CEMENT PIPE MACHINERY.
Use any power you please.
J. W. STOCKWELL & CO.,
23 & 163 Danforth St., Portland, Me.

FOR SALE—100 Shares Stock in the Slifer, Walls & Shriver Mfg. Co. C. DAVIS, Lewisburg, Pa.

THE FREAR ARTIFICIAL STONE.
INCOMBUSTIBLE, AND UNSURPASSED IN DURABILITY. Upwards of 400 houses erected of it, in Chicago, Toledo, Buffalo, Elmira, New Orleans, New Haven, Albany, Brooklyn, and elsewhere. It can be sold at less than half the cost of labor on the natural material. Orders for stone received at the office of THE NEW YORK FREAR STONE CO., N.Y. Life Ins. Co. Building, Nos. 346 and 348 Broadway, corner of Leonard St., New York.

SHORT HAND. **150** words per minute in **4 weeks.** Send Stamp for circular. PROF. GRAY, P. O. Box 4,847, N. Y.

EXTRACTS & CARMINES of **INDIGO.** TAYLOR & BARKER, Manf'g Chemists, Lowell, Mass.

5000 AGENTS WANTED.—Samples sent free by mail, with terms to clear from $5 to $10 per day. Two entirely new articles, saleable as flour. Address S. H. WHITE, Newark, New Jersey.

HUNTING, Trapping, and Fishing made easy. *Best* Book; 76 pages, 50 engravings. Only 25 cts. postpaid. Send for Catalogues of Books, &c. Address C. S. RILEY, Holland, N.Y.



Reynolds'
TURBINE WATER WHEELS.
The Oldest and Newest. All others only Imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch, reliable, economical power. Beautiful pamphlet free. GEO TALLCOT, 96 Liberty st., New York.
Gearing, Shafting.

NEW INVENTIONS—NEW STYLES.

MASON & HAMLIN
Cabinet Organs.

Highest Excellence, Lowest Prices.

We introduce this season several new inventions of great value; including DAY'S TRANSPOSING KEY-BOARD, enabling every performer to transpose the key without the slightest difficulty.

Also, NEW STYLES of Cabinet Organs, in very rich and beautiful cases, at *extraordinarily low prices.*

Full particulars in circulars and ILLUSTRATED CATALOGUES, sent free to any address.

It can hardly be longer necessary to advertise the *quality* of the Mason & Hamlin's Organs, for it is scarcely disputed by any that they ARE THE BEST IN THE WORLD; the

VERY STANDARD OF EXCELLENCE

among instruments of the class.

Every purchaser may be sure that he is obtaining, in proportion to its size, capacity, style and class, the very best instrument which it is practicable to produce. We are not afraid to warrant all our work as up to even this high standard.

But while the superiority of the Mason & Hamlin Organs is established, it is not so widely known that the prices are not higher than those of ordinary instruments. We offer the largest variety in the country—one to thirteen stops—at from $50 to $1,000 each.

Every one interested should at least send for the ILLUSTRATED CATALOGUE and CIRCULARS of the Company, which COST NOTHING, being sent post-paid.

MASON & HAMLIN ORGAN CO.,
596 BROADWAY, NEW-YORK,
154 TREMONT ST., BOSTON.

SHAFTING with PATENT HANGERS
A Specialty, also Power Looms, Spooling, Winding, Beaming & Sizing Machines of latest improvements, manufactured by THOS. WOOD, 2106 Wood st., Phila., Pa.

E. M. MAYO'S BOLT CUTTER, patented in 1867, improved in 1871, is the best in use. Send for illustrated Circular. Cincinnati, Ohio.

Niagara Steam Pump
CHAS. B. HARDICK,
23 Adams st., Brooklyn, N. Y.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK,
P. O. Box 1,057 Boston, Mass.
N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

THE WOODWARD
STEAM PUMP.
Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Dealers in Wrought-iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, and Public Buildings heated by Steam, Low Pressure. Woodward Co., 76 and 78 Center st., N.Y.

MACHINERY, **NEW and 2d-HAND.**—Send for Circular. CHAS. PLACE & CO., 60 Vesey st., New York.

PORTABLE STEAM ENGINES, COMBINing the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **900** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO., Lawrence, Mass.
46 Cortlandt st. New York.

AGENTS, LOOK—$3 to $20 per day easily made—a sly and respectable business—useful article—every body wants one—success sure. Send stamp for circulars. EUREKA RUBBER TYPE CO. 615 B'dw'y, N.Y.

HINKLEY KNITTING MACHINE

The Simplest, Cheapest, and Best in use! Has but one needle! A Child can Run it. **Agents wanted in every Town.** Send for Circular and Sample Stocking, to
HINKLEY KNITTING MACH. CO., Bath, Me.

Chemical Analysis. Address Prof. J. C. DRAPER, 429 Lexington Avenue, New York City.

MODELS, PATTERNS, EXPERIMENTAL, and other machinery. Models for the Patent Office built to order by HOLSKE MACHINE CO., Nos. 528, 532, and 532 Water st., near Jefferson. Refer to SCIENTIFIC AMERICAN office. 14 tf

PATENT Emery Grinders, Twist Drills, Fluted Hand Reamers, &c., unsurpassed for elegance of design, workmanship, and durability. These indispensable Tools can be purchased of us for less than half their cost in an ordinary machine shop. Illustrated catalogue free. AMERICAN TWIST DRILL CO., Woonsocket, R. I.

1832. SCHENCK'S PATENT. 1871.
WOODWORTH PLANERS
And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y., and 118 Liberty st., New York.

LATHE CHUCKS—HORTON'S PATENT from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks Conn.

$425 A MONTH! Horse and carriage furnished. Expenses paid. H. B. SHAW, Alfred, Me

Canadian Inventors,

Under the new Patent Law can obtain patents on the same terms as citizens.

For full particulars address

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

PATENTEES,

WHO WISH TO REALIZE PECUNIARY benefit from their inventions, either by sale of the rights, or partnership with capitalists, are invited to send for our explanatory circular. Many valuable labor saving inventions are lying dormant which might realize a fortune for their owners, if brought properly before the public. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall Street, New York.

Figures will not lie!
How Large Fortunes are made!
FACTS FOR THE PEOPLE.

SEE the prices at which four of the leading Sewing Machines are sold in the UNITED STATES, and ENGLAND.

	Price in England.	In the U. S.
Wheeler & Wilson	**$45.00**	**$85.00**
New Singer - -	**32.50**	**65.00**
Elias Howe - -	**35.00**	**65.00**
Wilson Shuttle -	**40.00**	**45.00**

The above Prices are for exactly the same classes of machines as sold in both Countries. There is scarcely any difference in the cost of material and labor in any of the above named machines.

☞ AFFIDAVIT—W. O. Wilson, President of the Wilson Sewing Machine Co., personally appeared before me, and made oath that the above prices are correct, and taken by him from Circulars published in the United States and England under the corporate names of the Companies manufacturing said machines. FRED. SMITH,
Clerk of the Court of Common Pleas of Cuyahoga Co., O.

THE WILSON SEWING MACHINES are for Sale in most every County in the United States, and
No. 707 BROADWAY, NEW YORK.

Washington Iron Works,
MANUFACTURERS of Steam Engines and Boilers, Saw Mills, Flouring Mills, Sugar Cane Mills, White's Patent Double Turbine Water Wheel, Gray's Patent Cotton and Hay Press, Baker's Anti-Friction Lining Metals, and American White Brass, Iron and Brass Castings, and general machinery. Send for Circular to Office, 60 Vesey st., New York.

PATENT IMPROVED
VARIETY MOLDING MACHINERY,
And Adjustable
CIRCULAR SAW BENCHES.
For Machines and information, address
J. P. GROSVENOR, Lowell, Mass.

STEAM
PUMPING MACHINERY



EVERY VARIETY. Large and Splendid **Illustrated Catalogue** Sent Free, on Application.

Cope & Maxwell Man'fg Company,
118, 120 & 122 East Second St.,
CINCINNATI, O.

HAND SAW MILL.—Do work of 3 men. Rip 3 inch lumber with ease. Thousands in use. Agents wanted everywhere. HILLS & HOAG, 32 Courtlandt Street, New York.

THE "PHILADELPHIA"
HYDRAULIC JACK.
PISTON guided from both ends; all working parts guarded from dust; single or double pumps, cylinders, shafts, rocker arms, pistons, etc., entirely steel. No. 14 N. 5th st., Philadelphia, } PHILIP S. JUSTICE.
No. 42 Cliff st., New York. }

MASON'S PAT'T FRICTION CLUTCHES are manufactured by Volney W. Mason & Co., Providence, R. I. Agents, R. BROOKS & CO., 128 Ave. D, New York; TAPLIN, RICE & CO., Akron, Ohio.

$375 A MONTH—Horse and outfit furnished. Address NOVELTY CO., Saco, Me.

STEEL CASTINGS,
UNDER HAINSWORTH'S PATENT.

We are making **Steel Castings, Smooth, True, Free from Porosity,** capable of receiving **Very High Polish.** Can be **Forged** or **Welded** easily as **Bar Steel,** and **Strong as Forged Steel.** Send for Circular.
PITTSBURGH STEEL CASTING CO., Pittsburgh, Pa.

ORCHESTRAL, MEDIUM and COLIBRI MATHUSHEK PIANO FORTES.
Acknowledged the best in the world for tone, touch and durability. Descriptive Pamphlets free. Address MATHUSHEK PIANO M'F'G CO., New Haven, Conn.

CINCINNATI BRASS WORKS.—None but best quality of Brass Work for Engine Builders and Steam Fitters. F. LUNKENHEIMER, Proprietor.

IF YOU want even speed, reg. your wheels with J. A. WHITMAN'S Imp. Gov., Auburn, Me., p. $100.



You ask WHY we can sell First Class 7 Octave Pianos for **$290?** We answer—It costs less than $500 to make any $800 Piano sold through Agents, all of whom make 100 per ct. profit. We have no Agents, but ship direct to families at Factory price, and warrant Five Years. Send for illustrated circular, in which we refer to 500 Bankers, Merchants, &c. (some of whom you may know) using our Pianos in 46 States and Territories.
U. S. Piano Co., 865 Broadway, New York.



"Buckeye" Hominy Mill.
IN THE WORKING OF THIS MILL the Corn requires no preparation except shelling. It has a regular feed and discharge, and needs but little attention. IT IS COMPLETE IN ITSELF. Hominy can be made from common as well as flint corn. It occupies very little room, and any miller can work it. There is nothing the miller can manufacture to a better profit than Hominy. Send for descriptive pamphlet. BALTIMORE PEARL HOMINY CO., Baltimore, Md., Sole owners of Patent.

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

THE CELEBRATED
Cold-rolled Shafting.
THIS Shafting is in every particular superior to any turned Shafting ever made. It is the most ECONOMICAL SHAFTING to buy, being so very much stronger than turned Shafting. Less diameter answers every purpose causing a great saving in coupling, pulleys and hangers. It is perfectly round, and made to Whitworth Gage. All who give it a trial continue to use it exclusively. We have it in large quantities. Call and examine it, or send for price list.
Address GEORGE PLACE & CO.,
126 and 128 Chambers st., New York.

Sturtevant Blowers.
THESE are in every particular the best and most perfect Blower ever made. A full assortment of every size on hand, ready to deliver.
Address GEORGE PLACE & CO.,
126 and 128 Chambers st., New York.

N. Y. Machinery Depot.
GEORGE PLACE & CO., Manufacturers and Dealers in Wood and Iron Working Machinery, of every description, Stationary and Portable Engines and Boilers, Leather and Rubber Belting, and all articles needful in Machine or Railroad Repair Shops. 126 and 128 Chambers st., New York.

Andrew's Patents.
Noiseless, Friction Grooved, or Geared Hoisters, suited to every want.
Safety Store Elevators. Prevent Accident, if Rope, Belt, and Engine break.
Smoke-burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute, Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical. Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

P. BLAISDELL & Co.,
MANUFACTURERS OF FIRST CLASS **MACHINISTS' TOOLS.** Send for Circulars. Jackson st., Worcester, 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, Klouman & Co., Union Iron Mills, Pittsburgh Pa.

SWIVEL HEAD ENGINE LATHES
GAGE MACHINE WORKS.
WATERFORD, N.Y.

WOODBURY'S PATENT
Planing and Matching
and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, { 91 Liberty street, N. Y.; 2 Liberty street, Boston.

Machinist's Tools.
AT low prices, 97 to 113 R. R. Ave., Newark, N. J. E. & R. J. GOULD successors to Gould Machine Co.

WOOD-WORKING MACHINERY GENerally. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass.
WITHERBY RUGG, & RICHARDSON.

$150 A MONTH! EMPLOYMENT
EXTRA INDUCEMENTS!
A premium HORSE and WAGON for Agents. We desire to employ agents for a term of seven years, to sell the Buckeye $25.00 Shuttle Sewing Machine. It makes a stitch alike on both sides, and is the best low-priced licensed machine in the world. W. A. HENDERSON & CO., Cleveland, Ohio, or St. Louis, Mo.

MACHINISTS.
Illustrated Catalogue and Price List of all kinds of small Tools and Materials sent free to any address. GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.

Milling Machines.
STANDARD, UNIVERSAL, INDEX AND PLAIN, in every variety, of unequalled design and first class workmanship. Send for illustrated catalogue to the BRAINARD MILLING MACHINE COMPANY, 80 Milk Street, Boston. Works at Hyde Park.

AGENTS WANTED. Agents make more money at work for us than at anything else. Particulars free. G. STINSON & Co., Fine Art Publishers, Portland, Me.

To Electro-Platers.
BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction, manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield street, Boston, Mass. Illustrated catalogue sent free on application.

FOOT LATHES, best in the country. WOODMAN & PIKE, Lake Village, N. H. Circulars free.

BURDON IRON WORKS.—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines and Boilers, of all kinds, Sugar Mills, Screw, Lever, Drop, & Hydraulic Presses, Machinery in general. HUBBARD & WHITTAKER, 10 Front st., Brooklyn.

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, 105 Liberty st. New York. 17 1

SHINGLE AND BARREL MACHINERY.—Improved Law's Patent Shingle and Heading Machine, simplest and best in use. Also, Shingle Heading and Stave Jointers, Stave Equalizers, Heading Planers, Turners, etc. Address TREVOR & Co., Lockport, N.Y.

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever invented, with Overwhelming Testimony in its favor, send for new illustrated pamphlet (40 pp.) to Messrs. BEALD, SISCO & CO. Baldwinsville, N. Y.

PROPELLER PUMPS.
Any capacity and elevation. See Sci. Am., Aug. 19, '71. W. R. BUCK, Sec., 61 N. Front St., Philadelphia, Pa.

Subscribers—Who wish to have their volumes bound, can send them to this office. The charge for binding is $1·50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

VULCANIZED RUBBER

Adapted to Mechanical Purposes. New York Belting and Packing Co., 37 & 38 Park Row.

ASPHALTE ROOFING FELT.



A WELL test d article of good thickness and durability, suitable for steep or flat roofs; can be applied by an ordinary mechanic or handy laborer. Send for circular and samples to E. H. MARTIN, 70 Maiden Lane, and 9 Liberty Street, N.Y.,

NEW PATENT DRILL CHUCK.



IT is 2 in. in diameter, holds a drill from 1-64 to 1-2 in., operates with a key, and is warranted to be stronger and more durable than any other. Price, $10. Agents wanted. Address,
A. F. CUSHMAN, Hartford, Conn.

PUBLIC HEALTH PROMOTED! AGRICULTURE BENEFITED!
GOUX'S
Patent Absorbent Closet and Urinal.
FOR BOTH IN DOOR AND OUT DOOR USE.
The Patent 'Sanitary' Closet

By the use of this Patent Closet, the objections raised against dry closets in general are entirely obviated and done away with. They not only screen from sight the contents of the tub placed under the seat, but they actually absorb and completely deodorize all the gases, which, under the best conditions, still escape from other dry closets—a thick dust of disinfecting powder being spread evenly over every motion from a box, which is so placed under the seat that it constantly covers the contents of the tub or container, and thereby intercepts all emanations that might arise from under. The mechanism is self-acting, totally independent of the action of the occupier, and so simple that there is hardly a possibility of its getting out of order; and the commode, by its compactness and reduced size, may be placed in any apartment without inconvenience, in sight or otherwise, to the most fastidious taste. Containers for outdoor use adapted to any style of seat, or in plain pine boxes, as desired.

"The Goux system possesses all the advantages of the dry earth system without its disadvantages; it is economical, deodorizing, and self-acting. The whole refuse of every house, as excreta, liquid or solid, ashes, and sweepings, are disposed of and turned to account, and it is applicable in individual cases, dwellings, and in large communities."—*Scientific American*, Jan. 1, 1872.

For further particulars apply to, or address
A. L. OSBORN & CO., 424 West Canal St., New York.

THE INDUSTRIAL MONTHLY
(formerly called the TECHNOLOGIST),
IS NOW COMMENCING ITS THIRD YEAR.

Manufacturers, Mechanics, Builders, Engineers, Architects, Inventors, every one that takes an interest in the Industrial Arts, should see a copy.

SPLENDIDLY ILLUSTRATED
with Engravings of all kinds of new Machinery, Machinists' Tools, Buildings, new Designs, etc., accompanied with elaborate descriptive articles, no Artisan should be without it.

Only $1.50 Per Year.
The Cheapest and the Best in America.
EVERYBODY CAN AFFORD IT.
SPECIMEN COPIES FREE.

Note the following inducement to Clubs:

To Clubs of	3, and under	5,	$1.25	per year.
"	5, "	10,	1.20	"
"	10, "	15,	1.15	"
"	15, "	20,	1.10	"
"	20, and over,		1.00	"

CASH PREMIUM.

TWENTY cents to be kept, by the getter up of the Club, out of every dollar collected, that is, one fifth of the whole amount, the remaining four fifths to be remitted with names and addresses in full.

NOW IS YOUR TIME—TAKE ADVANTAGE OF IT.

ADDRESS,
The Industrial Publication Co.,
176 Broadway, New York.
P. O. Box, 4875.

THE LAND OWNER A Journal of Real Estate, Building, and Improvement —Cartoon plats of farm and town sites accompany each number. Only $1 per annum. J. M. WING & CO., Chicago, Ill.

AUCTION SALE OF
VALUABLE MACHINERY, TOOLS, &c.
The "American Standard Tool Co." will offer for sale, at Public Auction, to be held at their factory, cor. High and Orange Sts., Newark, N. J., on Wednesday, 17th January, 1872, at 10 o'clock, A. M., their entire stock of Machinery and Tools, consisting of Engine, Hand and Drilling Lathes; Drill Presses of various sizes; Milling, Edging, Shaping, and Slotting Machines; also, Trip Hammer; "Justice" Power Hammer; Drop; Anvils; Blowers, and general tools for forging; together with Shafting, Hangers, Pulleys, Belting, Steam Engine, Boilers, etc.; also, the tools heretofore used in the manufacture of the "Standard" Seven Shot Cartridges, and "Navy" Six Shot Revolvers (the latter of Colt's pattern, and formerly made by the Manhattan Fire Arms Co.). Catalogues furnished on application.

VALUABLE PATENT RIGHT FOR SALE
Lock Box 21, Camden, N. J.

KIDDER'S PASTILES—A Sure Relief for Asthma. STOWELL & CO., Charlestown Mass.

American Saw Co., Manufacturers of



And Perforated Circular and Long Saws. Also Solid Saws of all kinds. No. 1 Ferry st., cor. Gold street, New York. Branch Office for Pacific Coast, No. 908 Front street, San Francisco, Cal.

IRON PLANERS, ENGINE LATHES Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO. New Haven, Conn.


BEST DAMPER REGULATOR for Steam Boiler. Send for Circulars.
MURRILL & KEIZER, Balt., Md.

PREVOST'S ELECTRO-
Magnetic Motor Co
To Telegraph Co's., Gilders, Silver Smiths, Physicians, Professors of Science, etc. A new recoil apparatus is presented for electric light for light houses and public works. The services of M. Meynial, maker of mathematical instruments, and former manager of the electric light at the Grand Opera of Paris, are secured. Also, Proprietors of Prevost's new battery, and Barlow's new galvanic fluid: No. 1 Battery, 6 in., $5—No. 2, 3 in., $2—Fluid in Carboys, 7c. per lb. Both possess continuity, economy, strength, and are odorless. Address Company, 56 Amity Street, New York. E. Prevost, Superintendent.

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


MILLED MACHINE SCREWS of superior quality made to order from sample or drawing.
BROWN & SHARPE M'FG CO.,
Providence, R. I.

WHITE BRASS, manufactured by DUPLAINE & REEVES, Philadelphia, Pa.

WIRE ROPE.
JOHN A. ROEBLING'S SONS,
MANUFACTURERS, TRENTON, N. J.

FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse No. 117 Liberty street.

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 Palleys, Hangers, etc., of the most approved styles. Price lists mailed on application to
JONES & LAUGHLINS,
120 Water street, Pittsburgh, Pa.
☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 126 Chambers street, N. Y.

Diamond-Pointed STEAM DRILLS.

THE adoption of new and improved applications to the celebrated Leschot's patent, have made these drills more fully adaptable to every variety of ROCK DRILLING. Their unequalled efficiency and economy are acknowledged, both in this country and Europe. The Drills are built of various sizes and patterns; WITH AND WITHOUT BOILERS, and bore at a uniform rate, of THREE TO FIVE INCHES PER MINUTE in hard rock. They are adapted to CHANNELLING GADDING, SHAFTING, TUNNELLING, and open cut work; also, to DEEP BORING FOR TESTING THE VALUE OF MINES AND QUARRIES. TEST CORES taken out, showing the character of mines at any depth. Used either with steam or compressed air. Simple and durable in construction. Never need sharpening. Manufactured by
THE AMERICAN DIAMOND DRILL CO.,
No. 61 Liberty St., New York

HUTCHISON & CO.,
Commission Merchants for the sale of Steam Pumps, Engines, Boilers, Machinery, and Manufacturers' Supplies, corner of Wood Street and Second Avenue, Pittsburgh, Pa.

NEW CENSUS AND PATENT LAWS

A new edition of the Patent Laws, with official rules for proceeding before the Patent office, etc., including Census for 1870, complete. It shows the population by counties of all the States and Territories, and population of cities of over 10,000 inhabitants. Important to every patentee who has rights to sell. It enables him to calculate the value of territory, by the population.
Price, bound, 25 cents. Mailed on receipt of price.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
New York City.

Trade-Mark Patents.

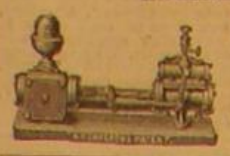
MUNN & CO. desire to call the attention of manufacturers and business men generally, to the importance of the law of patents, as applied to trade-marks for business purposes.

Any person, firm, or corporation, domiciled in the United States, or in any foreign country affording similar privileges to citizens of the United States, can obtain the right to the exclusive use, for THIRTY YEARS, of any TRADE-MARK, consisting of any new figure, or design, or any new word, or new combination of words, letters, or figures upon their manufactures.

This protection extends to trade-marks already in use or any length of time, or about to be adopted.

Full information on this important subject can be obtained by addressing
MUNN & CO.
37 Park Row, New York.

A. S. CAMERON & CO.,
ENGINEERS,



Works, foot of East 23d street, New York city.
Steam Pumps,
Adapted to every possible duty.
Send for a Price List.

McNab & Harlin Man'f'g. Co.
Manufacturers of
BRASS COCKS, PLUMBERS' BRASS WORK, Globe Valves, Gauge Cocks, Steam Whistles, and Water Gauges, Wrought Iron Pipe and Fittings,
BRASS AND COMPOSITION CASTINGS,
NO. 56 JOHN STREET, NEW YORK.



BABCOCK
Fire Extinguisher.
"ABSOLUTELY THE BEST PROTECTION AGAINST FIRE!"
Send for "It's Record."
F. W. FARWELL,
Secretary.
407 BROADWAY, N. Y.
656 WABASH AVENUE, CHICAGO.

ORIENT SAFETY LAMPS,



Entirely of metal, are the only lamps in use which can neither break, leak, nor explode. Are ornamental and cheap. Adapted to all household uses; also, to stores, factories, churches, &c.
AGENTS MAKE $10 A DAY
SELLING THESE LAMPS.
Manufactured by
WALLACE & SONS,
89 Chambers St., New York.

Swain Turbine.

"Our Low-Water Wheel from this on"
WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, the Lowell Tests.
For Report of tests at Lowell, with Diagrams and Tables of Power address
THE SWAIN TURBINE CO.,
North Chelmsford, Mass.



LUBRICATORS.
DREYFUS' celebrated Self-acting Oilers, for all sorts of Machinery and Shafting, are reliable in all seasons, saving 75—95 per cent. The Self-acting Lubricator for Cylinders is now adopted by over 80 R.R. in the U.S., and by hundreds of stationary engines. Send for a circular to
NATHAN & DREYFUS, 108 Liberty St., N.Y

Pennock's Patent
Iron Bending Machine,
INVALUABLE in Car and Machine Shops. Saves several times its cost in one year's use. Instantly adjustable to thickness, and bends at any desired angle. Price, $150. Address
THE PENNOCK MANUFACTURING CO.,
Kennett Square, Chester Co., Pa.

CREDIT & CAPITAL.
McKILLOP, SPRAGUE & CO.
will issue about the first of January, 1872, their Semi-Annual Volume of the
Commercial Agency Register.

It will be the most COMPLETE AND VALUABLE work of the kind ever published. This is the only *Reference Guide* giving a close estimate of the CAPITAL of each firm, in connection with their CREDIT ratings.

This Agency was established in 1842, and the COMMERCIAL REGISTER has become a *Standard Work* for the Bank and Counting Room.

ASSOCIATE OFFICES.
JOHN McKILLOP & CO., Philadelphia, Pa.
JAMES WM. KIMBALL, Boston, Mass.
JOHN McKILLOP & CO., Baltimore, Md.
TAPPAN, McKILLOP & CO., Chicago, Ill.
TAPPAN, McKILLOP & CO., Cincinnati, Ohio.
LATHROP, McKILLOP & CO., St. Louis, Mo.
TAPPAN, McKILLOP & CO., Milwaukee, Wis.
TAPPAN, McKILLOP & CO., Detroit, Mich.
TAPPAN, McKILLOP & CO., Toledo, Ohio.
MOORE & McKILLOP, Quincy, Ill.
WRIGHT, McKILLOP & CO., Kansas City, Mo.
STRONG & HEDENBERG, St. Joseph, Mo.
TAPPAN, McKILLOP & CO., St. Paul, Minn.
HOPE, McKILLOP & CO., San Francisco, Cal.
HOPE, McKILLOP & CO., Portland, Ore.
MURRAY, MIDDLEMISS & CO., Montreal, Canada.
MURRAY, MIDDLEMISS & CO., Toronto, Canada.
PURCELL, ROSS & CO., Albany, N. Y.

THE BAND SAW!
Its ORIGIN and
HISTORY, with Engravings of the OLDEST MACHINE, sent gratis. Address RICHARDS, LONDON & KELLEY, 23d st. (above Arch), Philadelphia.

SECOND HAND LATHE WANTED, with 11 to 13 ft. swing. Address
JAS. LEFFEL & CO., Springfield, Ohio.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

PATENT IRON RIM MOULDERS RIDDLES and SIEVES. Send for circular. Made only by BORTON & MABIE, Peekskill, N.Y.

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



Union Stone Co.,
Patentees and Manufacturers of
ARTIFICIAL STONE & EMERY WHEELS,
and Artificial Stone and Emery Wheel Machinery and Tools. Send for circular. 29 Kilby Street,
BOSTON, MASS.

WIRE ROPE.
STEEL, CHARCOAL and B. B., of the very best quality, suitable for Ships, Rigging, Suspension Bridges, Guys, Derricks, Inclined Planes, Hoisting purposes, &c. A Large Stock constantly on hand at
JOHN W. MASON & CO.'S,
43 Broadway, New York.

THE BEST SAW GUMMER OUT, ONLY $15; Emery Grinders, at $25, $40, and $100; Diamond Turning Tools, $15; Solid Emery wheels of all sizes; The above standard goods are *all* of our own manufacture Address THE TANITE CO., Stroudsburg, Monroe Co., Pa

L. W. Pond---New Tools.
EXTRA HEAVY AND IMPROVED PATTERNS.
LATHES, PLANERS, DRILLS, of all sizes; Vertical Boring Mills, ten feet swing, and under. Milling Machines, Gear and Bolt Cutters; Hand Punches and Shears for Iron.
Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.
A. C. STEBBINS, New York, Agent.

VENEERS,
HARDWOOD BOARDS,
Large and choice assortment of
FRENCH BLACK WALNUT, AMBOINE, THUYA, HUNGARIAN ASH;
Together with a complete stock of
DOMESTIC FINE FIGURED VENEERS, BOARDS AND PLANK.
☞ Send for catalogue and price list.
G. W. READ & CO., 170 & 172 Center St., N. Y.
Factory, 186 to 200 Lewis st., between 5th and 6th sts.

TODD & RAFFERTY, Manufacturers of Steam Engines, Boilers, Flax, Hemp, Tow Bagging, Rope and Oakum Machinery. Steam Pumps and Governors always on hand. Also Agents for the New Haven Manufacturing Co.'s Machinists' Tools. ☞ We invite especial attention to our new, improved, Portable Steam Engines. Warerooms, 10 Barclay st.; Works, Paterson, N. J.

SCIENTIFIC AMERICAN

PROSPECTUS

For 1872.

A year's numbers contains over 800 pages and makes two volumes, worth as a book of references, ten times the subscription price

ENGRAVINGS

by our own artists, will not only be given, of all the best Inventions of the day, but especial attention will also be directed to the description and illustration of

LEADING MANUFACTURING ESTABLISHMENTS, MACHINES, TOOLS AND PROCESSES.

Inventors and Patentees

will find in each number an official List of Patents, together with descriptions of the more important Inventions. We shall also publish reports of decisions in Patent Cases and points of law affecting the rights and interests of Patentees.

THE NEW VOLUME OF
SCIENTIFIC AMERICAN
commenced JANUARY FIRST; therefore, now is the time to organize Clubs and to forward subscriptions. Clubs may be made up from different post offices.

TERMS FOR 1872.

One copy, one year		$3.00
One copy, six months		1.50
One copy four months		1.00
CLUB RATES	Ten copies, one year, each $2.50	25.00
	Over ten copies, same rate, each	2.50
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress,"		10.00
One copy of Scientific American for one year, and one copy of "Science Record,"		4.00
Ten copies of "Science Record," and ten copies of the Scientific American for one year,		35.00

CLUB PREMIUMS.

Any person who sends us a yearly club of ten or more copies, at the foregoing club rates, will be entitled to one copy, gratis, of the large steel plate engraving, "Men of Progress."

Remit by postal order, draft or express.

The postage on the Scientific American is five cents per quarter, payable at the office where received. Canada subscribers must remit, with subscription, 35 cents extra to pay postage.

Address all letters and make all Post Office orders or drafts payable, to

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. XXVI.—No. 4. [NEW SERIES.] NEW YORK, JANUARY 20, 1872. $3 per Annum. [IN ADVANCE.]

SCIENTIFIC COMMISSION OF JAPAN.

There are two parts of the world now rapidly advancing to the front rank as centers of civilization, which fifty years since were practically unknown to the Caucasian race, namely, Australia and Japan. The former has been transformed from a savage wilderness to a state of comparative cultivation and wealth with a rapidity only paralleled on the continent of America. The latter, which for ages has remained in a state of barbarism, has at last shaken off, in a great measure, the prejudice and superstition that prevented its progress, and has shown that it has the material, power, and resolution to take its place with the most civilized nations of the earth. A few years will affect this wonderful transformation. The present generation may live to see it.

It is worthy of remark, that the most powerful influence in bringing about this great change in the condition of Japan is the outcome of American civilization. One of the oldest nations on earth now sits at the feet of the youngest, and asks for aid and instruction in all that pertains to the material interests of its people. Our engraving gives accurate portraits of the distinguished American citizens selected by the Japanese Government as a scientific commission to investigate and report upon the commercial industries and agricultural resources of the country, and to give counsel as to the best means of developing such resources.

The chief of the Commission is General Horace Capron, long and favorably known as a thoroughly scientific agriculturist, conversant as well with the various sciences collateral to agriculture, and late Commissioner of the United States Agricultural Department, in which difficult position he has won richly deserved commendation, from those qualified to judge, in all sections of the country.

Professor Thomas Antisell, of Washington, accompanies the party as an expert in the subjects of mining and manufactures. Professor Antisell's reputation as a technical chemist, mineralogist and geologist is well known, and General Capron is to be congratulated upon having secured his services.

The work of the Commission includes the examination of the country with reference to the introduction of railroads and other improved means of transportation. This branch is confided to Major A. G. Warfield, Jr., of Baltimore, Md. Major Warfield is looked upon in his profession as one of the most competent of its younger members; has already had much experience in the special class of work which is likely to be demanded in Japan, and is pronounced by no less an authority than Latrobe, of Baltimore, one of the best locating engineers of the country.

The Secretary of the Commission, Doctor Stuart Eldridge, of Washington, D. C., possesses high scientific and literary qualifications, and, although a young man, has achieved a prominent standing in his own profession.

The Commission is amply provided with the necessary equipments and instruments of precision; and, with such a *personnel*, there is much to be expected from its labors. We look confidently for a result which shall benefit not only our island neighbors, for neighbors they are both in interests and feeling, though so far distant in miles, but shall, perhaps, be of equal advantage to ourselves. While Japan is represented by such men as Mr. Mori, the Minister at Washington, and Consul Charles Wolcott Brooks, of San Francisco, international commerce must increase, community of interests be more fully recognized, and the good feeling, already existing between the great nations of the East and West, strengthen and become permanent.

By late advices from Japan we learn that the Commissioners were received with high honors by the Japanese Government, on arrival at Yokohama and Yeddo. At the former place a grand salute was fired from the forts, and on their landing they were received by a delegation of Japanese officials of high rank. On the next day they embarked on a Japanese war steamer for Yeddo, being saluted by the fleet at that fort on passing, and were received on landing by another delegation of Japanese officials, among whom were the Prime Minister and Minister of Foreign Affairs. A grand banquet was given there by the Prime Minister and Cabinet at the Summer Garden on the 9th of September, which was followed by a number of others at the residences of the different members of the Cabinet. On the 16th of September, the Commission had an interview with His Imperial Majesty, the Tumo, or Mikado, which is said to have been rarely accorded to foreigners, and was given on a scale of unusual magnificence. In every way the Commission have been most favorably received, and the members pleased beyond all expectation.



Charles W. Brooks, Japanese Counsel at San Francisco — General Horace Capron, Chief of Commission. — Prof. Thomas Antisell, Technologist and Geologist. — Major A. G. Warfield, Jr., R.R. and Mining Engineer — Stuart Eldridge, M. D. Secretary of Commission.

HISTORY OF ICE-MAKING MACHINERY.

[Condensed from the Milk Journal.]

Cooling and ice machinery have been practically divided into two classes. First, those in which heat is directly applied in order to produce cold; as, for instance, in the air machines, where the air is first compressed and subsequently expanded, and in the ether machines, where the evaporation is effected *in vacuo*, the speed of the process being accelerated by the use of an air pump; and second, those machines in which cold is produced by direct heat without the aid of power, as, for example, in the latest ammonia machine. Each machine has its partisans, and dire battle is done occasionally; ink has flooded fields of paper, and thousands of broken pens must have strewn the lists. It is claimed for the air machine that it requires the assistance of no chemical agents; that the machinery acts direct upon the air and water; and that it will produce cold air, refrigerate fluids, or make ice continuously as wished, with the aid of fuel alone. On the other hand, it is claimed for the ammonia machine that more ice or heat reduction can be got out of the coal used by it than

any other, the quantity needed being only what will suffice to boil a solution, and that the only power needed is that small amount which works the pumps and keeps the cold conveying fluid in motion. As for the ether machine, it is claimed for it that the construction is of the simplest, that it is cheaper to maintain than any other, and that the congelation commences with the first revolution of the flywheel. Outsiders, who are factionaries of no particular maker, would mostly look at freedom from accidents in dealing with the machines, giving preference to the ether machine, where the process is carried on in a vacuum, and the resistance to overcome does not exceed 15 lbs. per square inch, as against three times the amount in an air machine, and ten times the amount in some ammonia machines. Others would judge by the lowest temperature which the invention could register. As a rule, the best machine of any class will be found to be that which is the safest, occupies the least space, needs the smallest quantity of fuel, works the most continuously, makes use of the cheapest medium, is the least costly to maintain, can be worked by hand or power; above all, that which costs the least, and which the best fulfils other purposes when not used for its own specific work.

AIR MACHINES FOR PRODUCING COLD AND ICE.

Among the first machines of this description were those of Newton & Williams, introduced into notice about twenty years ago. The latter compressed the air and passed it in that condition through a close chamber containing a liquid of low temperature, which absorbed and carried off most of the heat produced by the compression. The condensed air was then led to expand, in contact with the substance to be cooled, from which substance the heat was gradually absorbed. The main points of the air machine are epitomized in the foregoing, but the modes of operation have been somewhat varied. Sundry other inventors followed in the wake, but it was not until 1862 that the production of ice was economically attained by the Kirk air refrigerator.

The success of this ice machine led Mr. Kirk, of Glasgow, to study, in its turn, the production of an article for cooling liquids without making ice, and he has, during the present year, constructed a machine for this purpose, capable of cooling 45 barrels of water at the rate of 15° per hour. Here the water which removes the heat caused by compression, and that to be cooled, are injected as a shower through the compressed and expanded air of the hot and cold chambers, and are withdrawn by simple valves. When driven with compound engines, a surface condenser is attached, which enables clear water for divers purposes to be warmed by the exhaust steam. The machine, moreover, works noiselessly, and is as simple as it is effective for common refrigerating purposes.

In the ice making air machine of Mr. Mignot, of Paris, especial means have been adopted to inject the water in the form of spray into the very midst of the air as it is being compressed in the compressing cylinder. The cold air produced, being about 60° below freezing point, is conveyed through a trough with large cells containing the water to be congealed, and escapes at about 4° above freezing point, which would be at a temperature enabling even more work to be done if wanted. The chief feature of interest in this machine, which last year attracted great attention, lies in the injecting of the spray, which slightly diminishes the work necessary to compress the air. Another point to be admired in it consists in the fact that the compression and expansion cylinders are placed in easy conjunction with each other, and so work simultaneously. It is just possible also that the ice produced at so low a temperature would outlast the natural ice.

In the air machine of Mr. Windhausen, of Brunswick, the air is admitted into the compressing chamber as usual, and thence passes into a condenser formed of two series of pipes, whence it enters the expansion chamber to be dilated and cooled. The air then escapes through a valve into the refrigerator, containing the vessels of liquid to be frozen, that is, if ice is wanted, or directly into the room to be cooled, if a reduction of temperature there is desirable. He employs either a single or double acting cylinder, compressing on one side of the piston and expanding on the other, or a double cylinder, one for compressing the air, and the other for subsequently expanding it.

The above represent the most successful machines of the present day for the production of cold by the alternate compression and expansion of the air. Whether the system can eventually be brought into still more economical restraint, depends, we think, mainly upon the improvements brought to bear upon the steam engine itself. For the steam engine is a law with this kind of ice machine. At present, air machines are reputed too costly to compete with, for instance, the ether machines. An ether machine of 12 horse power will favourably compare with a Windhausen machine of the same power; for the former takes up only a space of six superficial yards, and will produce 400 lbs. of ice per hour, whilst the latter occupies one half more space, and turns out but 300 lbs. of ice. Perhaps it will eventually be found that the air machine will be the one most suited for the artificial refrigeration of air, apart from ice making, inasmuch as the requisite amount of cold can be regulated with the greatest nicety by means of a valve under the control of the attendant.

AMMONIA MACHINES FOR PRODUCING COLD AND ICE.

As the machine of this kind which first attracted notice after Dr. Faraday had shown the possibility of obtaining cold by the liquefaction and subsequent gasification of ammonia, the ice machine of Mr. Carré, of Paris, demands a mention, not only for that reason, but because it is still peculiarly adapted for ice manufacture on a small scale. This machine is fully described on page 265, Vol. XXIII of the SCIENTIFIC AMERICAN.

Mr. Mort, in 1867, patented a process of producing a temperature suitably low for the preservation of animal food by an improved machine, where ammoniacal gas was liquefied by pressure, and made to absorb heat on its release from liquefaction, which is well worth attention; and in 1869 he protected a process in which, as he says, he avails himself of the known affinity that ammonia has for water, and claims that, with nothing but a peculiar pump and a simple apparatus, the whole process of producing cold is carried on, and substances are refrigerated and frozen without the necessity for any medium of transmission other than the ammoniacal liquor itself. In the earlier ammonia systems of Carré, Tellier, Reece, and others, liquefaction was carried on under pressure alone, but Mr. Mort's process is one of liquefaction by affinity, by the aid of a slight pressure. It is, however, difficult to explain these differences without the aid of experiments.

A recent ammonia machine is the one patented by Mr. Reece, of London. A generating vessel is charged with a solution of ammonia, and a fire is then lighted under the boiler, which expels all the air. A strong solution of ammonia is then pumped up to the top of an analysing cylinder above; and, as the solution descends the different plates there, it is in a great measure separated from the water by the steam rising from the generator or boiler. The nearly anhydrous ammonia is now passed into a rectifier, where it is completely cooled by a stream of cold water, and rendered completely free from watery vapour. The perfectly anhydrous ammonia now descends into a liquefactor, where it is liquefied by the mere pressure of the gas upon itself. When a sufficient accumulation has accrued, the fluid is then run into a cooling cylinder until the coil therein is full; and when that is effected, access is given therefrom to a second cylinder, where the liquid ammonia assumes its gaseous condition, cooling the liquid inclosed in the inclosed coil. The now exhausted ammonia traverses the coil in the cylinder to an absorbing vessel, where it meets with the exhausted liquor from the distilling vessel, or generator, and is dissolved. The solution is now pumped through a horizontal heater, where it meets with the liquor proceeding from the boiler into the top of the analysing cylinder, where the same series of operations are repeated. If water is required to be cooled, it is sent through the coil in the cooling cylinder direct; and when ice is desired, a solution of chloride of calcium is made to flow through the coil, and round the ice forming cells in which the ice is made. A drawback to the use of this machine is that it has to be worked up to an enormously high pressure, and, if imperfectly constructed, would induce a very serious explosion. Another objection is its cumbrousness, and non-adaptability to working when on shipboard.

ETHER MACHINES FOR PRODUCING COLD AND ICE.

The principle of the ether process is the production of cold and ice by the evaporation of this volatile liquid; but as its tension is otherwise too small, this is carried on *in vacuo*. A machine of this kind also permits the continuous re-use of the ether without loss, provided that the stuffing boxes are kept in perfect order. In Messr. Siebe's machine, the ether is removed by an air pump worked by hand or steam, and the air is then allowed to enter the refrigerator, where it becomes vaporized. It then traverses some branch pipes into the cylinder, and is forced through other pipes into a spiral coil surrounded by water, which acts as a condenser. An air vessel is constructed in the condenser, and sometimes an auxiliary condenser is placed in a bucket outside.

In passing through these coils the ether is liquified, and, parting with its heat to the environing water, is returned to the refrigerator. One adaptation of this machine is largely employed by brewers, who usually pass a continuous stream of water, or wort, through the apparatus, with a consequent reduction of 20° to 30° of temperature. Messrs. Siebe's machine, to make one ton of ice, will, they aver, cool 15,522 gallons of water, or 648 gallons per hour, 10°; whereas one ton of ice applied in the ordinary way will only cool 3,240 gallons, or 135 gallons per hour, 10°, showing a considerable waste to attend the use of ice by brewers, etc., and a great economy in the adoption of a refrigerating apparatus. In a similar way, we are informed that in Texas it takes 300 lbs. of ice to cool 1,000 lbs. of meat; and here, too, the ice machine is a necessity.

Professor Gamgee, during the past twelve months, has patented what he considers an improvement on the above kind of machine, viz.: by affording a greater area of conducting surface in proportion to the space occupied by the machine; in other words, he constructs his refrigerators and condensers on the tube within tube principle, and obtains a greater cooling power in consequence.

In working both the above machines, the ordinary ether is adopted; but the latest system of Mr. Tellier is based on the evaporation of an ether produced by the distillation of wood, and is carried on by him at Auteuil, near Paris, with marked success. This machine seems to be able to effect all that a refrigerating machine can effect, in the way of ice production and the maintenance of chambers at 28½° during the hottest summer months. Like the majority of ice machinists, he is now busy developing a scheme for the importation of meat. He proposes to subject Australian newly killed carcasses to his process of cooling, etc., and send them homewards in vessels fitted up with his cooling machines.

FREEZING POWDER MACHINES FOR PRODUCING COLD AND ICE

There are in the market of nearly every country some scores of differently constructed machines, varying in price, for the production of ice by the use of freezing powders.

An inexhaustible freezing compound, which can be reconstituted by exposing it in shallow vessels to the sun's heat, when the ultimate crystals, of which it is composed, can be collected, is sold by Messrs. Brown Brothers & Co., of London, who are also venders of a series of excellent block ice making machines, the smallest of which, the "Paragon," costs £8, turning out a half pound block in eight minutes, and the largest, the "Industrial, No. 4," costing £72, and producing fifty pounds of block ice in half an hour. Cheaper machines than even the "Paragon" are sold for icing creams and the like, but we need not enter upon them. Of course the cost of the freezing powders rules the question as to whether it is more expedient to make ice in this way than to purchase foreign ice.

We have now completed our remarks upon ice machines, properly speaking; and, in order to imbue the minds of our readers with an idea of the value of these machines, we may state that the Windhausen air machine patent for North America was sold for £22,500, and the French patent for 750,000 francs. As much as 40,000 dollars has also been obtained for the right of using the Carré machine in a single Texan province.

The Factories of England---Sufferings of Workmen.

In the course of an article on sanitary reform, in *Chambers' Journal*, an intelligent writer says:

"If we turn back to the unhealthy state of the air in factories and workshops, it may be observed that the workmen of all countries show such a carelessness about their health that the best reforms often fail through the want of their cooperation. In some trades, where poisonous substances are used, the masters have tried to enforce the wearing of gloves or the frequent washing of the hands; yet the men have refused to conform to such simple injunctions. At a manufactory in the neighborhood of Newcastle, the workmen threatened to leave because they were desired to take baths at certain intervals. But nevertheless, great improvements have taken place in the last fifty years. White lead which is one of the most dangerous compounds of oil paint, has been rendered almost innocuous; and the largest manufacturers can now boast that years will pass without any of their men being attacked by colic; this is chiefly due to strict attention to the laws of cleanliness. The making of matches requires many dangerous operations, such as dipping the bunches into inflammable paste and placing them, when finished, in boxes. In the first of these the maker constantly breathes phosphoric vapor, and in the second, which is chiefly performed by women, spontaneous combustion frequently occurs, causing serious wounds on the hands. These have both been remedied by using machines instead of the hands, and a still greater benefit has arisen by a different preparation of phosphorus being employed.

"The Sheffield cutlers have suffered severely from the sharpening of steel knives and needles; the fine dust entering the mouth and nostrils, and the constant stooping over the grindstone deforming the chest. The preparation of skins and leather places the currier in an unwholesome atmosphere; and the cotton mills of Lancashire have a bad reputation. Ventilation is the principal remedy against these maladies.

"As for the long trail of smoke which our large factories emit from their chimneys, much has already been done to lessen it, though there is still great room for improvement. At one time, it was suggested that if they were built to an immense hight, the smoke would cease to be noxious, and Glasgow points with pride to some of these columns, higher than any building in the world excepting the spire of Strasburg cathedral and the largest pyramid of Egypt. But this was a very imperfect proceeding. There was nothing in the air to neutralize these emanations, and though the particles fell at a greater distance, attenuated, it is true, they were just as mischievous. Coal smoke is very disagreeable, but other gases from chemical works act as a mortal poison on vegetation. Such are the nitrous and sulphuric vapors from the manufactories of these acids; whilst the smelting of iron ore renders a country sterile for miles round. One of the most curious effects of this kind is to be found in the smoke of lime kilns on the vineyards of France; it gives the grapes and wine for some distance round a disagreeable taste; and in Burgundy, the kilns are always interrupted in their work from the time of the flowering of the vines to the season of ingathering. In the previous cases, condensation of the injurious vapors before leaving the chimney has been found eminently serviceable."

Fire-Proof Buildings---Views of the Sculptor, Mr. Hiram Powers.

The Providence *Journal* publishes a letter from Mr. Hiram Powers to a citizen of Rhode Island, in which, after alluding to the burning of Chicago, he says:

But it may be asked, "Is it possible to make a city fireproof?" I answer, yes, and without any great extra expense. To prove this, I have only to say that, although there have been frequent fires in the city of Florence during the thirty-four years of my residence in it, not one house has been consumed, except a theatre, and that was not entirely destroyed. Rooms, full of goods, have been heated like ovens by ignited calicoes, straw hats, etc., but as the floors above and below were all covered by thin brick tiles, the goods burned without ventilation. And as there was no flame, a smell like that of a coal pit soon gave the alarm, and the fire was soon extinguished by no other engine than a squirt holding about a gallon, which discharged a well directed stream through some aperture. I once beheld some firemen marching to a fire in Florence. Foremost were three men with picks, next four men with buckets, then three men with highly polished brass squirts on their shoulders; all marching with an air of pomp and importance. The fire was at the residence of Mr. Clevenger, the Ameri-

can sculptor, and had been burning twenty-four hours on the end of a joist just under his fire place. He had smelt something like a coal pit for some time, and at length perceived smoke rising from the brick floor. On going below he found the room full of smoke, and a rush bottomed chair just under the joist was partially consumed. But the joist was not yet burned off, and why? Because the fire was bricked down. It could not rise and burst into flames.

The secret of fireproof building then is this: It must be made impossible for the flames to pass through the floors or up the stairway. If you will have wood floors and stairs, lay a flooring of the thinnest sheet iron over the joists, and your wood upon that; and sheath the stairs with the same material. A floor will not burn without a supply of air under it. Throw a dry board upon a perfectly flat pavement and kindle it as it lies, if you can. You may make a fire upon it and in time consume it, but it will require a long time. Prevent drafts, and though there will still be fires no house will be consumed. The combustion will go on so slowly that discovery is certain in time to prevent any great calamity.

But the roofs, how about them? Slate or tiles? Zinc melts too easily. I believe that hard burned tiles, if flat, would stand the frost at home; and if so, they constitute the best roofing. My house has no joists. All the floors are of tiles resting on arches. One of these arches was made over a room twenty five feet square, by four men in four days. The bri ks are about one and a half inches thick, and laid edgewise with plaster of Paris. There was no framework prepared to lay them on, unless you would so term four bits of wood which a man could carry under his arm. And yet this arch is so strong as to be perfectly safe with a large dancing party on it. I never have heard of one of those floors falling, and they are absolutely fireproof. Of course light arches like these would not do for warehouses.

It would pay, I think, to send out here for an Italian brick mason who knows how to build those thin but strong arches for dwelling houses. I know that there is a prejudice at home against brick or composition floors. "Too cold in winter," it is said. And so they are if bare, but cover them with several thicknesses of paper and then carpet them, and no one can distinguish the slightest difference between their temperature and that of wood floors. Who doubts this, let him try the experiment with the feet of the thermometer. The truth is that the brick or composition floor is no colder in itself than wood—the thermometer attests this—but it is a better conductor. I do not insure my house, as I know that it is not combustible.

SODA.

One of the chemical discoveries of the present century, the applications of which are the most varied, and the history of which is the least known, is the manufacture of soda. It is a metallic oxide; that is to say, the combination of a metal with oxygen. Like potash, with which it has many affinities and many common uses, it belongs to what the Arabs called, in the ninth century, alkalies,—a name which, as well as alchemy, has been adopted in most European laboratories. It has a strong affinity for acids, and combines with them to form various salts. This property is made use of in trades of various kinds, as, for instance, in scouring cloths that must be freed from greasy matters, and also in the manufacture of soap. The white and marbled soap has not even yet lost its superiority, and still occupies a first place among similar products of other nations. It is made by combining soda with the acid fat of olive oil.

The glass manufactories also consume an immense quantity of soda. Glass is composed of flint and different alkaline bases, such as potash, soda, lime, and barytes. Certain mineral oxides give it a variety of color, sometimes of a very undesirable kind. Should the paste contain traces of iron, instead of producing white glass there will be only the common bottle glass; and if the iron be in larger proportions, the dark green shade will be the result. On the contrary, add a certain quantity of oxide of lead to a pure base of potash, and the beautiful crystal glass is formed; a still larger dose, and the diamond paste, with its wonderfully dispersive power, will deceive many an unpractised eye. Between these extremes, the dull bottle and the many sided crystal, there is the window glass, which adds so much to the comfort and health of our houses, the gorgeous looking glasses to adorn our drawing rooms, the rich decorations for the dining table, the crystal pendants of our gaseliers, and many other objects which satisfy our commonest necessities, and minister to the highest taste or luxury.

When marine salt is acted upon by sulphuric acid, an acid gas is thrown off, and sulphate of soda remains. In the time of Leblanc, chemists were ignorant of the composition of the gas which escapes, and gave it the name, for want of a better, of muriatic acid; and marine salt was supposed to be a composition of this acid and soda, which was an error. In the present day, it is known that marine salt is composed only of soda and chlorine, and that muriatic acid consists of hydrogen and chlorine. Neither Leblanc nor his companions suspected the real case, that sulphuric acid could have no power over salt without the intervention of water. It is this simple agent, which, by decomposing, furnishes oxygen for the sodium, and hydrogen for the chlorine; giving, as a result, the soda which combines with the sulphuric acid, and a gas which flies off, now called, to adopt the more exact name of the new system, hydrochloric acid. Without water there could be no reaction; happily, it was always present in the sulphuric acid that was employed, and consequently this error in theory had no influence over the result in action. We have now reached the point of obtaining sulphate of soda; to obtain the common soda, it is necessary to divide it from the sulphuric acid, which was altogether Leblanc's discovery. Most chemists proposed a solution of this difficult question by heating the sulphate with various bodies; he laid his hand upon the one which gave the best results,—chalk (carbonate of lime) and charcoal. It is singular that he did not even know the exact theory of the reaction this produces, which latter chemists have fully defined; but his instinct was so sure, his first experiments were conducted with such accuracy, and the quantities were so irreproachably defined, that later years have in no degree changed the manufacturing process which Leblanc first laid down. First came the decomposition of marine salt by sulphuric acid; then the decomposition of sulphate of soda by the heated kiln, and the washing of the rough soda on the floor of the kiln.

SULPHURIC ACID.

From the first of these operations, one of the most important articles in modern industrial occupation intervenes—that of sulphuric acid. In a few years, a way of making it in large quantities was discovered, and the face of all chemical operations was changed. It is by the help of it, that, directly or indirectly, chemists are enabled to extract from the different salts the greater part of the acids used in laboratories and in the arts. Thanks to it, hydrochloric acid has been economically obtained, which has rendered such service in paper making, bleaching, dyeing of stuffs, also serving for the preparation of gelatin, of ammoniacal salts, and of disinfectants. Next is carbonic acid, which is used in the manufacture of soda water and all effervescent drinks, in the extraction of sugar from beet root, and the fabrication of alkaline bicarbonates; and last of all is azotic acid, the most powerful agent of oxidation, which dissolves all metals, even gold and platina, when united to hydrochloric acid, and is indispensable to the workers in metals. By sulphuric acid, phosphates are transformed into powerful manures; sulphates of aluminium, of potash, of magnesia, of ammonia and of iron are economically obtained, with many other important applications in agriculture, medicine, and domestic economy. The production of electric currents, of electrochemical gilding and plating, the refining of gold and silver, the making of stearine candles, the purification of colza and other oils, the dissolution of indigo, are some among many other branches of trade which could not be carried on without sulphuric acid; and its being manufactured in such large quantities is entirely owing to the soda works.

HYDROCHLORIC ACID.

One of the most serious embarrassments arose from the immense quantity of hydrochloric acid which was poured out from the soda works in the form of gas. It was condensed as much as possible by passing it through a series of vessels full of water, thus obtaining acid dissolutions, which had a certain value; but more was produced than could be disposed of. Besides, much escaped into the atmosphere in the shape of corrosive acid vapor, which attacked the iron parts of buildings, dried up the leaves of the trees, and exercised a most pernicious influence on the health of the surrounding neighborhood. The winds carried it away to great distances, and the effects were perceptible miles away. The proprietors had to pay heavy damages; and it became a matter of existence or non-existence to the soda works to find a means of condensing and collecting this deleterious acid. All these difficulties have been surmounted; and as it has often happened in chemistry, each has become the means of fresh progress. One of the most curious plans tried to purify the air was to build the works near to old abandoned quarries, and to bury the inconvenient vapors in their depths; but the acid, penetrating the stone, rendered it moist and friable, so that portions fell, and houses built in the neighborhood were rendered unsafe. Two different arrangements are now adopted, both succeeding perfectly. One is to pass the gas through many hundreds of stone bottles, communicating with each other through well luted tubes; a current of water is driven through them in an opposite way to the gas, and the smallest portion of hydrochloric acid is thus dissolved. Another plan is what is called the absorbing cascade; a high, wide tower is built of flintstones, the interior of which is filled with coke, fragments of flint, or bricks set apart; the gas is introduced at the base, and before it can escape it has to pass through all the interstices of these hard materials. From above, a fine rain of water is continually falling, and, meeting the gas at every angle, retards its progress and absorbs the acid.—*Chambers' Journal.*

Experimental Science at Cornell.

Professor B. G. Wilder, Professor of Comparative Anatomy and Zoology, at Cornell University, Ithaca, N. Y., calls upon all persons, who desire to facilitate the cause of science, and the instruction of the young men under his charge, to send him specimens for dissection. For every specimen a written acknowledgment will be sent, and eventually, to each donor, a copy of any scientific paper in which may hereafter be embodied the result he will have helped to reach. The specimens may be sent at his expense as above. The package, if large, may be sent as freight; if small, by express. He says:

"We want brains of all animals, both wild and domesticated; nothing can be amiss, for if duplicates come of what we already have, the students can dissect the brains, or the skulls, if desirable, can be prepared. When possible, the size and weight of the animals should be noted; and especially the sex and apparent age. The most valuable collection that could be sent us would include a male and a female, an old and a young, of the same species, the size and weight, the age and sex being marked in some way upon the specimens themselves; these would be worth more than fifty heads of different animals and bearing no such information. When the animals are small, or any doubt could arise as to their specific identity, they should be sent entire; but if large, the heads alone. Of course, a badly damaged head would not be worth the sending, unless very rare; and in all cases the killing should be so accomplished as to avoid injury to either brain or skull; the head should be cut off with one or two of the neck vertebræ attached, so as to save the *medulla oblongata* at the nape of the neck, and should be kept in a cool place before sending.

"We want the unborn young of all animals, and at all stages of development; as a rule, the smaller the better, but, as with the brains, hardly any specimen of this kind would be amiss; for where it is too large for entire preservation in alcohol, special organs may be prepared (the brain, stomach, etc.), so as to be extremely useful in showing the manner of the animal's development. On account of the extreme delicacy of these specimens, great care must be exercised in procuring and sending them. When possible, they should be kept and sent in the womb, the fluid contents of which are the best protection; but if this cannot be, then they should be placed in a jar or can with water and a little salt; larger embryos (colts, calves, etc.) may be laid upon hay or tow, and packed in a box, great care being had to prevent any pressure upon the head, for the skulls of unborn animals are so soft as to yield, and the brains are then ruined. Still-born or aborted animals are particularly useful if the time since conception is known; but embryos are often found in animals killed in the chase or for food. Of course, the species from which the embryos are taken should be noted, and, in case of domesticated animals, the exact breed so far as known; the pure breeds are most valuable for both brains and embryos, such as the ass, the mule, the different breeds of horses, the Newfoundland dog, and indeed nearly all the breeds of dogs, the brains of which differ among themselves to a wonderful extent.

"Such monsters as animals with two heads or two tails, or an unusual number of limbs or toes, or with but a single eye in the center of the face, etc., usually die soon after birth, and are then looked upon as mere curiosities, and so thrown away. Such specimens are of the greatest value to science. Gœthe, who was naturalist as well as poet, well said: 'It is in her monstrosities that Nature reveals to us her secrets,' and many of the more obscure laws of life and organization have been elucidated by the aid of these unfortunate creatures, which go astray before they are born, and live only to die. The not infrequent occurrence of such malformations among the human race should alone induce a careful study of whatever may lead to a knowledge of their nature and possible causes. There are few persons, especially living in the country or upon farms, who have not occasional opportunities of procuring such specimens as we desire; but none are so likely to have them as the hunters, the butchers, and the stock breeders: let me ask all such to save and send the specimens that almost daily come into their hands. Their value to us and to science is not to be estimated by the little trouble it may take to procure them, or the price which ignorance sets upon them."

Advantage of Californian over European Wine Growers.

In Europe, they only reckon to secure in ten years one good crop and fine quality, and two more crops of fine quality, but small quantity; while seven vintages are reckoned as being of poor quality, small quantity, and total failures. In our State, the variation in quality seldom amounts to five per cent, while the most disastrous years have not lessened the crop below the ordinary yield more than twenty-five per cent in quantity. This very variation in quantity can be fully known three months previous to the vintage, thus allowing the producer ample time to secure his casks, and furnishing him positive knowledge as to the number required. In other countries, even fourteen days before the vintage, there is no certainty of a crop; a wind, a rain, or a hail storm is apt to occur at any moment and devastate the entire vintage. All is uncertainty there; nor has the vintner any possible means of positively ascertaining how many casks he must provide. In abundant years in the old countries, the exchange has often been made of so many gallons of wine for an equal number of gallons capacity of casks. The disadvantages of being forced to secure such immense quantities of casks in so limited a period are too easily perceived, and we certainly cannot appreciate our own advantage too much in being very differently situated.

Another great benefit, derived from the long continuance of the dry weather, is the exemption from weeds in our vineyards after the final plowing. Thus all the nourishment and strength of the soil go wholly to their destination, the vine, and hence the vigorous appearance that even the most delicate imported varieties acquire even in our poorest soils. They necessarily bear much more. This circumstance will also explain, in a measure, why our cultivation does not cost as much per acre as that in European countries, though our labor is so much higher. The advantage of our dry weather does not end here; it precludes the possibility of continued mildew, and allows the vintner to leave his vines unstaked, the bunches of grapes actually lying and securely ripening upon the very ground, without fear of frost or rotting. In this condition, the grapes mature sooner, are sweeter, and, it is believed, possess more flavor.—*Overland Monthly.*

PRESERVATION OF STONE.—Doctor Eugène Robert, of Paris, recommends copper salts as being the best preservatives of stone in a damp climate. These salts prevent the formation of lichens, to the action of which M. Robert attributes the destruction of stone. This is, without doubt, true for granite, but its efficiency for sandstone is questionable. The latter deteriorates by exfoliation, without the development of any vegetation.—*Les Mondes.*

EXTRAORDINARY EXPERIMENTS ON STEAM BOILERS.

Perhaps the most interesting and important experiments, relating to the explosion of steam boilers, that were ever attempted were commenced on Wednesday, November 22, 1871, by Mr. Francis B. Stevens, under the authority of the United Railroad Companies of New Jersey. We give, herewith, an engraving of the scene of the experiments.

At the suggestion and by the advice of Mr. Stevens, that corporation generously and philanthropically appropriated the sum of ten thousand dollars to be expended by him in experimental investigation of the causes and of the subject generally of steam boiler explosions.

Mr. Stevens collected nine boilers; and, after testing, by hydrostatic pressure, several times to the point of rupture, each time repairing them, he finally set them all up on the United States reservation at Sandy Hook—by permission of the Secretary of War—with the object of actually exploding them by steam, and thus observing, if possible, the conditions of explosion and with the intention of obtaining as much valuable information as possible.

These latter experiments were commenced on November 22, in presence of Joseph G. Belknap, Inspector-General of Steamers for the United States, Coleman Sellers, President of the Franklin Institute of Philadelphia, Professor R. H. Thurston of the Stevens Institute of Technology at Hoboken, N. J., B. F. Isherwood, U. S. Navy, Captain Woolsey of the Jersey city ferry, Mr. A. Smith of the North Shore Ferry Company, Messrs. Callan and Dripps of the Pennsylvania Central Railroad Company, Mr. Brown of the Camden and Amboy Railroad Company, and Messrs. Erastus Smith, Charles Haswell, Norman Ward, William and Andrew Fletcher, and other engineers and manufacturers, making a party of about fifty of our best known experts in engineering.

The first boiler tried was a steamboat boiler which had been in use thirteen years—a return flue boiler, 6 feet 6 inches diameter of shell, 28 feet long. It had been subjected, November 4, to a hydrostatic pressure of 82 lbs. per square inch.

At 2 P. M. a large fire of wood burning violently in its furnaces, the gauges, which were placed at a distance of about 250 or 300 feet from the boiler, indicated 58 pounds pressure per square inch. The pressure rose steadily and regularly at a rate of about 2 pounds a minute until, at 2.18 by Professor Thurston's time, a pressure of 90 pounds was reached, and the horizontal seams of the shell began to leak very generally, while a rent started in the flange of the steam chimney at its junction with the shell. At 2.23 P. M. the pressure had reached a maximum of 93 pounds, and the leaks allowed steam to escape as rapidly as it was generated. The pressure then gradually subsided to 90 pounds at 2.50 P. M., when the fires were extinguished and the experiments were ended.

The next experiment was made upon a new construction namely: a copy of the back end of the *Westfield's* boiler, in the spacing of its screw stay bolts and in its dimensions generally. The fires having been lighted, the steam rose in pressure very rapidly, reaching 165 pounds to the inch in 29 minutes; and, while the Professor was entering the figure in his note book, the explosion took place, at 3.51 P. M., with a loud report and producing remarkably interesting effects. One side of the "leg,"—for the construction was that of the "water leg" of a boiler—was thrown a long way out into the adjoining field, tearing down the fence in its way; the other side went in the opposite direction, cutting a large hole in the next boiler, letting out its steam and water, and putting an effectual estoppel upon the proposed explosion of that, at least until repaired. The brickwork of the furnace was thrown in all directions with tremendous violence, some portions falling unpleasantly near the party at the gauges. Both parts of the exploded boiler were deeply "dished." The staybolts had drawn out of the sheets; and, around the holes, were noticed curious markings, resembling the magnetic spectra in their outlines, and possibly indicating the distribution of strains in the metal while yielding under pressure.

The next day, November 23, another boiler was experimented upon, the gauges being now placed 450 feet from the enclosure. This boiler was built by T. F. Secor in 1845, and was removed from the steamer after being in use 25 years; and, when removed, it had a certificate for 30 pounds. It was a return tubular boiler, 12 feet wide and 15 feet 5 inches long. It had been twice subjected to the hydrostatic test, the last time to a pressure of 59 pounds without fracture.

On this occasion, the steam rose regularly, and at 50 pounds some of the traces gave way with a loud report, and at 53½ pounds, the water standing 15 inches above the flues, it exploded with terribly destructive effects. The steam chimney, with a part of the boiler top, weighing altogether several tuns, rose to a great hight in the air, falling over four hundred feet from its original position, and the boiler itself was torn into hundreds of pieces, the flying fragments tearing down the high fence and injuring others of the boilers remaining to be tested.

Mr. Stevens concluded to leave the other proposed experiments until some days later, in order that all interested persons might have an opportunity to witness the effect of this last explosion, and to satisfy themselves that steam boilers are not necessarily safe because there is "plenty of water."

The public owe a debt of gratitude to Mr. Stevens and to the United Railroad Companies of New Jersey for the professional zeal and enthusiasm that has proposed and urged the prosecution of these experiments, and for the liberality which has enabled them to be carried out. We doubt not that thousands of dollars and hundreds of lives will be saved by this signal disproof of the prevalent belief among engineers that a boiler is safe from explosion so long as it has a good supply of water, even though old and worn out.

Other wealthy railroad and steamboat companies owe it to themselves and to the public that the New Jersey companies are not compelled to pay all of the expenses of these experiments, and that Mr. Stevens is not compelled to stop in this good work for lack of funds.

The experiments having now ceased for lack of means to continue them, *Congress* has been petitioned to provide funds to prosecute them to final results. We trust this petition will be granted as not only engineers, but the general public, are greatly interested in obtaining more light upon the subject. We know of no scientific work more worthy assistance from the General Government, and none from which more practical benefits are to be anticipated.

Williams' Car and Tender Loading Apparatus.

Mr. James Williams, of Bell's Depot, Tenn., has just patented an invention which consists in a box holding a sufficient quantity to load the tender with fuel or the car with freight. The box is pivoted on a frame higher than the tender and car, so as to tilt toward the tender and car, and the side of the box which swings down is hinged so as to be let fall upon the top of the tender or car and form a chute for conducting the contents into the vehicle to be loaded. The ends of the hinged side have pieces similar to the end boards of the box, which assume a vertical position when the side falls down, and form sides to the chute, preventing the escape of the contents of the box over the ends.

For loading tenders, the box is much smaller than is required for discharging a car load at once into a car, and is arranged in vertical ways. A hoisting drum and other necessary apparatus for lifting the box from the ground to the proper elevation for discharging is employed; but for loading cars the freight should be as high as the box to be put into it, or it may be carried up by elevators. The frame supporting this loading apparatus is mounted on car wheels to to be run along a temporary track, to facilitate the taking of the wood or coal from different positions, and conveying the load to the proper place for discharging.

THE refusal of Mechanics' Unions to reconsider their unreasonable restriction, whereby their own sons are denied the privilege of learning the trades of their fathers, is one of the mysteries of the age. We have before alluded to this, for we feel that the prosperity of the country, the interest of humanity, and the welfare of coming generations, all demand that the shutting out of boys from learning the trades ought to cease, so that they may be trained up to become good workmen, and be able to learn an honorable mode of living.



BOILER EXPERIMENTS AT SANDY HOOK.

Chromium and its Compounds in the Arts and in Medicine.

The following is a brief abstract of an interesting lecture on chromium, delivered by Dr. Louis Feuchtwanger, before the Polytechnic Club of New York. It was fully illustrated by specimens.

Chromium is a very remarkable metal, which is very sparingly distributed in the earth's crust. Chromic iron is the only mineral which is found in sufficient quantities to be useful as a source of this element. It is found in serpentine rocks, in veins and disseminated grains. It is quite abundant in Siberia, Styria, Asia Minor, the Shetland Islands, Cuba, and the United States. (The lecturer described the deposits of Pennsylvania, Maryland, North Carolina, and California, which he had carefully studied.)

The constitution of chromic iron is exhibited by the formula FeO, Cr_2O_3 or (FeO,MgO), (Al_2O_3,Cr_2O_3).

The following analyses exhibit the percentage composition:

Locality.	FeO.	MgO.	Cr_2O_3.	Al_2O_3.	SiO_2.	
Baltimore, *cryst.*	20·13	7·45	60·04	11·85		Abich.
" *massive.*	18·97	9·96	44·91	13·85	0·83	Abich.
Bolton, Canada.	35·68	15·03	45·90	3·20		Hunt.
L. Memphremagog.	21·28	18·13	49·75	11·80		Hunt.
Beresof.	18·42	6·68	64·17	10·83	0·91	Moberg

The following minerals also contain chromium:

Crocoisite, PbO,CrO_3, containing 31·3 per cent of chromic acid.

Melanochroite, $3PbO,2CrO_3$, containing 23·3 per cent of chromic acid.

Vauquelinite, $3CuO,2CrO_3+2(3PbO,2CrO_3)$, containing 27·9 per cent chromic acid.

Pyrope, Bohemian garnet, a silicate of alumina, iron, and magnesia, containing from two to six per cent of chromic acid.

Ouvarovite, lime chrome garnet. Silicate of lime and chromium, containing 33 per cent of Chromic oxide.

Emerald, a silicate of glucina and alumina, colored by three-tenths of one per cent of chromic oxide, according to Klaproth.

The following are the more important applications of chromium compounds in the arts:

1. The yellow or neutral chromate of potassa is the basis of all the other preparations, being made directly from the chromic iron.

2. The red or bichromate of potassa is obtained from the foregoing salt, and is extensively employed in the arts. In photography it is the basis of most of the printing processes, on account of the property which it has of rendering gelatin insoluble by exposure to light. In dyeing, it is extensively used as a mordant. It is the material from which chromic oxide, chromic acid, and the metallic chromates are prepared.

3. Chromic oxide is the most insoluble green pigment known; it is extensively used in printing "greenbacks," and in staining glass and painting porcelain.

4. Chromic acid is a powerful oxidizing agent. It is extensively used on this account in chemical researches, is found very useful as an exciting fluid in galvanic batteries, was used for preparing the beautiful "mauve red" from aniline, is employed in bleaching palm oil, destroying the empyreumatic impurities of acetic acid, etc.

5. The chromates of lead, bismuth, baryta, strontia and zinc are extensively used as pigments, varying in tint from the vermillion red of the basic chromate of lead, to the pale straw yellow of the strontia salt. The common "chrome green" is a mixture of chromate of lead and Prussian blue.

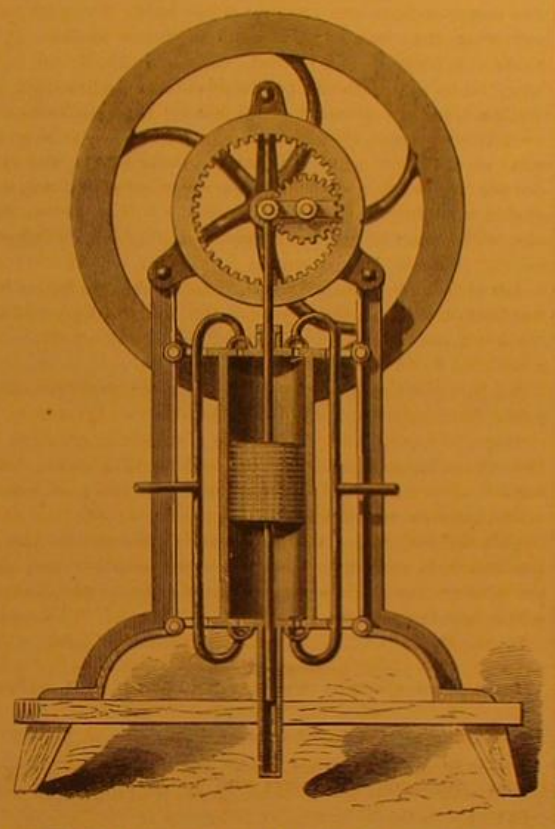
6. The beautiful violet chromic chloride has recently been introduced as a cancer remedy.

7. Chromium steel, made by combining about five per cent of chromium with cast iron, possesses most remarkable properties. On account of its excessive hardness, it is the best metal for the construction of safes, while its tensile strength, equal to a strain of 140,000 pounds to the square inch, especially adapts it to the construction of suspension bridges; it was employed in the St. Louis bridge, and will be used in the Brooklyn bridge.

FREE PISTON AIR PUMP.

Probably the most remarkable pneumatic machine which appeared in the French Exposition, or which has been yet constructed, is the free piston air pump, of Mr. J. A. Deleuil, of Paris. The peculiarity of this machine is that the piston works out of contact with the barrel of the pump, and of course entirely without friction. This piston is a metallic cylinder, and the barrel within which it moves is of glass. But though there is no contact between the surfaces, the space between them is exceedingly minute, being stated at the fiftieth part of a millimeter. It is of course necessary that the workmanship should be very superior, and that the strength of the whole machine should be such as to remove all danger of change of figure, or of any even very slight deviation of movement, or disturbance of the truly concentric adjustment.

The efficacy of this machine depends upon the difficulty and slowness with which gases make their way through very narrow spaces. The film of air between the piston and the wall of the cylinder is practically confined there, and forms a kind of lubricating cushion. The only resistance, therefore, which the piston encounters in its movement, is that which arises from the unequal density of the air above and below it. The engraving shows this machine in elevation. The piston is driven by means of the epicycloidal combination of La Hire, operated by a crank and flywheel. It is guided by a rod extending entirely through the barrel at bottom as well as at top. There are two valves at each end of the cylinder, one opening inward and the other outward. The outward opening valves both communicate with the same tube, which is recurved and united with the cylinder at both extremities. At the middle point of this tube, a branch leading from it may be connected with a condensing apparatus; so that the pump may be used for compression as well as for rarefaction. When used for the ordinary purposes of an air pump, however, this branch is open to the atmosphere. On the other side, the two inward opening valves are similarly connected, and the branch tube on that side establishes communication with the receiver to be exhausted. But when the pump is employed to compress air, this branch is open in its turn to the atmosphere. The valves, as drawn in the figure, are operated by the elasticity of the air. But, in the construction now given to this part of the apparatus, they are opened and shut mechanically by the piston itself. For this purpose, there are introduced two cylindrical rods passing through the piston and reaching from end to end of the cylinder, but capable of a slight longitudinal movement as the piston changes its direction. This movement opens a valve at one end and simultaneously closes the corresponding one at the opposite end; but this change having been effected, the rod remains stationary, the piston sliding on it as it continues its movement. The particular contrivance here described is not peculiar to Mr. Deleuil's pumps, however, as it has been often employed before.



The interior bore of the barrel must, of course, be very truly cylindrical and well polished. The piston is, in length, more than equal to its diameter. When the pump is used for compression, a greater length of piston is employed than is necessary for exhaustion. In point of fact, in this case, the difference of pressure on opposite sides of the piston becomes several times greater than it can be when the machine is employed only to produce a vacuum. There is no difficulty in carrying the condensation, in the course of a very few minutes, as high as five or six atmospheres. On the other hand, exhaustion is effected with remarkable rapidity. With a machine having a cylinder of four and a half inches in diameter, a twenty gallon receiver may be exhausted down to a pressure of less than half an inch of mercury in five minutes. Exhaustion may be carried lower than to the tenth of an inch in mercury.

The figure shows that the piston has not a continuously cylindrical surface from top to bottom. It is cut by grooves of very slight depth, and about half an inch apart. These grooves fulfil, apparently, a very useful function. Suppose the difference of pressure below and above the piston to be very great—the excess being, for example, below: the velocity, with which the air tends to escape on the upper side, will be much less than that with which it tends to enter the narrow space between the piston and cylinder on the lower. But before this superior velocity can be transmitted beyond the first groove, this groove must be filled with air of density equal to that below the piston. And before the same velocity can be propagated beyond the second groove, this second groove must be filled in like manner. As the movement is slow even when the pressure is greatest, it will take a much longer time to transmit, through all the intermediate grooves to the upper limit of the piston, the tendency to movement which exists at the lower limit, than it would do if the piston were quite continuously cylindrical; and thus we have the paradoxical effect of a *packing*, produced not by *adding to* the substance of the piston, but by *taking from* it. It is found, in fact, that the working of the pump may be interrupted a sensible time without turning a stopcock, and yet without vitiation, by the infiltration of air between the piston and cylinder, of the vacuum already secured.

How greatly the world would be benefitted by unlimited facilities for transportation and exchange of goods is shown by the fact that, while the people of Persia are starving by tens of thousands, the inhabitants of some of our Western states are burning corn in their stoves in place of coal.

The Coast Survey.

Professor Benjamin F. Pierce, the distinguished astronomer and mathematician, succeeded Professor Bache, and now superintends the operations of the coast survey. Some idea of the extreme accuracy with which the survey is carried on may be obtained from a description of the manner of measuring the base lines of the primary triangles. Four bars, each a little over two yards in length, are clamped together, end to end, making a combined length of over eight yards, or of exactly eight French meters. These bars are stiffened by being placed in a wooden box, allowing the ends to project beyond the box, the whole forming a measuring rod, which is used as follows: The compound bar is carefully placed in position in the line to be measured, and a powerful microscope placed over the forward end and adjusted so that its crosswise exactly coincides with the edge of the bar. The bars are then advanced until the rear edge comes into exactly the same position under the microscope that the forward edge has just left. A microscope is now adjusted over the forward edge again, the rod advanced as before and adjusted to its second position. This process is repeated until the base line of six miles, more or less, is measured. During the whole time, the temperature of the bars has to be carefully observed. The base line apparatus now in use was devised by Professor Bache, and has superseded the one here described on account of its greater accuracy. The measuring bar is so constructed that its length is not affected by changes of temperature, and greater nicety is obtained in making each successive length of the bar commence precisely where the previous one ended. Such accuracy has been obtained in the use of this apparatus that repeated measurements of the same mile do not differ from each other more than one twentieth of an inch. The necessity for such accuracy does not at first sight appear, but becomes evident when we remember that an error of a one-thousandth part in the base line is reproduced in such a way that all the lines measured will be in error a one-thousandth part. This, in a line of one hundred miles, would be about five hundred feet. An error of five feet in that distance would disgrace the survey. In order to verify the triangulation, a line is established by means of it at a considerable distance from the base, and then measured with the base line apparatus. The length of the line by the two methods should agree. It is a source of gratification to those who take pride in the successes of their own country that our coast survey, tried by these checks, is not surpassed by the most careful surveys of any other country. The accuracy which is indicated by this method of measuring the base lines is an example of the accuracy required in every part of the survey. In the triangulation, the form of the earth has to be rigorously taken into account, and the angles are obtained by repeated measurements with the most accurate instruments. The geographical positions of the various stations have also to be fixed by the most refined astronomical observations, reduced by the most elaborate and accurate methods. In this way, the assumed figure of the earth is constantly tested and the effect, upon the plumb line, of its irregularities and want of homogeneity shown. Two methods of making astronomical observations, first introduced into work of the kind by the United States Coast Survey, have drawn very flattering commendation from the old astronomers and masters of survey in England and Europe generally. They are that of determining the latitude with the zenith telescope, and that of determining the longitude with the aid of the telegraph. The accuracy obtained by these methods is such that they have nearly superseded all others.

A California Tea Plantation.

A writer in the *Overland Monthly* for January says: At Colonel W. W. Hollister's, I saw something I had never seen before. The Colonel has a tea plantation, in an evidently flourishing condition; but, though the plants looked thriving, and the planter believes that, in time, he will reap an abundant harvest, this is a venture I should not advise many to embark in for the present. Fortunately, Colonel Hollister has both the means and the disposition to make these experiments, of which the farming community of all California will some day reap the benefit. Shall I expose my ignorance by confessing that I never before knew that there is really but one tea plant? The different varieties we buy are only the result of the different manipulations in preparing it for the market. The plants themselves look to me like little, young orange trees. I saw them from one to four inches in hight, and the seeds are about the size and shape of a small hazel nut. Together with the tea, the Colonel has imported a "live Japanese," to take charge of the plantation; so that if tea raising succeeds at all, it certainly will here. His almond orchard, too, is on a grander scale than that of his neighbors: fifty thousand trees have already been set out—some of them, in fact, are over two years old—and fifty thousand more are being planted. Speaking of his neighbors: they are not so very near. The Colonel has a hundred thousand acres, more or less on which to plant tea, cotton or Canada thistles, should he so choose.

JOSEPH GILLOTT, who died at Birmingham, England, January 5, at the age of seventy-two years, had a world-wide reputation as a manufacturer of steel pens. He was born at Sheffield, and removed to Birmingham when about thirty years old. In 1803 Mr. Wise, of Great Britain, began the manufacture of steel pens. Mr. Gillott became interested in the business, and by his wonderful mechanical talent made several improvements and built up a large trade. About thirty years ago he put up the extensive Victoria Works, on Graham street, Birmingham, which are to-day one of the sights of the town.

IT is an ancient proverb, "The feet of the avenging deities are shod with wool."

Correspondence.

The Editors are not responsible for the opinions expressed by their Correspondents.

Class Legislation and the "Working Man."

To the Editor of the Scientific American:

After repudiating the communistic nonsense which is so frequently and erroneously attributed to us as a class, it becomes our duty to oppose, with all our powers, the idea that our occasional troubles are to be remedied by exceptional legislation, and by defiance of the laws of political economy; in other words, that an evil can be cured by a folly, perhaps by a crime.

Class legislation, the parent of all jobbery, political intrigue and malversation of public property, is the favorite panacea, for short work, low wages and dull trade, of all the writers and talkers who are trying to tinker this matter; and such of us as value our independence, and believe that all legislative enactment should deal with the public as a whole and on general principles, will join with me in repudiating any violation of this principle, the maintenance of which is vitally important to the interests of any nation whereof the working people form a considerable portion. When government by public opinion is superseded by government by "rings," the interests of the working men are the first to go to the wall. We have had all sorts of special acts of Congress passed in the last few years; the majority of these are ostensibly intended to raise artificially the prices of commodities, and the public are informed that only by these high prices can high wages be paid. In the meantime, wages are falling on every hand, the charges for all the necessaries of life are, almost without exception, what they were when gold was at 180, and the public lands of the west (the almost boundless extent of which, offering new fields for industry and enterprise, is the real reason why wages are high in our country) are being jobbed away by millions of acres to railroad companies and other wielders of powerful influences, well known to Congress and to State legislatures, to lobbyists and other enemies of the public welfare. The loudest talkers and the most pretentious of our would-be friends are advocates of these class laws, who think they can bolster up a falling trade by an act of Congress or a subsidy; they have had their own way for some years, and now goods are at famine prices, wages are falling, the export trade and the enterprise of our merchants are on the wane, and, as usual, the working men suffer, more severely than any other body, the injuries resulting from a subversion of the laws of political economy. Have we not good reason for deprecating this suicidal policy, however specious may be the smooth speeches of the monopolists who are so disinterestedly advocating our interests, and who never, on any account, are influenced by considerations personal to themselves?

I will give an instance of the effect of attempting to make things pleasant by resisting the laws of Nature. Recently, in London, the number of laborers engaged at one of the docks was much reduced by the weather, and employment was scarce. The men out of employ offered to take lower wages; the men in work resisted their being engaged. Now the wages of a dock laborer are none too high anywhere; he is required to exercise only physical strength, and no man with knowledge of a handicraft would willingly spend his time in hauling bales of goods. Therefore the work is always done by men who are not accustomed to anything but a rough and penurious life; and in resisting the reduction of wages, the hands in work had as fair a claim as any man can possibly have. We take it for granted, then, that it would be a great hardship to these people to have their scanty pay still further reduced, for reduction of such a pittance means dispensing with some of the actual needs of existence. But, in candor, we must consider the case of the majority, who were out of work. They say: "You have had your five dollars a week for some time, we have had nothing; we are willing, and shall be glad, to take four; you do not want your meals diminished in number to two in a day, we are without a meal at all. Let us, whose necessities are greater than yours, have our turn. Our willingness to take less wages is a proof and a good indication that, and how far, our needs are greater than yours. Let us have a chance. Your talk, of its being for the interests of laborers as a class that wages should be kept up, means only that *your* pay must be maintained at its present rate; our only chance of getting work, and thereby bread, is by the reduction of wages." What can legislation do in such a case? What is the use of fighting against Nature, and attempting to make water run up hill? If men would reflect and see that the curse of society is too much legislation, that the interference of the government with trade and economical questions is as illegitimate as it is with religion, dress, and diet, there would be some chance for the permanent elevation of the social status of the working people. We have our brains full of vigorous life, we have almost exclusive possession of the mechanical ingenuity which now produces so large a share of the world's subsistance, we may say, without boasting, that we are loyal and law-abiding, and capable of the moderation and self-restraint without which man is a worthless blatherskite; and other trades and professions cannot refuse to call us brothers, if legislators and grievance mongers would only leave us to our own independence.

The most scandalous malversations of the public funds ever contemplated are the proposed subsidies to ship builders, and I am glad to see that no workmen are found clamoring for access to the public purse. Why? Not because a workman has not as much right to a share of the public money as another, but because employment created at the national expense is only pauperism on a large scale; and the workmen are not the persons for whose benefit subsidies are voted. They have always been the victims, not the *protégés* of class laws and special legislation; and if there are some among us who are not yet aware of the fact, they will certainly soon find it out.

In conclusion, let me say that we are not less anxious to repudiate the accusation of communistic ideas than we are that of a desire for national aid and public eleemosynary benefits; and a summary of all that we can say or think on this subject is comprised in the following short, pithy, and peremptory sentence: Let us alone.

In another letter, I propose to remark on some of the legitimate remedies for our troubles and difficulties.

New York city. PRINTER.

Zinc Amalgamation for Extracting Gold and Silver.

To the Editor of the Scientific American:

I am glad to see that Mr. Butler asks if extraction of gold and silver by this mode "has been practically used in any place on a large scale." I hope for some light on the subject in reply to his query. I have sought (by private means) to learn if such was the case. I have thus far only heard from those who set forth their theories, but fail to adduce facts.

What we need, are facts. It is the business of the miner, the world over, to mine and raise the ore. Then the ore is taken by the stamp mill or the smelting works and the metals extracted. Now many seem to think the miner should step aside, from what I conceive to be his legitimate business, to test any new process which seems to have a correct theory behind it. He should not; when facts are shown, proving that such a mode, at such an expense, will do more for the miner than the millman or smelter can do to-day, that mode will find speedy adoption. The field is a large one. The waste is now enormous. The reward to the successful man will be great.

Let me give you some figures, from a mine in Colorado, so well attested to me that I am ready to be responsible for them. The mine yields gold and silver, and the figures cover a period of forty-one weeks, ending December 9 ultimo. The gross yield, in currency, was over $72,000; the actual profit, from this yield, was over $29,000.

Tests, repeated week after week, render it sure that less than three fifths, in value of the gold and silver, was obtained. The actual value, in currency, of the metal wasted was, therefore, more than $48,000.

This difference was actual waste, a subtraction from the wealth of the country of just so much actual value, in all probability never to be regained, aside from the loss to the parties owning the property. LAMBDA.

Boston, Mass.

Iron and Copper Pyrites in Gold and Silver Ores.

To the Editor of the Scientific American:

The gold found in this combination, instead of being of a bright yellow color and metalic lustre, is of a grayish brown, dull tint. In this condition, it is known as "rusty gold," and seems to be quite indifferent to the action of quicksilver. Experience shows that this class of ore, on melting, gives a regulus of bright gold, containing 99 per cent of the original. This experiment indicates that there is a film of some other substance upon the surface of the rusty gold. Besides ferruginous sulphuret of copper, may there not be tennantite, white copper and the different classes of arseniate of copper, all of which contain more or less arsenic and sulphur? In some instances the amount of silver in the pyritical ores is usually very small. A small portion, alloyed with gold, is saved in the stamp mill; but by far the larger part, being in a state of sulphide which will not amalgamate, is lost. Why? This is the problem of which the solution has been long looked for.

The fact that copper is found in these ores in combination with silver as well as gold, indicates that the species of silver is the sulphuret, that is, brittle sulphuret of silver, which contains silver, antimony, iron, sulphur, arsenic and copper; sulphuretted antimonial silver, containing silver, antimony and sulphur; or, it may be, carbonate of silver, composed of silver, carbonic acid, oxide of antimony, and a trace of copper. However, the striking resemblances, of these species containing sulphur, antimony, arsenic and copper, would lead one unskilled in mineralogy and metallurgy to form a fixed idea that the film of some substance found on the surface of rusty gold is a combination of the heretofore mentioned impurities. Of course, this coated gold can be saved only to a small extent by the ordinary stamp mill process.

The partial desulphuration effected by the many patent processes which have infested the territories will not accomplish this. Why? The chemical nature of this coating has not yet been absolutely ascertained

The fact that so high a roasting is required to remove it, clearly indicates that it is not sulphide of iron; while other circumstances would lead us to believe it to be oxide of iron; but may it not contain antimony and arsenic? It has been generally supposed that desulphurating ores by heat would remove the impurities that impeded amalgamation. This has proved an erroneous idea; sulphur is not the only obstacle to the process of amalgamation.

In Colorado ores we have, in combination with gold and silver pyrites of iron and copper and all these in combination contain more or less antimony and arsenic, which are directly opposed to the affinity of quicksilver. Hence it is palpable that these impurities must necessarily be removed by chemical agencies accompanied with mechanical power to stir the substance up and keep the whole in motion, reducing them to chlorides, and then running them off by means of a faucet (thus leaving the ore in a condition for amalgamation) before the amalgamating process is commenced. The shameful loss in these and all other classes of gold and silver ores, proves that the processes of chlorodizing in use are a failure, and that heat by roasting, alone, only partially removes the impurities at an astounding cost. Scientific men, so called, have made stupendous mistakes of judgment; but they have been surpassed by the blunders of practical men, so called. The scientific men without practice and the practical men without science, the honest men without capacity and the smart men without honesty, have done so much to destroy the mining industry of the territories, that the very fact of its continued existence, after such terrible trials, is proof of its inherent vitality and future prosperity. The great question apparently still remains unsolved by practical operations on a large scale: Will mere desulphurating by roasting leave auriferous pyrites, in a condition suitable for the extraction of the gold and silver by amalgamation? Experience thus far is discouraging; but we need not doubt some simple expedient will be discovered; overcoming the difficulty. That such an invention is needed appears from the fact that chloridizing and smelting, two processes which are acknowledged to be metallurgically perfect, are too expensive to be applied to a large class of ores, for which amalgamation will probably always remain the available method.

PERCIVAL STOCKMAN.

[The above is by an experienced miner who has spent many years in the mines of California and in the silver mines of Mexico and South America.—EDS.]

Turbine Water Wheels---A Proposition.

To the Editor of the Scientific American:

I propose to the builders of turbine water wheels throughout the United States, or to as many as may see fit, to meet me at the Grand Central Hotel in the city of New York on some day to be appointed, for the purpose of selecting some suitable place, near one of our cities, say Boston, New York, Philadelphia, Baltimore or Richmond, where we can have our water wheels tested and examined by a committee of competent and disinterested persons; with the understanding that said committee shall reject all wheels sent them which may be made or finished differently from those offered for sale; and that all the wheels sent to the committee, and not rejected by them, shall be examined and properly tested; and that a report of the merits of each wheel tested shall be published; and that all expenses shall be equally divided and paid by those who send wheels to be examined and tested. N. F. BURNHAM.

York, Pa.

Condition of our Navy Vessels.

Since the Spanish war speck has appeared on the horizon, our daily papers have taken up the subject of our war vessels; and, from the discussions and information otherwise obtained, we should doubt if our naval authorities are prepared for an emergency, should hostilities be commenced between this country and Spain. On the authority of the *World*, we learn that at the Brooklyn navy yard there are three still unfinished vessels lying, on which not a day's work has been done since the close of the war. These are the first rate screw steamships, Java and New York, each of 2,490 tuns burden, and the ironclad Colossus, 2,127 tuns, and fitted to carry ten guns of large calibre. The Java is constructed of white oak, the New York of live oak, and both will be splendid vessels if they do not rot before they are launched. The Colossus will require a year's work for her completion, but the others could be finished much sooner if there were any money to carry on the work. There are no vessels in commission, although a number are lying there for repairs. Among these are the Minnesota, first rate, 2,912 tuns and forty-five guns; the Roanoke, second rate, ironclad, 2,260 tuns and six guns; the Florida, second rate, 2,135 tuns and twenty-five guns; the Tennessee, second rate, 2,135 tuns and twenty-three guns; the Hartford, second rate, 2,900 tuns and eighteen guns; the Canandaigua, third rate, 955 tuns and ten guns; the Iroquois, fourth rate, 695 tuns and six guns, and the Portsmouth, fifth rate, 846 tuns and fifteen guns. There are also two storeships, the Guard and the Supply, the former carrying four guns and the latter two. It might be imagined, on viewing the rather formidable array of guns and ammunition presented at the yard, that the country was fully supplied; but on closer examination such would be found to be not the case, as by far the larger quantity of powder is the remnant of what was left over after the war, and consequently has not improved by age. Most of the guns are Parrotts, of which there are three hundred, ranging from twenty to one hundred pounders. Of smooth bore guns there are three twenty inch guns, twelve fifteen inch guns, twenty-eight nine inch guns, ninety seven eight inch guns, and one hundred howitzers. This enumeration includes only those which are serviceable. The small arms comprise a number of pistols and cutlasses, and about two thousand Remingtons. The above quantities represent the whole of the navy yard supplies, and it may well be asked: What would be done if war were declared?

Of all the vessels now at the yard, only the Canandaigua is nearly ready for active service, though the Hartford and Portsmouth are also fitting for sea. The Canandaigua can be made ready in about ten days. In case of war, little assistance could be furnished from here, unless large extra expenditures were authorized by Congress. With abundance of men and money, only one vessel in addition to the Canandaigua—the Portsmouth—could be made ready in a month, and then only as a sailing vessel.

In six months, under the same conditions, eight vessels could be made ready, including the ironclad Dictator, now

lying at New London. Perhaps the most formidable engine of war would be the Stevens floating battery, which is at the present time being put in a state of completion, and is expected to be quite ready for action within forty days' time. As the battery now lies in the yard at Hoboken it appears unwieldy, but ere a fortnight a vast change will be apparent. It has been pronounced by naval connoisseurs one of the most formidable of engines of war. Its keel was laid down in 1840. Since then it has been on the verge of completion thrice, but the changes in naval architecture have been so numerous and important that it has been taken apart to make it conform to these improvements. It is nearly 300 feet in length, is 25 feet beam, and draws 21 feet of water. Its frame is built of the stanchest of live oak. This is covered by teak planking, which in turn is backed with two foot teak slabs. The outside armor consists of five inch chilled iron plates. These are secured to the wood by headless bolts. By this method, the surface on each side of the vessel is smooth, and affords no opportunity for plunging shots to tear off the plates. Its battery will consist of seven guns; four of these are 500 pound rifled Rodmans. The remaining three are 250 pound rifled Parrotts. Her prow is composed of solid iron, backed by oaken logs, and will prove a powerful ram. It is confidently expected that she will be enabled to steam at the rate of twelve knots an hour. Taken altogether, she is a war ship that, if brought into action, will astonish the Spaniards quite as much as did the Monitor the people of the Merrimac.

PREPARATION AND COMPOSITION OF ALLOYS.

The following instructions are extracted from Fesquet's translation of Guettier's metallic alloys, noticed in our last issue:

As generally practiced, the metals to be combined are melted by processes and in apparatus which vary, according to the quantity of alloys to be cast or the nature of the metals under treatment.

The metals easily fusible, such as lead, tin, etc., are melted in a ladle, or in wrought or cast iron kettles.

The more refractory metals are melted in crucibles, whose qualities of solidity and resistance to the fire are the more sought for as the metals have a higher point of fusion, or are more valuable.

For gold, silver, and platinum, we require crucibles of a superior quality, which will not crack, and thus lose in the fire the metals they are intended to receive.

For copper and its alloys, although requiring crucibles as solid and lasting as possible, we look more towards economy, because the work is frequent and regular, and we operate on quantities of less value.

When the mass of metal becomes considerable, whether because many castings are to be made, or because of the heavy weight of the pieces, instead of the crucibles, we operate in reverberatory furnaces, and sometimes in cupolas.

The processes of melting and mixing the metals in a crucible, however simple they appear at first sight, require certain precautions upon which we cannot too strongly insist.

The alloys made in one operation are always very difficult of preparation, when the metals, such as zinc and lead, copper and lead, for instance, possess a sort of "antipathy" in their affinity. It is with much trouble that we obtain, in this way, thoroughly homogeneous castings, presenting the same body and grain of similar alloys, which have already passed through a previous fusion.

In order to arrive at the best possible results, without employing the method by separate operations, it is proper, as a rule, to endeavor to operate according to the following principles:—

1. To charge the crucible, and melt first the least fusible of the component metals.

2. When this metal is in fusion, to heat it up to such a point that it will be enabled, without too great a cooling, to bear the introduction of the other component metals.

3. Once the first charge is in fusion, to introduce the other metals in the order of their difficulty to melt.* Whatever are the proportions of the component metals, and no matter which is the basis of the alloy, it is absolutely necessary that the most refractory metal should be melted first. Its fluidity, indeed, gives the measure of the temperature necessary for finishing the alloy. By charging first a fusible metal, it may volatilize and become oxidized, and the crucible may also break by raising the temperature high enough to receive, without too much cooling, a less fusible metal. At the same time, there will be more waste, and the proportion of the alloy will be sensibly changed.

4. To present at the flame of the furnace the metals which are to be subsequently added, in order to heat them as much as possible, and thus facilitate the change of temperature which takes place when the new metal is added to that or those already melted in the crucible. This practice is especially good when we have to introduce a volatile metal, such as zinc, which, being melted too rapidly, may cause the crucible to break.

5. To stir after the introduction and melting of each component metal; and to cover the crucible, at the same time that the fire is increasing more or less, according to the less or greater fusibility of the metal.

6. To cover the alloys rich in zinc with a layer of charcoal dust. This is not necessary when there is not in the alloy any metal, such as copper or iron, having a high point of fusion; or when the proportion of zinc added does not require a protracted heating, and the alloy may be poured out immediately. With alloys rich in tin, the charcoal dust will cause the scorification* of part of this metal; therefore it is preferable to cover the surface of the molten mass with refractory sand or pulverized sandstone.

7. To stir thoroughly the molten alloy just before it is cast, and, if possible, during the pouring out. The stirring is to be done with a stick of white wood, burning without splitting; and not with an iron rod, which has a tendency to produce dry alloys, and may modify the nature of the compounds by adding some iron to the alloy—a small proportion, it is true, but nevertheless appreciable.

8. To carefully clean the crucible after each operation, in order to maintain the accuracy of the mixture, and facilitate the fusion.

Such are the main conditions for obtaining alloys in one operation. If alloys thus prepared give some trouble in obtaining good results, they are very economical, and present the advantage of keeping, as strictly as is allowed by the fusion, the proportions of the mixture.

Moreover, in practice, it is generally acknowledged that a small proportion of an old alloy, added to a new one, improves it by giving it the homogeneousness which otherwise would be imparted only by a second fusion.

In ternary or quarternary alloys, made of copper, zinc, tin, and lead, it will always be well, in order to obtain more homogeneousness in the final mixture, to alloy beforehand the more fusible metals, such as zinc, tin, and lead; and to combine this first alloy with the copper, under the best conditions possible. In this way the last combination will possess better qualities than an alloy made in one operation.

However, we repeat it, alloys made by the first direct method, although much more simple and economical, do not answer all the wants of the arts, and do not present the same guarantees as those which have been remelted. For instance, runners from bronze or brass castings of a first fusion, when melted again, and when the primitive proportions were good, present a better grain, and a metal without defects, which is more easily worked than another alloy made directly by one operation.

The pieces cast with alloys made by the direct method—we always mean those in which copper is a component part—are possibly less liable to breakage and shrinkage than if made from old metal; but, on the other hand, the surfaces are not so clean, and the grain is not so close and easily worked. Moreover, such alloys are not very fluid, and do not produce sharp casts. These defects are more to be guarded against in the case of statuary and ornamental bronzes than when pieces of machinery are to be produced.

As a rule, the oftener a metal is melted, the more it loses its previous qualities.

* This is a general rule, to be applied in most cases; but there are exceptions. For instance: gold will easily dissolve in melted tin, and platinum in many metals. If platinum were first melted, and zinc, for instance, added, the temperature necessary to obtain the fusion of platinum would be sufficient to volatilize the zinc.—*Trans.*

* The author uses the word "scorification," but we do not think that the term is entirely appropriate. Nevertheless, it is certain that charcoal is not favorable to alloys of tin and copper, and that pure clay crucibles are to be preferred to those of plumbago for such alloys. Metallurgists know that at a certain period of the refining of copper, the metal is carburized and brittle. In order to prevent this carburization, it has been recommended to give a coat of pure clay to the interior of plumbago crucibles.—*Trans.*

THE AMERICAN HISTORICAL RECORD

"The American Historical Record, and Repertory of Notes and Queries, Concerning the History and Antiquities of America and Biography of Americans," is the title of a new publication, edited by Benson J. Lossing, and published by Chase & Town, 142 South Fourth street, Philadelphia, which promises to be interesting and useful. Those with literary and antiquarian tastes will find in it—if the future numbers correspond with this specimen number—much rare information and a medium for the exchange of such items of history as are at present traditional or to be found only in books so rare as to be only accessible to few. The plan of the publication also comprises historical discussions and essays, current historical literature, records of the proceedings of historical societies, engravings, etc. It is a monthly. The subscription price is $3.00 per annum. Mr. Lossing is well known to the public as an author eminently fitted to conduct a magazine of this kind. We make the following extracts pertaining to early American industries:

BUTTON MAKING.—It is a notable fact in the history of American manufactures, that the first maker of covered buttons, Samuel Williston, is yet living. In early life he was preparing to enter the ministry, when his eyesight so failed that he was compelled to give up study. He kept a country store in which the wooden buttons, then in general use, were sold. His wife covered some of these buttons with cloth. They became popular. Williston and his wife contrived machinery to do the work, the first ever employed in the United States. An immense manufactory grew from this seed, and made half the covered buttons of the world. Williston's factories are still running at East Hampton, Mass., and he is worth several millions of dollars.

THE OLDEST DAILY AMERICAN NEWSPAPER.—On the 28th of October, 1871, the *North American and United States Gazette* of Philadelphia celebrated the one hundredth anniversary of its birth. It was first established by John Dunlap, in 1771, with the title of *The Pennsylvania Packet and The General Advertiser*, a small folio sheet, published weekly. It was an adherent of the republican cause in America. In September, 1784, Dunlap & Claypoole commenced publishing it daily, and it was the first daily newspaper printed on the American Continent. Its name was soon changed to *The American Daily Advertiser*. Forty years later it was merged into the *North American*. In July, 1747, *The North American* and *The United States Gazette* were consolidated with the present title; and since 1854, Morton McMichael (for a long time a partner in the ownership of *The North American*) became its sole proprietor, and remains so. It has been a deservedly influential publication during its century of existence.

A RELIC.—In Pittsfield, Massachusetts, is an anvil which was brought to this country in 1663, by Elweed Pomeroy, who had forged upon it the ponderous horse shoes used in the reign of the first Stuart, King of England. Like the Egyptian anvil in the British Museum, three thousand years old, the Pittsfield implement, of precisely the same shape, is as sound as when the first blow was struck upon it.

COAL.—Bituminous coal was mined near Richmond, Virginia, so early as the year 1700; and a Richmond farmer used it in making shot and shell during the Revolution of 1775-'83. According to the statements made by Volney L. Maxwell, in a lecture at Wilkesbarre in 1858, anthracite coal was first used by Obadiah Gore, a Connecticut blacksmith in the Wyoming valley, in 1768. Jesse Fell, of Wilkesbarre, was the first to use it for domestic purposes. Philip Ginter, a hunter, discovered the Lehigh coal in 1791. The Schuylkill coal was first sent to Philadelphia in 1812.

Sewage Poison.

It had better be admitted at once, says the *Engineer*, that the specific property, that renders emanations from sewers and cesspools so dangerous to health, is not clearly understood. A gentleman of eminence has lately directed attention to the use of charcoal as an agent effectual for the absorption and destruction of sewer gases; but the question after all is, whether typhoid fever is produced by gaseous products exhaled from organic matter in a state of decomposition, or is attributable to the presence of a specific germ. It is certain that those whose calling brings them into daily contact with decomposing matters of the most offensive kinds are not affected by any special forms of disease; and it is also well ascertained that sewage emanations, possessing little or no offensive smell and not necessarily the result of decomposition, have produced typhoid and other complaints. There is no longer a doubt that cholera poison is a perfectly specific source of disease.

It has been collected from our sewers and experimented upon until its properties and characteristics have been clearly ascertained. It produces choleraic symptoms, of any degree of intensity proportioned to the dose employed and composed of such minute cells that it will pass through the closest filter. The probability is that other diseases are also produced by specific germs borne in the atmosphere; and if so, it will be unsafe to place implicit reliance upon charcoal or any mere deodoriser. Doubtless the gases that are evolved by decomposing sewage matter will, of themselves, seriously affect health; but there is nothing to show that charcoal has any effect in checking the spread of special diseases, or in arresting the passage of germs, of such minute dimensions that they will pass through finest filters and even elude the search of the most powerful microscope. The object of sewer ventilation is not, as is sometimes supposed, merely to purify or destroy foul and stinking air, but it has for its further aim the destruction or dilution of the insidious and probably inodorous poisons that associate with these foul smells. Where access can be had to furnaces and chimney shafts, complete destruction of all sewage products can be accomplished; but in the absence of such means, reliance must be placed on free dilution by discharging the sewer air above the roofs of houses and beyond the lungs of our populations. The experience and conclusions of Dr. Alfred Carpenter cannot, at this time, be too prominently placed before the public for it is only at a juncture like the present that they are likely to receive attention. He says: "Many facts have been brought to my observation as to the power of sewer gas to produce disease; as a factor in the production of typhoid fever its power is now well known. Many other diseases of the system have been directly traced to its influence; thus diarrhœa, dyspepsia in all its forms, palpitation of the heart, various forms of asthma, convulsions, especially in teething infants, and headaches, both persistent and intermittent." These, and a further list of complications, are the inevitable results of exposure to sewer gas whether it reach the system through traps from public drains, or attacks us more directly from soakage under our houses, or through the medium of a contaminated cistern or well.

The Pursuit of Strength.

Those unfortunates who devote their lives to the pursuit of strength, according to *Hall's Journal of Health*, who rise at unearthly hours, and shiver under ice cold shower baths, who never eat as much as they wish or what they wish, who live as mechanically as possible, and conscientiously deprive themselves of about all reasonable enjoyment, are certainly to be pitied. Still their terrible system leaves them alone during the night. If they eat, drink, move, and have their being under its supervision, through the day, at night they can sleep undisturbed. But a new school has arisen in California. Some crack-brained enthusiast has announced that he has prolonged his life for years by sleeping with his finger tips touching his toes. The reason of the advantage of this proceeding is not at first evident, but is easily understood when we read that "the vital electrical currents are thus kept in even circumflow, instead of being thrown off at the extremities and wasted." The discoverer has given the valuable secret gratuitously to the world, actuated solely by a desire to benefit suffering humanity. "Machines, warranted to hold the body easily in this position, can be obtained only of," etc., etc. If the method comes into general use, our posterity will, we fear, be a "stiff-backed generation."—*Chicago Tribune.*

Automatic Check Rein Attachment for Harnesses.

Scarcely any one accustomed to driving has failed to experience the annoyance of being compelled to alight from his wagon to uncheck and check his horse to allow the latter to drink. Every one who drives for pleasure would gladly escape this inconvenience, which, in muddy, rainy, or cold weather, is so disagreeable that we fear the wants of horses are often neglected on account of it. And those who make driving a business would, we should think, gladly avail themselves of so simple a device as we herewith illustrate, when once convinced that it would obviate the necessity of descending from their seats, either to check or uncheck their horses.

The neglect spoken of is probably suffered more by horses hired from livery stables than those owned by their drivers. Such horses will be far more likely to be attended to when this device is attached to their harnesses, as to water them will then give no trouble to their drivers.

The device detracts nothing from the ornamental appearance of the harness. It is entirely out of the way, and costs but little. The inventor informs us that, without advertising or attempting to make a business of selling the device in advance of facilities to manufacture, he has taken orders for a large number in the town where he lives, in the short time since he obtained his patent.

The terret, A, Fig. 2, is substituted for the ordinary check rein hook. It has a pivoted catch, B, made circular, except the recess at the bottom, and having a bevel edge which abuts against a corresponding bevel on the interior of the ring of the terret, so that it can swing backward, but cannot swing forward through the terret ring.

An elastic rubber cord, C, is fastened to the back strap of the harness, by means of a small catch or dog, D. The cord, C, passes forward over the back strap, or through it if made tubular, (as will be done on fine harnesses), till it reaches the terret ring, being somewhat stretched to give it the proper length and tension. At the end near the terret, it has attached to it a metal piece, E, the rear end of which is enlarged into a ball or knob, which, when pulled through the terret ring from the front, passes far enough back to let the pivoted catch plate, B, fall to its place, the recess in the bottom of the catch plate receiving the neck of the piece, E, while the ball engages the plate; so that the piece, E, cannot be drawn through forward again until the catch plate is raised. In an eye at the front end of the piece, E, is attached the snap hook, F, having a loop at the front end, through which the check rein passes.

The cord, G, is attached to the catch plate, B, and when drawn backward, raises B and releases E. The horse can then lower his head to drink, and when he has finished drinking, by drawing upon the driving reins he is caused to raise his head, the elastic cord, C, retracts, carrying back the piece, E, through the terret, A, where it engages with the catch plate, B, and the horse is thus checked again. The cords run through loops on the back strap, or through a hollow tubular back strap, as above mentioned.

The cord, G, which is used to release the piece, E, has a ring, H, Fig. 1, at its rear end. A small hook is screwed into the butt end of the whip stock, by which this ring is easily reached, and the cord pulled to uncheck the horse.

This invention was patented November 7 and November 21, 1871, by John Schofield, of Worcester, Mass., who may be addressed (Box 709), for further information.

Fig. 1.

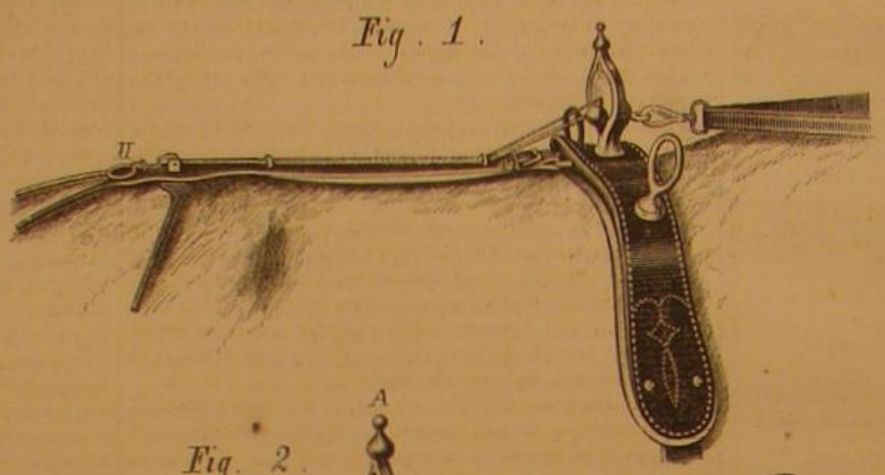
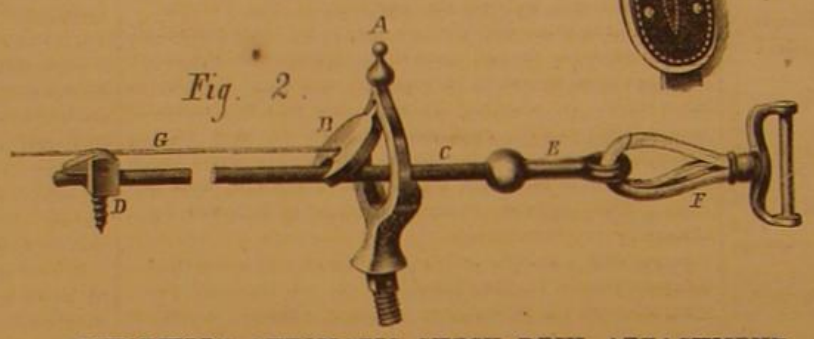


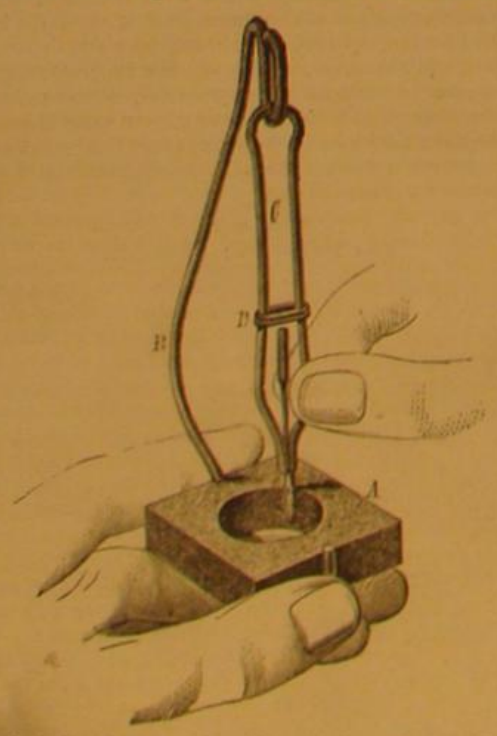
Fig. 2.



SCHOFIELD'S AUTOMATIC CHECK REIN ATTACHMENT.

MECHANICAL NEEDLE SHARPENER.

This is a most ingenious little invention, and one which



has in it the elements of a wide spread popularity. It costs little, and does its work quickly and far more perfectly than it can possibly be done by hand. For sharpening sewing machine needles, or, in fact, any other needle or small pointed instrument, it appears just the thing that has been long needed.

In the engraving, A, represents a pedestal, made of fine emery cemented together, forming a solid stone. The pedestal is square, and has in the center a circular opening.

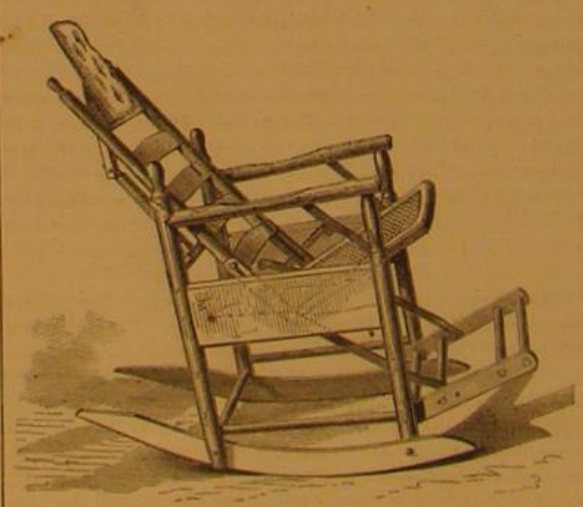
From the pedestal rises a curved standard, B, to which is linked the swinging clamp, C. The latter has two grooved jaws, which grasp the needle as shown, being held firmly together by the sliding loop, D.

The needle being clamped in the jaws, as shown, the swinging clamp and the needle are grasped by the thumb and finger of the operator, and swung rapidly around the inner wall of the opening in the pedestal. At each passage of the needle point, around and against the wall of the opening, it is ground evenly on all sides, and a few turns brings it down to a fine sharp point, the bevel being formed by the inclined position of the needle upon the face of the opening.

The invention was patented June 28, 1870. For further particulars address Currier, Philpot & Co., 5 Haymarket street, Boston, Mass.

HAUPT'S IMPROVED EASY CHAIR.

Next to a comfortable bed, an easy chair is one of the luxuries which adds as much to the comfort, of both the well and the sick, as any article of furniture in modern use. Much ingenuity has been expended to perfect this class of furniture, and there are many that "lap one like a mother," and



which are looked forward to with pleasant anticipation as the first haven of rest into which the weary sink, in the quiet evening hours at home.

Our engraving illustrates an addition to these modern comforters, which seems to possess all the requisites of ease and convenience sought in devices of its kind.

The back, seat, foot rest, and head rest, are all self adjusting and actuated by the movements of the occupant, who is enabled to assume an erect, horizontal, or any intermediate position desired, with very slight exertion.

If the sitter desires to lean back, he places most of his weight on the rear end of the seat, and throws his body backward. This movement starts the pivots of the chair bottom that previously rested in depressions at the rear ends of grooves in the side pieces. The seat moves forward, its rear end descending into these grooves, its front end being raised by swinging braces hinged to the arms and seat. At the same time, the foot rest is moved forward by a rod jointed to the chair bottom and pivoted to the foot rest. The motion of the parts will cease when the movement of the sitter ceases, or will be reversed by his reverse movement.

The parts move harmoniously, smoothly, and easily, and the position of the sitter is changed with that facility which adds so much to the luxury of such chairs.

The invention was patented through the Scientific American Patent Agency by William W. Haupt, of Mountain City, Texas, October 17, 1871.

Science Perfecting Swimming.

Frederick Barnett, of Paris, has patented a novel yet simple apparatus for swimmers. The invention consists in supplying to man, by art, the apparatus which has been given to the frog by nature. For the hands, he has a large membranous fin which is held to its place by loops passing over the fingers and a strap around the wrist. The surface presented to the water by these fins is so large as to add greatly to the effectiveness of the strokes of the arm, but not so large as to exhaust the muscular power. Their effect is to very much reduce the effort usually required in swimming. But the greatest ingenuity is displayed in the form and fitness of the fins for the legs, which are attached to the ankles, and are so formed that they act upon the water, both in the movement of bringing the legs and throwing them back. They act so finely in treading water, as swimmers call it, that one can really walk, if not on the water, at least in it. The difference between swimming with this apparatus and without it, is very much like the difference between rowing a boat with a handle and the blade of an oar. The old swimmer has no trouble in using the fins at first trial, and is surprised to find with what strength he can swim without exhaustion. He easily swims twice as fast with the apparatus as without it, and with it he can sustain himself for hours upon the water, or swim many miles.

Tungsten Colors.

Fine colors are prepared from tungsten, which, being permanent and little acted upon by heat, can be used to advantage on many occasions. Tungstate of baryta is a pure white; tungstate of nickel, clear green; tungstate of chromium, dark green; tungstate of cobalt, violet; tungstic acid, a beautiful clear yellow, passing into orange. Tungstate of soda is not employed in colors, but is recommended for rendering fabrics uninflammable; for this purpose it is better to combine it with phosphate of soda. Metallic tungsten was at one time supposed to improve the hardness of steel, but we hear very little of its use for this purpose, and it seems more probable that the accidental admixture of manganese was the real indurating constituent. It is also claimed that tungsten largely increases the magnetic power of iron.

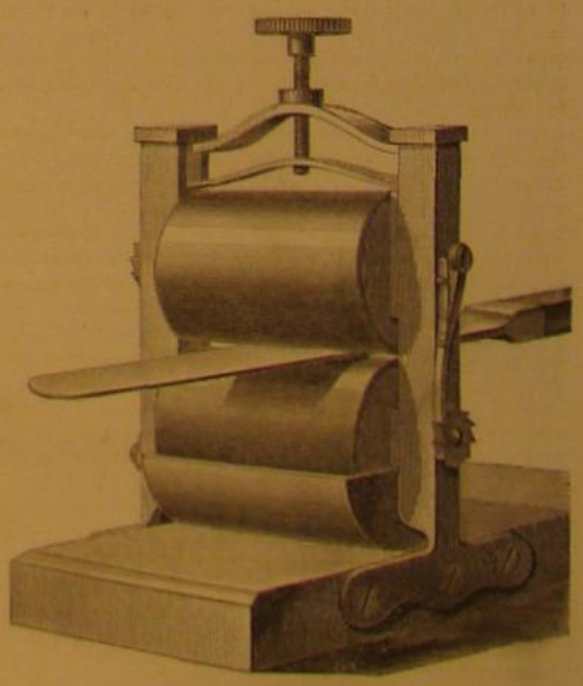
KNIFE CLEANER AND POLISHER.

This is a very neat implement, and we should judge a very efficient and convenient appliance for cleaning knives and forks, designed for hotels, restaurants, or private families.

The engraving illustrates the device so fully that only a few words of explanation are required.

Two elastic faced rollers are mounted in the uprights of a suitable frame as shown. The lower part of the bottom roller is inclosed in a trough for holding the brick dust, emery, or other polishing material. Each roller is controlled by a ratchet and pawl, so that it can only turn in a direction opposite to that in which the other can turn. The rollers are pressed together by a spring, which is adjusted to give the requisite pressure by a screw at the top of the frame.

In use, the knife to be cleaned is thrust in between the rollers, one of which turns while the other is held from turning by the ratchet and pawl. As the knife is drawn back again, the roller which first turned is held and the other one turns, each alternately turning and remaining stationary as the knife is drawn out and thrust in, and thus dividing the labor between the two strokes, rapidly cleaning the knife and giving it the required polish.



This knife cleaner is the invention of William S. Beebe Joseph T. Baynes, and Abraham King, whom address, for further information Watervliet, N. Y.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW (PARK BUILDING) NEW YORK.

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

☞"The American News Co.," Agents, 121 Nassau street, New York.

☞"The New York News Co.," 8 Spruce street, New York.

☞A. Asher & Co., 20 Unter den Linden, Berlin, Prussia, are Agents for the German States.

☞Messrs. Sampson Low, Son & Marston, Crown Building, 185 Fleet street, Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London, are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXVI., No. 4. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, JANUARY 20, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

A California Tea Plantation	51	*Mechanical Needle Sharpener	54
Accurate Workmanship	55	Mechanics' Unions and Apprenticeship	50
Advantage of Californian over European Wine Growers	49	New Books and Publications	57
Answers to Correspondents	58	Notes and Queries	58
Applications for the Extension of Patents	60	Official List of Patents	60
*Automatic Check Rein Attachment for Harnesses	54	Portable Fire Extinguisher	56
Business and Personal	57	Preparation and Composition of Alloys	53
Car and Tender Loading Apparatus	50	Preservation of Stone	49
Chromium and its Compounds	51	Pure Air	56
Class Legislation and the Working Man	52	Recent American and Foreign Patents	58
Condition of Our Navy Vessels	52	Science perfecting Swimming	54
Death of Joseph Gillott	51	Scientific and Practical Information	56
Declined	58	*Scientific Commission of Japan	47
Experimental Science at Cornell	49	Sewage Poison	53
*Extraordinary Experiments on Steam Boilers	50	Soda	49
Fireproof Buildings in Italy	48	Teach the Children to Draw	55
*Free Piston Air Pump	51	The American Historical Record	53
High and Low Steam	55	The Coast Survey	51
History of Ice Making Machinery	47	The Factories of England	48
*Improved Easy Chair	54	The late James Fisk, Jr	55
Inventions patented in England by Americans	60	The Pursuit of Strength	53
Iron and Copper Pyrites	52	The Study of Botany	56
*Knife Cleaner and Polisher	54	Tungsten Colors	54
		Turbine Water Wheels	52
		Zinc Amalgamation for Extracting Gold and Silver	52

Importance of Advertising.

The value of advertising is so well understood by old established business firms, that a hint to them is unnecessary; but to persons establishing a new business, or having for sale a new article, or wishing to sell a patent, or find a manufacturer to work it: upon such a class, we would impress the importance of advertising. The next thing to be considered is the medium through which to do it.

In this matter, discretion is to be used at first; but experience will soon determine that papers or magazines having the largest circulation among the class of persons most likely to be interested in the article for sale, will be the cheapest, and bring the quickest returns. To the manufacturer of all kinds of machinery, and to the vendors of any new article in the mechanical line, we believe there is no other source from which the advertiser can get as speedy returns as through the advertising columns of the SCIENTIFIC AMERICAN.

We do not make these suggestions merely to increase our advertising patronage, but to direct persons how to increase their own business.

The SCIENTIFIC AMERICAN has a circulation of more than 40,000 copies per week, which is probably greater than the combined circulation of all the other papers of its kind published in the world.

ACCURATE WORKMANSHIP.

It has been truly said that no work of human hands is perfect, and that though we may strive to our utmost to secure entire accuracy in workmanship, it will be forever beyond our reach. On the other hand it has often been asserted that the works of Nature are perfect, that they are far superior in every respect to human handiwork, and upon this assumption many a moral homily has been based.

That this proposition has been so generally accepted, affords a forcible instance of the readiness of mankind to accept as truth whatever is presented to them as a generalization. Formulate an idea and lay it down as a proposition, and nine out of ten will accept it as true, because five of the nine will lack the power to detect its falsity, and the remaining four will have too much indisposition to the mental labor involved in logical reasoning, to test whether the proposition be correct or otherwise. About four tenths of the human race are mentally lazy, five tenths are so credulous as to accept anything as a principle which is clothed in the garb of a generalization, and certainly not more than one tenth think for themselves.

Only in one sense are the works of nature more perfect than the works of man. In their adaptation of complicated means to ends, they are for the most part unquestionably above any human production. Yet even on this point there is much illogical inference. We once heard a Professor of Anatomy, in lecturing on the hand, speak of its complicated structure and its marvellous machinery, as one of the greatest evidences of a beneficent design pervading creation. Five minutes later he spoke of the carpal bones and their investing ligaments as being peculiarly liable, on account of their structure, to obstinate and deep seated inflammation when injured; but he did not adduce this as an evidence of a beneficent design. Yet surely there is as much reason to believe that all the effects of a peculiar construction are designed as that one of them is.

But turning our attention to the mechanics of nature, we find that, so far as perfection in form is concerned, human work may stand well in a comparison. It has been said that the types of all the forms employed in the arts are found in Nature; but if we admit this, we shall find on examination that these types are in the majority of instances extremely imperfect. Nowhere in Nature is found a perfect sphere, a perfect cube, a perfect square or prism. We look in vain for perfect cylinders, for absolutely straight stems of trees, for filaments perfectly uniform in size throughout. No individual of any species exactly resembles any other, and even the elementary parts of animal and vegetable structures differ from each other. The anatomist might dissect a thousand subjects without finding two femoral bones that would not differ in some way; and even in the same body the corresponding parts on opposite sides are often found to be somewhat different. So much for the uniformity and mechanical accuracy of natural things. If man's mechanical productions are not perfect, they excel in the particulars named.

There are many practical difficulties in securing accuracy in construction, but we shall find that they may be placed in two categories. The first category includes our own imperfections. These are nature's imperfections. Our vision is so limited that, in very fine work, we must supplement it by the magnifying glass and the microscope. The command of mind over muscle is so far from absolute that, even when the former has been trained to command and the latter to obey through long years of practice, the control of the one and the obedience of the other are still defective. Eye and ear and touch, all tell us falsehoods and never more than approximate to truth.

The second category is found in the lack of rigidity in the materials which we use. Even the diamond, the hardest substance known to man, is elastic and changes its size with every variation of temperature. Nothing we can touch is precisely alike under any two different sets of circumstances. Some things change by absorbing or losing moisture. Others when once changed never resume their original form. So mobile is matter, that a toy cart drawn by a baby hand over a stone floor will generate vibrations the waves of which flow along through the granite, through the legs of the most solid workbench, and set the particles of the material in hand dancing to an entirely new step. All matter throughout the universe, though some of it may seem to the superficial eye to be at rest, is in constant agitation. While the large masses are whirling through space with inconceivable velocity, the smaller masses—molecules—are each moving through what may be—for all we know—even wider orbits in proportion to their size, than those of the sun, moon and stars. The slightest external change is followed by a change in their movements. A man goes on board an ocean steamer with a shingle nail in his pocket, and instantly the compass needle in the binnacle feels the fact, and varies somewhat in its indications. Change, change, is written upon each and every atom of the universe. Nothing shall be constant, nothing shall be uniform. The combined intelligence of mankind cannot command a force strong enough to chain one infinitesimal atom. Endless variety—nothing stable—this is a fiat from which we vainly strive to escape, and to which we cannot find one solitary exception.

HIGH AND LOW STEAM.

An error prevails somewhat extensively among steam users who have not studied the theoretical principles of steam generation, which we propose briefly to correct. It is erroneously supposed that high steam contains much more heat than low steam, and that on this account it will be more efficient in heating buildings and driving engines. We would say to those who entertain this notion that a pound of steam at any pressure contains practically a constant number of heat units. In other words, a pound of steam at either low or high pressure will raise the temperature of a given quantity of water the same number of degrees. This has been thoroughly proved by experiment, the variations from the law being too small for notice in common practice.

It is only the sensible heat of steam which is measured by the thermometer, (the temperature), that increases under pressure, and this increases only as the latent heat diminishes so that the sum of the two is always a constant.

These being facts, it is certainly folly to incur the greater danger of high steam for heating buildings. The low steam will, pound for pound, both in evaporation and consumption, heat just as many cubic feet of air space as high steam.

But although the theoretical working power of steam is measured by the heat it contains, in practice there is a gain in using high steam for propelling engines. Steam generated under pressure is capable of expanding more than low steam, and as this expansive power can be made to perform work, there is a practical economy in using as high pressures as safety will admit; not that the steam contains the power to do more work, but that we can utilize a larger portion—a small proportion at best—of its working capacity. It follows that it takes no more fuel to produce a pound of high steam than a pound of low steam. There is, however, with high temperatures resulting from increased pressure, a greater loss through radiation, to make up for which more fuel will be consumed.

It may be asked: If these things be so, why, in testing the evaporative power of boilers, is it recommended to evaporate under atmospheric pressure? Why will not one pressure do as well as another, provided the proper allowance for radiation is made? We answer that it will make no difference at what pressure we make the test, provided we can keep the pressure uniform. There is usually more or less difficulty in maintaininga constant high pressure, while, with free discharge of steam, there is none in maintaining the atmospheric pressure. It is only for convenience sake that atmospheric pressure is considered by some as more desirable.

In conclusion, we would say that the heat which passes from boilers in the steam generated is the true measure of their working capacity. The heat which passes out in water mechanically suspended does no work. It is only then when the true proportion of the mechanically suspended water is determined that the working capacity of boilers is properly tested.

THE LATE JAMES FISK, JR.

The man whose name heads this paragraph achieved, in a very short time, a prominence in the railway and financial world that has given an interest to the circumstances of his death which his personal merits and character would never have elicited from the public. Our columns are no place for condoning the faults of the deceased by expatiating on his amiability and generosity, nor for homiletics on the scandalous and flagitious vices of which he and, we regret to say, his popularity were very largely composed. Cowardly and wanton assassination has cut him off in the midst of all his notoriety, wealth and pleasures; and New York, amidst the many black deeds that have been committed within her borders, has no greater stain upon her reputation than the murder which has just been committed.

It is difficult to account for the continued existence, in our midst, of so large a number of persons ready to commit the darkest and most violent crimes upon little or no provocation. The absurd and cowardly habit of carrying concealed weapons has much to answer for in this particular, and the great quantity of intoxicating liquors consumed by a large portion of our population is the chief cause for their production and use on the slightest pretext. But the bravado of the murderer obtains its principal stimulus from the fact that the law is full of uncertainties, that political influence and money have a protective power even under the shadow of the gallows, that, against the most adverse circumstances, a long delay is sure to be accorded to the guilty, and that thus the world may cease to take an interest in the matter, as we have often seen occur in our rapidly changing and effervescent state of public opinion. We are justified in these statements by the events which followed the crime of Foster, who murdered Mr. Putnam on the latter's alighting from a street car. The popular indignation against the dastardly perpetrator of this outrage was very great, and inquest, trial, and condemnation followed its committal with a promptitude which is an integral part of the majesty of the law, and the chief means of prevention of crime. But before the day of execution arrived, the culprit was reprieved by one of the hole-and-corner legal processes which discredit the whole American nation and people; and before long the murderer, the object of as righteous an indignation as ever animated the public mind, will probably be let loose to prey once more on society. It is by such precedents as that of Foster that crimes like that of Stokes are created and encouraged; and it may require the commission of a few dozen more outrageous villanies to get the popular sentiment on this subject into a condition more permanent and beneficial than a mere temporary frenzy.

It is quite time that some trustworthy system of administration of the laws was introduced into our social affairs. At present, with a vehement outburst of indignation at the time of the crime, followed by utter indifference to the sequel, and with political intrigue, corrupt judges, and monetary influence as complications, the process of the law is less certain and less logical than are the freaks of a gambler's fortune. If the wicked act which we now deplore does something to awaken the people, these lines will not have been written, and James Fisk, Jr., will not have died, entirely in vain.

TEACH THE CHILDREN TO DRAW.

Teach a child first to read; not merely to speak words in the order in which they occur, but to read understandingly, slowly, and carefully for ideas. Next teach him how to use numbers in arithmetical calculations, and show him that in all the business of life, in all its study, in all its science, the statement of facts in figures is the most important element. Then teach him to draw. You may stop your teaching right there, if you will, and rest confident that, if the boy thus taught has any disposition to mental acquisition, he will find a way to make it. Not that further good teaching will not greatly assist his progress, but that the acquirements named form a solid foundation upon which he *may* and, if his tastes are for learning, *will* build a noble superstructure.

The fundamental value of the two first elements of education named are generally appreciated by educators in this country; the third is only beginning to be appreciated. In the Boston public schools, drawing is now to be made a part of the course of study. The teachers are, we are told, to be taught how to teach drawing, at least such of them as have not the requisite knowledge. This accomplishment should be a part of every teacher's legal qualifications for employment in a public school, not merely because it enables him to give lessons in drawing, but because in the present age the power to draw rapidly and well is a means for the expression of ideas scarcely inferior to language; nay, without which it is impossible to convey certain ideas at all, in the absence of the objects delineated by the skilled pencil of the draftsman.

We cannot carry with us in our pockets geological and mineralogical cabinets, collections of shells and plants, museums of machinery and galleries of art. The power to represent such things as we cannot have at hand in talking about them has become essential to every one who aspires to anything like eminence in science or the arts. Even in walks of life not intimately connected with science and art, (daily becoming fewer) the power to draw is one that often saves time and money.

We speak, of course, more particularly of free hand drawing. Mechanical or geometrical drawing, as it is called, pertains to certain branches of business which will engage only a few out of the many youths now in American schools. A knowledge of it and skill in it can easily be acquired after the other, and will be attained by those who find it necessary to their callings.

No study so interests the young as free hand drawing. It does not weary as do studies which exercise the mind without practising the hand; and if the pupil is put to it in early youth, it cultivates a habit of keen and thorough observation which of all things is the most important discipline to which a young mind can be subjected.

The fault of superficial observation will scarcely ever be found in a pupil who has been taught to sketch from nature. Perhaps no greater or more universal fault than this can be met with in the men and women of America. As a rule, things are glanced at, not seen. In all matters except accounts, we are as a people inaccurate. Hasty, careless, we plunge along headlong, and things pass by us in a confused stream, as do the near objects we view from the windows of an express railway train.

Now while we advocate rapidity in all matters of mere motion, and never yet traveled a hundred miles by a quick train without wishing we could do it quicker, we know that we defeat one of the main objects of life when we attempt to force our minds beyond their normal pace. Let us refuse to look at things at all, rather than to waste time by a half look.

We believe the fault in American character would be greatly remedied by a system of general instruction in free hand drawing, and that the effects upon progress of the discipline thus obtained would be felt most favorably in all the other departments of study pursued in our schools. It appears somewhat astonishing that this fact, proved by years of experience in Europe, should have remained so long unrecognized by American educators.

THE STUDY OF BOTANY.

The study of botany has claims to far more general favor than it receives. No science can be pursued with greater facility, without the aid of a living teacher. It requires but an inexpensive apparatus. A good magnifying glass, small pincers, a press for preparing specimens, a tin box for collecting plants, a pocket knife and a good text book are all that are needed. Any section of country affords ample scope for filling a herbarium, which, by exchanges, can be made as complete as desired. Specimens are easily preserved, and when well cared for, always afford great pleasure in their exhibition.

The advantages of the study are, besides the pleasure derived from any healthy mental occupation, the healthful exercise of body in searching for specimens, the cultivation of the finer tastes, and the vast fund of useful information to be obtained. The dependence of mankind upon vegetable products, for supplies of food and clothing and articles of luxury, is greater than upon either the animal or mineral kingdoms. The animals that give us labor, or from which we obtain food, derive their sustenance from vegetables, and thus indirectly plants are made to contribute to the direct demands made upon them for the sustenance of the human family. A large number of the medicines that we rely upon to cure "the ills that flesh is heir to" are of vegetable origin. We adorn our homes by surrounding them with beautiful flowers, and even the resting places of the departed are made attractive by the sweet scents and exquisite colors of the floral realm.

It is pleasant enough to inhale the fragrance and to feast the eye upon the softly shaded tints of beautiful flowers, but there is all the difference, in the pleasure ordinarily derived from this source and that afforded through the intelligent inspection of flowers by the skilled botanist, that exists in the degrees of delight, derived by cultivated and uncultivated ears from music. To the botanist, there is far more in flowers and foliage than mere color and odor. There are delicate structures, each of which has a definite purpose and meaning. There are beautiful analogies, properties hidden from the common eye, and nice relations which form a basis of classification. All of these things are delights to the minds that comprehend them.

But there is practical profit in the study, as well as unfailing pleasure. Every intelligent farmer ought to know something of botany. By it he often can tell when his land is in danger of being seeded with troublesome weeds, and can exterminate them before they overrun the soil.

We once lived in a rural neighborhood where the practising physician was a proficient in botany. He had doubtless saved the farmers of the county in which he resided thousands of dollars by his gratuitous hints. We once heard him give warning to a farmer, pointing to a conspicuous plant that reared its head above the fine green of a luxuriant meadow. "Pull up by the roots every weed of that kind that you see on your farm." There were few, and it would have cost little to obey the good doctor's injunction. It was disregarded, and three or four years later the farm was literally seeded with a plant till then scarcely known to any farmer in the region.

But little need be said by way of instruction to those who may be induced by our remarks to undertake the study of botany. The driest part of the study, as sometimes taught, is the terminology and nomenclature. Instead of attempting to master all this at once, the better way is for the student to commence with a plant specimen, and endeavor, by means of the analytical method explained in all good text books of botany, to ascertain its name and properties, looking up the necessary definitions as he proceeds. A flower of good size and of simple structure, such as an apple blossom, a butter cup, or sweet briar blossom, should be first undertaken, the many rayed, composite flowers being more difficult. By pursuing this course, the task of learning many definitions is distributed so much as to be almost insensibly accomplished.

The practice of preserving specimens should always be followed. Nearly all text books describe the proper method of doing this, and we need only add to their directions that success in it depends principally upon the patient thoroughness with which the work of laying down the plants in papers for pressing is performed. A plant well pressed is easily mounted so as to look well, while one ill pressed is not worth mounting at all.

Some of the best and most instructive studies in this latitude are found in plants that appear in bloom while the snow has scarcely melted away in the spring. Indeed we have often found anemones and trailing arbutus on the sunny side of a knoll while the snow still rested on the other, and one must start early in the season to find some of the crow-foots in blossom. How many of our young readers will make a beginning next spring?

PURE AIR.

We recently heard a Professor of Chemistry say that the greatest curiosity in his cabinet was a specimen of pure iron. This metal, which is present everywhere, is so difficult to obtain free from impurities, that not half a dozen men on the face of the globe have ever seen it. We are beginning to entertain the same opinion of pure air. Of all the chemical mixtures known to the man of science, we doubt if any gases are so rare as pure and unadulterated air. If it starts right, it soon gets mixed up with organic germs, dust spores, mephitic gas, carbonic oxide, sulphuretted hydrogen, cholera in disguise, and typhoid in odors, until plants wither and animals die, and lamps cease to burn. That this should be the condition of things is not astonishing; on the contrary, the chief surprise is that, with all mankind diligently engaged in filling the waters with pollution and the atmosphere with gases, we are not worse off than we really are.

The habits of the present generation are such as to give rise to more refuse matter and poisonous products than those of previous ages. The fuel we use, the articles we manufacture, and the waste of sewage, combine to create more impurities than were known to our forefathers; and if it were not for the fact that science has given us remedies, nearly in proportion to the increased evil, our population would diminish under the high pressure system which at present prevails. Considering this state of facts, it is not at all astonishing that the attention of Sanitary Commissions, Boards of Health, and Parliamentary Committees is called to the subject, and that we hear of so many reports and propositions to remedy the evil.

The recent illness of the Prince of Wales has occasioned an inquiry into its probable cause, and we see that it is traced to the imperfect sewage of the district of country where this nobleman's party were recently hunting. The disease, from which the Prince appears to have fortunately recovered, is called typhoid, or more properly "night soil fever," and "cesspool fever." Since its rise has been unmistakably traced to disorders of the intestines, the medical faculty have been disposed to give it the name of *enteric* fever; and by this name it appears likely to be henceforth known. The approach of the fever is, in most instances, slow and insidious, and hence the particular occasion on which it was contracted is often overlooked; but all authorities agree that the foul air, proceeding from sewers and cesspools, is the chief cause of this form of disease. By reference to the reports of the Metropolitan Board of Public Works of London, it will be seen that different experiments were made to improve the ventilation of the sewers; but all of them were declared to be too expensive, and no other way could be found than to allow the gases for the future to continue to escape from the middle of the streets. To burn the gases by means of high chimneys would take two hundred and fifty furnaces for the city of London alone, at the cost of two millions of dollars, and a yearly outlay of half a million for fuel, exclusive of the wages of labor. To disinfect the sewers of a large city chemically would be a worse undertaking than pumping out the ocean by Paine's magneto-electric machine. It is evident that both of these schemes are impracticable, and the contamination of the air and water is likely to go on for ever if no better remedy can be found. But this is not all; the present system of sewage acts as a destructive agent in other ways. It not only pollutes the water and gives rise to pestilent fevers, but dilutes a most valuable manure, and destroys it for all useful purposes. We spend fabulous sums of money to destroy the very article which, if properly treated, would be worth millions of dollars.

Now suppose some inhabitant of Mars were to visit our earth. He would naturally be received half way by a self-appointed committee of our first citizens, and, in the course of the inevitable *fêtes*, balls, dinners, and receptions through which he would be obliged to pass, might be shewn through a house "replete with all the modern improvements." The water arrangements, upon which we particularly pride ourselves, would be pointed out, and then would come a sail around the city at low tide, when the mouths of the sewers would be belching forth their greatest stench; and the practical side of the question would be exposed to view, and the chairman would deplore the fact that, in spite of our scientific knowledge, we were unable to abate this nuisance, and he was sorry to inconvenience his noble visitor, and he would about helm and get out of it as fast as possible.

What opinion would this son of Mars form of our boasted civilization? In one place he is shown where we pour the noxious matter in; and where it comes out we deplore our inability to neutralize its deleterious effects. He would probably ask: *Why pour it in at all?* And that would show us at once where the Columbus *egg* of this difficulty lies, and afford the solution. Why pour it in at all? Why pump water up hill to let it run down? Why spend millions to undo what never ought to be done at all?

It is evident that the building of such works as the Thames embankment, the construction of great chimneys to carry off foul gases, and the immense loss to agriculture, could be avoided if we applied the remedy at the outset, and that would be by using the ounce of prevention and disinfecting all animal matter by dry earth, and never allowing it to pollute our waters.

While our water arrangements appear to us, individually, a great convenience, they are, collectively, the fruitful source of most of our diseases, and ought to be differently regulated.

In spite of all precautions, much impurity would be likely to find its way into the sewers: but the worst evil could be stayed, and disinfecting rendered substantially unnecessary. Pure air is irreconcilably hostile to contagious disease. If we cannot aspire to have it out of doors, it is in vain to look for it in factories, shops, and overcrowded houses.

Nearly all writers on this subject expend all their force and arguments in favor of a complete system of drainage and sewage. We would not gainsay the value of these precautions, but would again repeat that the true remedy is to stop filling the sewers with matter that no power can afterwards cleanse.

"The river Rhine, it is well known,
Doth wash the city of Cologne;
But tell me, nymphs, what power divine
Shall henceforth wash the river Rhine?"

PORTABLE FIRE EXTINGUISHER.

The value of a ready means of extinguishing fires at their very commencement has often been dwelt upon in these columns. We have shown, by facts, figures, and argument, that a large proportion of all the fires which occur could, by such means, be extinguished before extensive damage occurs.

Without making invidious distinctions between the portable fire extinguishing apparatuses now in use, we may well refer to the history of a single one as ample proof of the correctness of our position. We refer to that known as the Babcock Fire Extinguisher, which has made for itself a most honorable record, and is becoming quite extensively introduced. We have not space to enumerate the large number of fires which have been almost immediately extinguished by this machine, but the number is very great. A few words, however, as to the origin of the present form and use of the device, may not be uninteresting.

The original machine was of French origin, and is known as the Carlier and Vignon Machine. To this machine as a starting point, have been added a great number of American improvements. Observing the bulletins of the Northwestern Fire Extinguisher Co., 407 Broadway, New York, announcing the dangerous fires that have been recently controlled at the outset by the use of these portable extinguishers, we have taken pains to investigate its claims upon public favor, and are satisfied that it deserves to rank among the best of modern appliances for saving property.

The machine as now used employs what is known as the Bate and Pinkham mode of charging, by which the liquid acid and the solution of bicarbonate of soda are kept separate until the apparatus is required. By this means there is no gas generated except at the time of using, and consequently no loss of gas or strain upon the cylinder during the intervals. The moment the two materials are allowed to commingle, which is done by simply pulling out the knob of a stem which controls a stopper, a large quantity of carbonic acid gas, in which no fire can live, is generated under great pressure which forces out thoroughly mingled water and gas in a fine, small stream through the nozzle of a small hose, provided with a stopcock to control the flow. Suitable arm straps enable the person using the device to place it upon his back, leaving his hands free to direct the flow from the hose.

A very small portion of the mingled gas and water, a mere film, is sufficient to extinguish a fire that has not been so long in progress as to heat the burning material through and through to the point of ignition. The gas extinguishes the flame, and the water cools the material, a most scientific combination.

It is becoming quite common for merchants and manufacturing establishments to have one of the extinguishers on each floor of their building, ready for immediate use.

It occupies not much more space than a water pail, and no more skill is required to operate it than pouring a bucket of water on an ignited floor.

SCIENTIFIC AND PRACTICAL INFORMATION.

FORTIFYING RAILWAY STATIONS.

Some years since the subject of permanently fortifying important railway stations was discussed by the Prussian Government and abandoned as impracticable. Russia has, however, taken up the project and is putting it into actual practice. The two frontier termini of the Brest and Kiew railways in the direction of Austrian Poland are thus being protected by a citadel and a few outlying forts, probably destined to be the nucleus of a consolidated military fortress in the future.

TEST FOR SILK FABRICS.

The *British Trade Journal* states that Mr. John Spiller, in the course of some investigations made last year, found that hydrochloric acid was an energetic solvent of silk, although it left wool and cotton unacted on, at least for a lengthened period. The practical bearing of this discovery was exemplified by the immersion of several so-called pure silk ribbons and other fabrics in the acid, when the silk was dissolved away, leaving the threads of the adulterating material intact; thus by obtaining a small sample, and immersing it for a few seconds in the hydrochloric acid, or preferably by dropping a little of the acid on the center of the sample, if it be pure silk a hole will be produced; but, if impure, the

threads left will immediately indicate the nature and extent of the adulteration.

METEORIC IRON IN GREENLAND.

The Swedish arctic expedition has brought home a number of masses of meteoric iron found there upon the surface of the ground. These masses vary greatly in size, the largest weighing 49,000 Swedish pounds, or twenty-one tuns English, with a sectional area of about forty-two square feet. This has been deposited in the hall of the Royal Academy at Stockholm. Another piece, weighing nine tuns, has been presented to the Museum of Copenhagen. These specimens considerably exceed in size the famous mass at Yale College, which weighs 1,635 pounds, but are not larger than some blocks that have been observed in parts of South America. The Swedish chemist Berzelius was one of the first to examine meteoric iron to see if it contained elements different from those found on minerals of terrestrial origin; but he never detected anything new. This result is rather disappointing, as meteoric iron is now believed to come from sources outside of our world.

ILLINOIS AND ST. LOUIS BRIDGE.

This important work is progressing successfully and rapidly. The St. Louis *Railway Register* states that thirty-eight of the large skewback anchor steel bolts to be used in the bridge have arrived. The work of putting them in place has been begun, and there will be no further necessity for delay on their account. The yellow pine and white oak to be used in the construction of the bridge have also begun to arrive. The pine is from Georgia. The oak is from Southern Illinois. Both the pine and the oak are of the best. Work will be commenced in this department at an early day.

HOT WATER PIPES AGAINST WOOD WORK.

We are asked whether these are dangerous. Our own opinion is that no fire ever originated from hot water pipes or from low steam pipes, except where materials liable to spontaneous ignition have been placed on or near the heating apparatus. Artificial heat will, of course, increase the probability that oily wool, greasy wood, metal cuttings, etc., will take fire. The ordinary wood work of buildings will not ignite at 212°.

LA FEUILLE DES JEUNES NATURALISTES.

A journal of a most interesting and valuable kind, under the above title, has recently entered upon its second year. It is published in Paris, and its object is to become a means of communication and mutual instruction between such French youths as are willing to devote their leisure hours to the study of natural history. The facilities for such pursuits are great in France, as almost every large school has has its own museum, containing specimens culled and arranged by the boys themselves. The editors, with commendable liberality, invite communications from young naturalists in other countries, promising to translate and publish any which shall be found suitable for the pages of this magazine.

EVAPORATION OF CHLORINE.

Those of our readers who use chloride of lime in manufactures are well aware of the quantity of the chlorine which escapes from the salt, and is lost. A good test for determining the amount of free chlorine has recently been published by Dr. Graeger. He takes a dilute solution of strongly acidified protosulphate of iron, and triturates it with a one tenth solution of permanganate of potassa. The compound must be kept in a close stoppered bottle. A solution of a weighed portion of the bleaching powder to be tested is added, through a pipette, to a portion of the protosulphate and permanganate solution in a stoppered flask, and the bottle well shaken. After this has stood a short time, the amount of protosulphate of iron undecomposed is estimated by means of the permanganate solution. One gramme of bleaching powder, containing 0·3546 grammes chlorine, requires 0·278 grammes protosulphate of iron; but the reaction is made additionally certain if the above named quantity of the iron salt be doubled. Care must be taken that ammonio-sulphate of iron is not used, lest that most dangerous explosive, chloride of nitrogen, be formed.

BREAKWATERS.

The obvious desirability of these important constructions, in situations where the water is deep and the expense of laying foundations, to say nothing of the superior erections, is very great, has frequently attracted much attention to the question of floating breakwaters. It has been recently asserted by an eminent authority, that at a depth of fifteen feet below the surface, wave action is reduced to a nullity, or zero; and experiments fully prove the correctness of this calculation. Of the great economy to be effected by a floating breakwater, with at least fifteen feet of material below the average horizontal line of wave motion, there can be no reasonable doubt; for an estimate of the cost of building breakwaters in the usual manner, namely, on a solid foundation, is given by an English engineer as ranging from $750 to $2,100 per foot run; and the splendid erection of this kind at Plymouth, England, which secures calm water to a large bay while the sea outside is one of the most tempestuous known in the world, costs $75,000 a year to keep in repair. Mr. Thomas Cargill, C.E., in discoursing on the subject before the Society of Engineers, London, Eng., points out that the idea of a floating protection to a harbor is probably derived from the observed action of sea weeds. The Gulf weed always has calm water to leeward, although the enormous masses of it seldom are more than twenty-four inches deep in the water. In these days of cheap iron construction, a system of connected iron cylinders, securely fastened together and anchored at the ends might prove valuable, especially as the protection of iron from the action of salt water by cement is now known to be practicable and thoroughly efficient.

Examples for the Ladies.

Mrs. R. W. Sanderson, Poppenhausen Institute, College Point, N. Y., has had a Wheeler & Wilson Machine since February, 1859, employed, without repairs, in sewing all materials, from triple beaver to Nansook, (ten years in dress-making); it is now used for instructing pupils in the Institute.

"I feel that my comfort depends upon WHITCOMB'S ASTHMA REMEDY."—*J. Shaw*, Saugus, Mass.

NEW BOOKS AND PUBLICATIONS.

SCIENCE RECORD FOR 1872. Being a Compendium of the Scientific Progress and Discovery of the Past Year. 400 pages, octavo. 100 Engravings, Steel Plate and Wood. Handsomely bound in muslin, $1.50: extra binding, half calf, $2. Munn & Co., Publishers, 37 Park Row, New York, Office of the SCIENTIFIC AMERICAN.

This new and elegant work presents, in convenient form, notices of the leading subjects and events, pertaining to science, that have occupied public attention during the past year. The progress of the more important public works is duly chronicled, with illustrative engravings. The leading discoveries, facts, and improvements, in chemistry, mechanics, engineering, natural history, and the various arts and sciences, are recorded and illustrated. Sketches of prominent scientific men, with illustrations, are given, and among the portraits are those of Faraday, Murchison, Darwin, Agassiz, Huxley, and Herschel. The Mont Cenis tunnel, the Hell Gate works, the Brooklyn suspension bridge, the Hoosac tunnel, the St. Louis bridge, the United States Patent Office, and other works are illustrated. A large amount of useful information, tables, descriptions of improvements, with engravings, are likewise presented. The book is one of much interest and value, and should have a place in every library.

THE NATIONAL ENCYCLOPEDIA. A Compendium of Universal Information, Brought down to the Year 1871, with the Pronunciation of Every Term and Proper Name. By L. Colange, L.L.D., Editor of Zell's Encyclopedia. Illustrated with five hundred wood engravings. Complete in eighteen numbers. New York: Francis B. Felt & Co., 91 Mercer Street.

The first two numbers of this work are received. As a popular work of reference it gives, in a compressed form, a vast fund of general information. Specimen numbers will be sent to any address on application. It is issued semi-monthly, at 40 cents per number.

THE MANUFACTURE OF RUSSIA SHEET IRON. By John Percy, M.D., F.R.S., Lecturer on Metallurgy at the Royal School of Mines, London, and to the Advanced Class of Artillery Officers at the Royal Artillery Institution, Woolwich, Author of "Metallurgy." With Illustrations. To which is added an Appendix on American Sheet Iron. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut Street. Price, by mail, free of postage, 50 cents.

This is a pamphlet, containing an alleged exposition of the secrets of Russia sheet iron. Those interested in metallurgy will find it an interesting contribution to metallurgic science.

LORD BANTAM. A Satire. By the Author of "Ginx's Baby." Author's Edition. New York: George Routledge & Sons, 416 Broome Street.

Those who have read "Ginx's Baby" will need no assurance of ours that its successor, "Lord Bantam," will repay the reading. The sharp pen of the author scarifies whatever and whoever it touches, but in a good humored way that redeems it from the charge of bitterness.

THE HOOSIER SCHOOLMASTER. A Novel. By Edward Eggleston. With twenty-nine Illustrations. New York: Orange Judd & Co., 245 Broadway.

This is a graphic picture of "Hoosier" life, entirely free from any thing morally unwholesome, and possessing elements of popularity second to very few recent publications of its kind.

A HAND BOOK ON SILEX. Embraced in Three Practical Treatises. I. On Soluble Glass, and all its Applications in the Arts. II. On Glass Making in all its Details. III. A Guide for Soap Making; the Manufacture of all Soaps, and their Manipulations. Containing a large Number of Useful Formulæ for Rendering Wood and Timber Fire and Dry Rot Proof, Silicifying Stones, Mortars, Cements, and Hydraulic Lime, White Washes, Paints and Cements, and How to Protect Wooden Shingles, Pavements, Railroad Sleepers, etc., etc. By Dr. Lewis Feuchtwanger, Chemist and Mineralogist. New York: Published by L. and J. W. Feuchtwanger, No. 55 Cedar Street.

This book contains much of the subject matter treated in the author's original work on soluble glass, the first edition of which is exhausted, the two departments on glass making and on soap making, having been added. The author has had a large experience as a practical chemist, which is in this work placed at the command of such as wish information upon the subjects enumerated in the title.

CHICAGO AND THE GREAT CONFLAGRATION. By Elias Colbert and Everett Chamberlain. With Numerous Illustrations by Chapin & Gluck, from Photographic Views Taken on the Spot. Cincinnati & New York: C. F. Vent. Chicago: J. S. Goodman & Co. Philadelphia: Hubbard Brothers.

This volume supplies information in regard to the material prosperity of Chicago antecedent to the great fire, a full account of the fire, and the condition of the city subsequent to the catastrophe. It is a large octavo of 528 pages.

HANNA'S COMPLETE READY RECKONER AND LOG, TABLE, AND FORM BOOK. By J. S. Hanna, Lumber Inspector, Lockhaven, Pa. Philadelphia: J. B. Lippincott & Co., Nos. 715 & 717 Market Street.

This is a very handy and reliable pocket manual, for those who have to perform calculations relating to measurements of lumber and other building materials, wages, board, rent, etc., etc.

NEW YORK OBSERVER YEAR BOOK FOR 1872.

Improved from their last year's issue, both in contents and appearance. It contains a list of all the Protestant clergymen of the country, classified into the various denominations, and other ecclesiastical information not attainable elsewhere. Price $1. New York Observer, 37 Park Row, N.Y.

THE HOME FIRE INSURANCE COMPANY, Broadway, N.Y.,

Has issued a set of twelve beautifully illuminated calenders, neatly fastened together—very convenient and ornamental for the counting room or library. Each card has the calender for the month, and is embellished with an appropriate original design, printed in colors.

ALMANACS.—We are indebted to G. W. Childs, of Philadelphia, for a copy of The Public Ledger Almanac for 1872. The cover is embellished with patriotic devices printed in colors, and the contents comprise much valuable information. Ninety thousand are issued, and a copy is presented to each subscriber of the Ledger.

The publishers of "WORK AND PLAY," a magazine for children of both sexes, have issued an annual, containing directions for playing indoor and outdoor games, tricks, charades, etc. It is well gotten up and illustrated, and is from the house of Milton, Bradley & Co., Springfield, Mass.

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.

Dry Steam, dries green lumber in 2 days; tobacco, in 3 hours; and is the best House Furnace. H. D. Bulkley, Patentee, Cleveland, Ohio.

The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin. $4 00 a year. Advertisements 17c. a line.

A Correspondent wanted, who understands the erection of works for, and the manufacture of, Malleable Gas Fittings, with the view of an engagement. Address, Lock Box 1321, Titusville, Pa.

A Mechanical Draughtsman wants a situation in a Draughting Office. Good testimonials. I. F. Baker, 20 Union St., Hartford, Conn.

For 2 & 4 Horse Engines, address Twiss Bro., New Haven, Ct.

Working Models made at low rates, by Wm. E. Cass, 61 Hamilton St., Newark, N. J.

Improved Foot Lathes, Hand Planers, etc. Many a reader of this paper has one of them. Selling in all parts of the country, Canada Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Automatic Gas Machines! The Cheapest method of Lighting Buildings out of the reach of City Gas Works. D. W. Holmes, 7 Liberty Square, Boston, Mass.

Patent Rights Sold on Commission by Moody & Co., 7 Murray Street, New York city. Send 50 cts. for one year's subscription for "The Patent Bulletin," post paid. Agents wanted.

Steel Springs for Pocket Books, Memorandums and Diaries. Springs of all kinds made to order. J. F. Dubber, 88 Hicks St., Brooklyn, N.Y.

Best Oak Tanned Leather and Vulcanized Rubber Belting. Greene, Tweed & Co., 18 Park Place, New York.

Blake's Belt Studs. The cheapest and best fastening for Rubber and Leather Belting. Greene, Tweed & Co., 18 Park Place, N. Y.

Valuable Patent Right for Sale. Lock Box 22, Camden, N. J.

Edson's Hygrodeik is the best Hygrometer in use. Send for circular. Geo. Raymond, Fitchburg, Mass., Gen'l Agent for United States.

The Improved Ingham or California Cleaner and Smutter. Combined is beyond question one of the very best and cheapest in America. Send for illustrated circular, giving full particulars. It will pay you. Address M. Deal & Co., Bucyrus, Ohio, Manufacturers.

Presses, Dies & all can tools. Ferracute Iron Wks, Bridgeton, N.J.

Maine's Portable Ventilator—Adjustable to any window Fresh air without draft. See Scientific American, Dec. 23. Send for Circular. Underhill & Co., 95 Duane Street, New York.

Chard & Howe's machinery oils, the best—try them—134 Maiden Lane, New York.

A practical Machinist, having first class Machinery for Iron Work, would like to hear of power, with inducement to settle in Virginia Kansas, or intervening States. Address, J. D. A., Lock Box 91, Boston, Mass.

We will remove and prevent Scale in any Steam Boiler, or make no charge. Geo. W. Lord, 232 Arch street, Philadelphia, Pa.

Rubber Valves—Finest quality, cut at once for delivery; or moulded to order. Address, Gutta Percha & Rubber Mf'g Co., 9 & 11 Park Place, New York.

For Hydraulic Jacks and Presses, New or Second Hand, send for circular to E. Lyon, 470 Grand Street, New York.

Williamson's Road Steamer and Steam Plow, with Thomson's Tires. Address D. D. Williamson, 32 Broadway, N. Y., or Box 1809.

Boynton's Lightning Saws. The genuine $500 challenge. Will cut five times as fast as an ax. A 6 foot cross cut and buck saw, $6. E. M. Boynton, 80 Beekman Street, New York, Sole Proprietor.

For Hand Fire Engines, address Rumsey & Co., Seneca Falls, N.Y.

Over 800 different style Pumps for Tanners, Paper Makers, Fire Purposes, etc. Send for Catalogue. Rumsey & Co., Seneca, Falls, N.Y.

Scale in Steam Boilers—To remove or prevent scale, use Allen's Patent Anti Lamina. In use over Five Years. J. J. Allen, 4 South Delaware Avenue, Philadelphia, Pa.

Taft's Portable Hot Air Vapor and Shower Bathing Apparatus. Address Portable Bath Co., Sag Harbor, N.Y. Send for Circular.

For Steam Fire Engines, address R. J. Gould, Newark, N. J.

All kinds of Presses and Dies. Bliss & Williams, successors to Mays & Bliss, 118 to 122 Plymouth St., Brooklyn. Send for Catalogue.

Brown's Coalyard Quarry & Contractors' Apparatus for hoisting and conveying material by iron cable. W. D. Andrews & Bro, 414 Water st., N.Y.

Presses, Dies, and Tinners' Tools. Conor & Mays, late Mays & Bliss, 4 to 8 Water st., opposite Fulton Ferry, Brooklyn, N.Y.

Over 1,000 Tanners, Paper-makers, Contractors, &c., use the Pumps of Heald, Sisco & Co. See advertisement.

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

Mining, Wrecking, Pumping, Drainage, or Irrigating Machinery, for sale or rent. See advertisement, Andrew's Patent, inside page.

Vertical Engines—Simple, Durable, Compact. Excel in economy of fuel and repair. All sizes made by the Greenleaf Machine Works, Indianapolis, Ind. Send for cuts and price list.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

To Ascertain where there will be a demand for new Machinery, mechanics, or manufacturers' supplies, see Manufacturing News of United States in Boston Commercial Bulletin. Terms $4.00 a year.

TO CITY SUBSCRIBERS.

The SCIENTIFIC AMERICAN will hereafter be served to our city subscribers, either at their residences or places of business, at $3·50 a year, through the post office by mail carriers. The newsdealers throughout this city, Brooklyn, Jersey City, and Hoboken keep the SCIENTIFIC AMERICAN on sale, and supply subscribers regularly. Many prefer to receive their papers of dealers in their neighborhood. We recommend persons to patronize the local dealers if they wish the SCIENTIFIC AMERICAN or any other paper or magazine.

Notes & Queries.

[We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers.]

1.—ENCKE'S COMET.—Will some of your readers inform me which constellation Encke's comet is in?—W. E.

2.—GEARING FOR SAWS.—Is it practicable to run a circular saw, of 48 inches or more diameter, with a bevel gear instead of a belt?—A. K.

3.—WATERPROOFING COTTON CLOTH.—I am making a tent of cotton cloth; is there any way in which I can make it waterproof?—H. W. U.

4.—FACE WORMS.—Can any of your correspondents give me a remedy for the grubs or face worms, so common about the nose?—H. E. A.

5.—EMERY BELTS.—We wish information as to the manner of making and using emery belts, on which to polish the prongs of fluting irons or tongs.—S. & B.

6.—FIELD GLASS.—Is there any difference in the construction of a day and a night field glass? If not, how can I determine the night adjustment?—F. H.

7.—SHELLAC AND LINSEED OIL.—Can I mix shellac varnish with linseed oil, and form a preparation that will give some luster when applied to bare wood?—W. W.

8.—CEMENT FOR SHEET IRON AND RUBBER PACKING.—Can any of your readers inform me how to make a cement that will unite firmly Russian sheet iron and thin rubber packing, and remain unaffected by changes of weather?—J. M.

9.—VARNISHING PITCH PINE.—I am informed that some process has been discovered, by which varnish can be applied to pitch pine, so as to prevent the wood from turning dark and becoming dingy in appearance. Can any of your readers tell me how it is done?—J. H.

10.—COATING IRON WITH QUICKSILVER.—Can iron weights be coated with quicksilver, by using hydrochloric acid to effect the union? Will some one refer me to some work whence I can get a sufficiently clear account of the process to enable me to repeat it, or state the process for the public benefit?—T. H.'s S.

11.—DIMENSIONS OF BOILER GRATE.—I have a marine boiler, 7 feet in diameter, 12 feet long, with grate surface 3 x 7 feet inside the boiler, which is cylindrical. The draft returns between two inch tubes. I would like to know if the grate surface is sufficient to burn shavings and cuttings.—B.

12.—STEAM BOILERS.—Mr. G. H. Gregory, of Toronto, Canada, in commenting on a letter from Mr. Nicholson, published on page 5 of our current volume, asks how it was that the motion of the steamer, in a sea so rough as that described, did not throw the water into contact with the upper row of tubes, which were red hot, and so cause an explosion.

13.—PROPORTIONS OF SAW MILL GEARING.—Supposing the pitman and saw of a Muley saw mill to weigh 200 pounds, and be attached to a crank wrist of 26 inch stroke, and running at a speed of 350 revolutions per minute, how much counterbalance will be required, or, in other words, what proportion of the weight of saw and pitman is necessary as a counterbalance, to make the crank wheel run with the least vibration?—T. B.

14.—FRICTIONAL ELECTRICITY.—I have a battery of this kind—turning with a crank, and designed for medical treatment—that I cannot get to work; and I desire to get, from some of your many readers, a possible remedy. It turns freely; the mechanism is all correct. The permanent magnet is strong, and I can observe no derangment of the revolving magnet. I have examined all points of contact, insulation, etc., and have tried it with close contact and none at all, without success. What shall I do?—M. H. K.

15.—COMPOUND SCREW GEARING.—You have given an answer, furnished by J. P. N., of New York, to my query in regard to compound gearing; but unfortunately, I am no better off than before, as the rule given by J. P. N. will only apply to simple gearing, as I understand it. In speaking of compound gearing, I refer to those lathes on which the wheels, intermediate between spindle and screw, must be compounded. What I want is a quick method of finding the wheels without making elaborate calculations. As J. P. N.'s rule will only find the spindle and screw wheels, I take it for granted that he did not understand my query. Will he please try again?—R. F. S.

16.—APPLICATION OF LIGHT ENGINES TO SAW MILLS.—Since the war, steam threshers are being introduced into this part of the State; but, as most of the threshing is done early in the fall, many of them are idle during the winter. Some attempts have been made to use them for driving saw mills during the winter season, but none that I know of have been successful. Now, in theory it would appear that a ten horse power would saw half as much as a twenty horse power. Thus far, however, we have not been able to do that much with ours; so what we want to know is how to apply such power to get satisfactory results. Timber is scarce, but we frequently have large trees, requiring at least a fifty inch saw; so, to make the proportions more definite, we want to know how to apply a ten horse power engine to a fifty or fifty-six inch saw so as to give the best results.—NEMO.

Answers to Correspondents.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisements at $1 00 a line, under the head of "Business and Personal."

ALL reference to back numbers must be by volume and page.

J. J. W., of ——.—White cedar, placed in the ground for fence posts, is very durable. We know some that has lasted more than sixty years.

M. M., of Mo.—We see no advantage in constructing boilers as you propose.

E. M. W.—You will find the subject of ice formation discussed at length in the SCIENTIFIC AMERICAN, Vol. XXII. We do not wish to reopen the discussion at present.

OIL IN WINTER.—To J. S., query 7, Jan. 1: By mixing kerosene oil with seal or sweet oil in a warm state, it will be prevented from getting stiff in cold weather. The right proportions will be found upon trial.—W. H. B., of N. J.

ETCHING ON GLASS.—F. H. can etch on his glass vessels as follows: Coat the object to be etched with a thin film of wax; then, with a sharp instrument, draw the desired characters carefully, cleaning the wax off in the figures; go to some chemist and get some fluoric acid, which must be handled very carefully. The acid comes prepared in metal bottles. Pour some of the acid in a small lead pan, which place in a still larger vessel filled with sand; heat the sand and place the glass object over the gas liberated from the heated acid, and it will soon be found to be beautifully etched. Great care must be taken when this is going on, for the gas, as well as the acid, is of a very deleterious character.—E. X., of Mass.

M. H. B., of Ill.—In order to trim a flat boat, would the excess of weight upon the heavy side be precisely double the amount necessary to carry to the light side? Ans. Yes.

FRICTIONAL ELECTRICITY.—This can and has been used for telegraphing. It is not as good as chemical electricity for the voltaic arch.—E. X., of Mass.

PREPARATION OF COTTON SEED OIL.—Query No. 23, Jan. 6. Treat the oil with ozone or ozonized air; either will accomplish the desired result.—C. F. D., of N. Y.

CLEANING PAINT BRUSHES.—J. G. M. should try soaking them in hot rancid grease.—W. H. R., of N. J.

CLEANING CASTINGS.—Query No. 15, Jan. 1. I advise L. V. B. to try the sand blast for cleaning his brass castings.—W. H. R., of N. J.

ROTARY MOTION.—W. T. V., query 13, Jan 1, 1872, can im. part rotary motion, of any desired speed, to the vertical shaft described, by a suitable train of gearing, actuated by a barrel spring.—J. M., of N. Y.

BACK PRESSURE.—To R. R.: The back pressure upon piston will not be materially increased, provided you leave the end of five inch pipe open. Do not use any back pressure valve. The pipe must be laid so that it will not "trap." You should use long round bends instead of elbows.—J. M., of N. Y.

GUN SCATTERING SHOT.—H. W., query No. 3, Jan. 1, can prevent his gun from scattering by inserting a ring about half an inch in width in the nozzle of the gun, beveling from the outer edge to nothing at the inward. It can be fastened in with rivets: it should be made of metal about one sixteenth of an inch in thickness, and be fitted very neatly.—W. H. R., of N. J.

BRONZE PAINT.—This can be made by mixing chrome green, two pounds, ivory black, one ounce, chrome yellow, one ounce, good Japan varnish, one gill. Grind all together and mix with linseed oil.—E. W., of Mass.

GUN SCATTERING SHOT.—If H. W. will inclose his shot in strong, round paper cartridges, just fitting the band, his charge will not scatter very much. Cartridges may be formed over a round wooden stick, and glued with mucilage or any suitable cement.—H. E. A., of Conn.

BRONZING IRON.—To bronze iron, J. G. H. should obtain, at any paint store, a bottle of gold size and some bronze powder: mix the articles in a saucer to the proper consistency and apply immediately, as it soon dries hard. Any sort of brush can be used.—H. E. A., of Conn.

FUSING SULPHUR.—F. C. A. can fuse his sulphur by a heat of 226° Fah. If the heat is carried above 450° Fah., the sulphur becomes dark colored and thick, like molasses. F. C. A. would do well to consult some book on chemistry.—H. E. A., of Conn.

CEMENT FOR LEATHER AND IRON.—E. A., query No. 4, in No 1, present volume, can make a very good cement for leather and iron by making a compound of glue dissolved in vinegar, heated over a moderate fire; then stir in one third its weight of white pine pitch. This should be done in a glue pot, where it should be kept and heated whenever wanted for use.—J. L. T., of O.

GUN SCATTERING SHOT.—E. A., January 1st, asks how his gun can be made to shoot closer. It can only be done by having the gun rebored, so that the bore shall taper towards the muzzle. There is, however, an article on this subject on the 394th page of Vol. XXIII, SCIENTIFIC AMERICAN. The Roper gun, made in Hartford, Conn., has a close shooting attachment, which consists of a ring of steel gradually tapering towards the muzzle (of the cap) which is screwed on at the will of the sportsman.—E. X., of Mass.

COMPOUND GEARS IN SCREW CUTTING.—If R. H. S. will follow my example, he will find it both simple and reliable. Let him make a fraction of his leading screw and screw to be cut, with his leading screw for numerator. Now let him split these into factors, and by adding a cipher to each, he will have the gears required; but the numerators are always the driving gears. Suppose he wants to cut twenty-four threads per inch. Example 1: Four twenty-fourths is equal to (2 divided by 6) multiplied by (2 divided by 4). Now by adding a cipher to each, the gears will be (20 divided by 60) multiplied by (20 divided by 40). If he has not two twenties, let him increase one numerator and one denominator, say one fourth, which would be (25 divided by 75) multiplied by (20 divided by 40); if he still has not got these gears, let him alter them again until he finds a right set of gears. Now I will give him another method from the same factors. Example 2: Four twenty-fourths is equal to (2 divided by 3) multiplied by (2 divided by 4). By multiplying the first fraction by 12 and the other by 15, he will have: (24 divided by 36) multiplied by (30 divided by 120); or he can multiply by any numbers to suit his gears. If this is simple and reliable enough for R. F. S., I hope he will acknowledge it, as I have been solicited to write a book on screw cutting.—C. F., of N. J.

TIGHTENING OF BELTS.—I notice in Vol. XXV., No. 21, that G. W. F. wants to know whether belts are tighter in wet or dry weather. In Vol. XXV., No. 26, E. O. McC., of S. C., says belts slacken in wet weather, and thinks that what he saw of a few (probably) new belts is a proof of the truth of his statement. Now I fully agree with E. O. McC. in answering the query, but I judge from a much broader observation than E. O. McC. or S. S. F. (Vol. XXVI., No. 1.) I have worked around leather belting for a number of years, and for the last three years have had belts of the following dimensions under my care: one 142 feet long by 36 inches wide; one 178 feet 6 inches long by 34 inches wide; one 85 feet 6 inches long by 34 inches wide. These belts are all double and made of the best of leather, all running from one fly wheel 30 feet in diameter to 6 and 7 feet driven pulleys. Now I know that on a damp day these belts sag from 6 inches to 18 inches more than they do on a pleasant day. I hear some correspondent say: Your machinery drives harder. Well, I will tell such that we were stopped eight weeks on a spinner's strike in the summer of 1870, and that, during all that time, the belt, half way between the pulleys, would indicate the state of the atmosphere as well as a barometer.—J. D. C., of Mass.

Declined.

Communications upon the following subjects have been received and examined by the Editor, but their publication is respectfully declined:

CEMENTS.—M. M.

FIRE KINDLER.—D. W.

FLYING MACHINE.—W. F. W

GAS.—J. S. P.

GEOMETRICAL PROBLEM.—W. P. M.

LATENT HEAT.—F. of T.

MASSACHUSETTS INSTITUTE OF TECHNOLOGY.—W. O. C.

MECHANICAL MOVEMENT.—E. N.

NEW STEAMBOAT ACT.—T. W. B.

PSYCHIC FORCE.—J. C. B.—P. P. H.—J. A. S.

RUPTURE OF BOILERS.—T. W. B.

STRAINS ON TRUSSES.—J. McR.

TO SMOKE OR NOT TO SMOKE.—E. E. S.

ANSWERS TO CORRESPONDENTS.—S. E. C.—R. R. R.—C. S.—G. W.—P. L. S.—E. B. R.—O. C. W.—W. J. B.—W. O. B.—C. D. S.—W. Q. & Co.

QUERIES.—W. E. H.—W. J. P.—T. B.—C. G.—M. L. D.—W. E.—G. A. L.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

SHOE FASTENING.—Samuel P. R. Triscott and George Alfred Wheeler, Worcester, Mass.—This invention has for its object to furnish an improved device for fastening the ends of boot and shoe laces, which shall hold the laces or strings firmly and securely. The device can be readily struck up out of sheet metal, in two pieces, so that it can be very easily and cheaply made, and, at the same time, can be ornamented in any desired style or manner.

SAW FILER'S VISE.—Nathan H. Baldwin, Laconia, N. H.—This invention has for its object to furnish an improved vise for saw filer's use, holding the saw firmly, and enabling it to be adjusted in any required position. The foot of the vise rests upon the bench or support, to which it is secured by a hand bolt. The standard of the vise has its lower end jointed and secured to the upper end of the foot by means of a bolt and hand nut. To the upper end of the standard is pivoted the middle part of the rear jaw of the vise. Upon the lower edge of the middle part of the rear jaw is formed a half circle, having a slot formed in it upon the arc of a circle having its center at the pivoting point of the said jaw. A cross head bolt passes through the slot of the half circle, through a hole in the upper end of the standard, and has a hand nut screwed upon it, so that by turning the head of the bolt across the slot in the half circle, and tightening up the nut, the jaws may be securely held in place when adjusted. By a simple adjustment, the jaws may be reversed for holding the saw to joint the teeth.

CIRCULAR SAW MILL.—Melancton W. Danks, Fulton, N. Y., assignor to himself and J. E. Harroun, of same place.—The object of this invention is to provide convenient and efficient means for feeding, gigging back, and changing or varying the feed to circular saws, so as to adapt the feed to light or heavy work; and it consists in a series of bevel friction wheels, so arranged that, while the feed motion and the gigging motion of the carriage is produced by means of said bevel friction wheels, the feed may be varied at the will of the attendant, as may be desired or necessary. The inventor does not confine himself to any particular number of bevel friction wheels, nor to any particular diameter or proportion for either the sliding wheels or those on the feed shafts. Neither does he confine himself strictly to saw mill feed work in the application of his bevel friction wheels, as they may, he claims be applied with great advantage to many other purposes.

ADJUSTABLE CUT-OFF VALVE.—George W. Smith, New Haven, Conn.—The valves oscillate in shafts. A combination of adjustable packing with grooved flanges of the ends of the valves, and with the slides, is employed. A combination, of a walking beam provided with spring catches at its ends three armed plates, ropes or chains, and springs, with each other and with the valve shafts and driving shaft, is another of the claims. A combination of pins, spring, bent levers, and connecting rod, with spring toes, walking beam, and governor, constitute the third claim. We judge that the invention is calculated to give a very sensitive and efficient variable cut-off.

HAIR SWITCH.—Benjamin Franklin Burgess, Jr., Boston, Mass.—This switch is made so as to be divided into three strands for braiding, composed partly of human hair and partly of thread or silk, or other suitable material. This thread portion is surrounded by the human hair, or forms the central portion of the switch, the arrangement being such that the human hair alone shows, and, being such, the natural hair of the wearer can be perfectly matched, which cannot be done with any dyed material. A switch, made according to this invention, will not get rusty like other artificial switches. It can be combed and braided the same as human hair, and, being composed of human hair and fine thread, keeps perfectly clean, and is entirely unobjectionable for ladies' wear.

HARVESTER.—John B. Thomison, Lynchburg, Tenn.—This machine is to be used either as a reaper or mower, and is so constructed as to rake the grain and drop it automatically upon the ground, in such a way as to place it out of the way of the machine on its next passage. As usual in this class of machines, the details are such as require diagrams for their illustration. We can only add, therefore, that the means employed for making the change from mower to reaper, and *vice versa*, are simple and easily adjusted, while the whole seems to be a substantial structure, capable of doing its work with small waste of power, and with little wear of parts.

PRUNING KNIFE.—David Morris, Bartlett, Ohio.—In this invention, pruning is accomplished by a knife that slides toward and away from a stationary hook, said knife moving in guides, and being moved by a rod that runs through the tubular handle of the instrument. The extremity of said handle bears levers with cogged segmental heads, which engage with the serrations on the head of the rod, and enable it to be reciprocated, by working the levers, so as to move the sliding knife.

SMUT MACHINE.—John Wernwag, Harper's Ferry, W. Va.—This invention relates to an apparatus which receives grain as it comes from the threshing machine in a hopper whence it is carried through a conveyor trough, wherein it is secured and wherefrom it is discharged into a revolving conical screen, within which it is beaten and separated from refuse grain and from which it is emptied into a fan by whose blast it is winnowed, the dust passing off through a trunk, the good grain falling through a spout, and the refuse grain being charged by a conveyor.

CAR COUPLINGS.—Franklin Nalley, of Battle Ground, Ind.—This invention has for its object to furnish an improved car coupling, so constructed as to couple the cars automatically when they are run together. By this construction, as the coupling link enters the bumper head, it pushes a catch back, which releases the coupling pin and allows it to drop into place, securing the link. By inserting the double coupling link in the upper and middle holes, in the middle and lower holes, or in the lower hole and beneath the bottom of the bumper heads, cars of different hights may be coupled with the same facility as if they were all of the same hight.

SPRING BIT FOR CLEANING AND ENLARGING WELLS.—James H. Boyd, of West Monterey, Pa.—The object of this invention is to produce a convenient tool for cleaning out or enlarging oil wells. The invention consists in the application, to the shank of the bit, of a spring for crowding it against the well, and of a catch for holding the spring close to the bit during its application to the well. When the tool is to be applied to a well, the spring is held close to the shank by the spring catch, so that the insertion of the tool will be facilitated. The projecting outer end of the catch at the same time holds the bit clear from the wall of the well, preventing it from scraping while being let down. As soon as the device is being worked, when in its proper place the catch will release the spring, causing the same to crowd the bit against the wall of the well. For enlarging a well, the bit is used with a long spring. In this case the spring will enter the smaller part of the well and cause the bit to work in the larger part of the same upon the shoulder. For cleaning out wells the short spring is used, which crowds the bit against the wall of the well for properly scraping the same.

HEAD REST FOR CAR SEAT.—John C. Gifling, of New York city.—The head rest is attached to a base block, which rests upon the top of the seat when the head rest is attached. The head rest is secured in this position by two metallic straps. The ends of the base block are sawed in a distance equal or about equal to the width of the straps. The straps are bent to form square cornered staples. The front leg of the staple shaped strap extends down on the front side of the back of the seat. The back leg extends down on the back side of the seat, and may be shorter than the other leg. The width of the block is designed to be about equal to the thickness of the back of the seat, so that the legs of the two straps will straddle the back of the seat. In fastening the head rest to the back of the seat, the parts of the strap are slipped into the slots in the ends of the block, where they are fastened by pins. In leaning back or resting against the back of the seat, the person's back will bear against the front legs of the straps, which will keep the head rest in its proper position when the head bears upon the cushion. When not in use the head rest is folded up, in which condition it may be carried in a satchel or overcoat pocket without inconvenience.

CLOTHES WRINGER.—John Fox, of Farmersville, Iowa.—This is an improved clothes wringer, which, adjusting itself to the varying thickness of the articles passing through it, and being easily adjusted to operate upon larger or smaller articles, as may be desired, forms a very convenient and useful utensil.

MINERS' SQUIB.—John Holmes, of St. Clair, Pa.—This invention relates to an improvement in squibs for the use of miners in the process of blasting coal, rock, etc. The paper is cut in a peculiar form, one end is saturated with a solution of saltpeter and dried, and then the beveled side is covered with mucilage or paste, so that when the paper is rolled into a tube the edge will adhere. The paper is rolled around a tapering piece of iron or other material of suitable size and form, and the tube is filled with powder. The match, properly prepared, may be rolled in the end of the tube, or attached to the end of the tube in any other suitable manner. The powder is prevented from escaping from the end of the tube by means of a stopper of soap or other suitable material in the end. The squib may be dipped in liquid sulphur to render it more inflammable, if desired. It is used for the purpose of throwing fire through the small opening left in a cartridge by the withdrawal of the tapering piece of iron or the needle, after the cartridge has been tamped in the hole which has been drilled in the coal or rock, or through a tube called a "blasting barrel," that is generally put into the hole with the cartridge and left in when the blast is discharged. Squibs of some kind are used, by all miners, ordinarily made upon the spot and consequently very imperfectly prepared, and with material unsuited to the purpose. The object of this invention is to furnish these squibs as perfect as they can be made of the most suitable materials, and have them ready for use in mining and other districts.

CLOTH SHEARING MACHINE.—Michael Craven, of Dedham, Mass.—This invention refers to a new shear rest for shearing cloth, such as plain and fancy cassimeres, satinets, shawls, etc. Its object is to prevent the forming of flocks on the back of the goods while being sheared. A roller as long as the brush of the machine is used, which hangs in arms that project from a rod, whose ends are journals by which the roller frame is pivoted to the frame of the machine. The roller is carried up clear of the brush. The cloth is drawn over the roller with its face side to the brush, which will raise the nap so that the shear blades may cut it off. The cloth passes between the roller and brush, both being close enough together to raise a sufficient nap, which loosens the flock felted into the cloth. In ordinary shearing machines, these flocks collect into lumps and accumulate on the back of the cloth, so that the shears will cut holes where such lumps appear. The roller in this machine will keep the lumps back and off the cutters, besides creating less friction than the ordinary flat, sharp edged rest now in use.

BRUSH.—George Pirrung and Felix Pirrung, of Chicago, Ill.—This invention relates to that class of brushes where the bristles or other material are confined to a rectangular head by means of a groove or grooves therein, as clothes, shoe, whitewash brushes, etc. The head of the brush is grooved, and the bristles are doubled at the middle and confined in the groove by a piece of wood, metal, or other material, by means of screws, nails, or in any substantial manner. At the ends of the brush, the bristles are secured by metallic clasps attached to the head by nails or screws. The clusters of bristles forming the ends of the brush are likewise secured by wires fastened by the nails. The bristles for the sides of the brush may be put into the groove in clusters or sections, the bristles of each cluster being secured together by wires. The wires may connect the end clusters with the side clusters. The head is provided with holes to receive the bent handle.

BALE TIE.—Floyd G. Brown, of Brenham, Tex.—This invention is a new buckle or tie for holding the ends of the bands of cotton bales. It is formed with two arms or ends, both of which are doubled, forming thereby a hole in the tie for receiving one end of the band. The object of the invention is chiefly to prevent the loss of the buckle from the band while the latter is loose, and also to facilitate the fastening of the band to the bale. It is made of sheet metal of rectangular form, with two nearly square apertures near the ends and with a transverse slot in the middle. The buckle is formed from this plate by doubling the same in line with the slot. One end of the band, after being bent, is fitted through the aperture in the buckle so as to be held between the bars. The band is then laid around the bale to be bound and all the slack of the band is secured, when the operator makes fast the outer end of the band by doubling all the surplus of the same, so that it also can be hooked over the bars. This tie, it is claimed, will be absolutely secure, and will prevent the spontaneous working loose of the band under all circumstances, except breakage.

IRON COLUMN.—William A. Gunn, of Lexington, Ky.—This invention consists in an improved construction of metallic columns to give the strength of the double T beam in two directions, while the necessity for cutting and riveting is greatly lessened. Double T bars or beams of wrought iron or steel are used. Two of the bars or beams are placed with their sides against the edges of a third bar or beam, and are riveted to said bar or beam, the rivets passing through the flanges of the latter, and through the bodies of the first named bars or beams. The rivets should not be placed opposite each other in the different bars or beams, and may be further apart than in posts or columns constructed in the ordinary manner.

ANIMAL POKE.—Stephen C. Leonard, of Rushville, N. Y.—This is a new animal poke which is provided with a spring cushion concealing the prongs or pokes and with contrivances for adjusting the throat latch in suitable position and at suitable hight to fit larger or smaller animals. The top of the bow may be cushioned by means of leather wound around or applied against it.

CAR COUPLING.—Frederick A. Illingworth, of Waltham, Mass.—This is an improved arrangement of coupling hook and shackle on a car coupling, and has for its object to bring all the parts of a coupling under more perfect control, and, at the same time, insure greater reliability than can be found on the cars now in use. The invention consists first in providing the pivoted coupling hook with a prop or device whereby it can be held up clear of the link or shackle or let down at will. The invention also consists in the new arrangement of a pivoted connecting shackle, which has also a prop, whereby it can be held in a horizontal position ready for coupling. Furthermore, the invention consists in a general new arrangement of parts for the purpose specified, and by which ordinary coupling links can also be used for connecting cars having common drawheads with those provided with this improved coupling.

DOUBLE DERRICK.—Asa M. Tomb, of Owego, N. Y., assignor to himself and Charles M. Haywood, of same place.—This invention relates to a new machine for hoisting and lowering heavy weights and conveying the same from one place to another; and consists in a new arrangement of hoisting ropes, pulleys, and shafts. The frame of the derrick is on caster wheels, which support it on the ground and permit its convenient and speedy conveyance from one locality to another. A windlass is hung horizontally in bearings secured to the frame. The operating shaft is hung to the frame parallel to the windlass. A crank handle is affixed to the shaft, and a pinion on the same, the pinion meshing into a toothed wheel, which is mounted upon the windlass. The elevating ropes have one end attached to the windlass, and each is thence carried over a friction roller, and over a loose pulley, on a horizontal rod secured to the upper part of the frame. From this pulley the rope passes over a loose pulley, on a suspended shaft, and thence up again over another loose pulley, and back to a shaft, to which its end is fastened. Thus, the two ropes being applied to the ends of the shaft, the shaft is held suspended. The windlass, when turned to wind up or unwind the ropes, causes this shaft to be raised or lowered. Two or more loose pulleys on this shaft serve to hold chains from which the weight is held suspended. The pulleys can be brought more or less far apart according to the length of the thing to be hoisted and conveyed. In stone quarries and yards, and also for building and other purposes, this derrick will be of considerable value.

MILLSTONE DRESS.—Edmund Deer, of Annapolis, Ind.—This invention relates to improvements in dressing burr millstones for grinding grain; and consists in feather edge zigzag furrows in the runner and in feather edge furrows in the bed stone, arranged in a peculiar manner. The bed stone has three feather edge endless concentric furrows. Short furrows extend from the endless furrows to the eye circle. There may be more or less in number of these short feathered furrows, and more than three endless furrows in the bed stone. In the runner a series of feather edge furrows radiate from the edge of the eye, and extend to the periphery of the stone. Between these furrows are intermediate furrows, commencing at the periphery of the stone, connecting with each other and with the radial furrows by means of short furrows, which latter are at nearly right angles with the intermediate furrows. The intersection of these short furrows with each of the longer furrows at the particular point where the partially ground grain is driven around the endless furrow of the bed gives the short furrow ample opportunity to receive air and feed from the eye. The endless furrows in the bed diminish in size from the outer one inward. The advantages of the endless furrow are that, starting with the grain in the deep edge of the furrow, the grain is not driven directly up the slant of the furrow, but is driven round, gradually nearing the feather edge, and becoming more and more crushed and more nearly pulverized than it would be were it to pass directly across the furrow. Nothing remains at rest in these endless furrows, as the action of the air is too powerful to allow the partially crushed grain to remain at rest. The "land" of the skirt gives ample chance for the runner to act upon the unfinished flour, and there being no furrows in the skirt to receive the flour, it is thrown off by the runner fully ground. Furrowing of this description will, it is claimed, do more grinding, with less friction, and consequently with less power than the "drop" now in common use. Instead of making endless feather edge furrows in the bed stone, the furrow may be made in sections, or form a series of arcs of circles with their feather edges in the direction of the skirt of the stone. The inventor does not, therefore, confine himself strictly to endless or continuous furrows. The "land" in the bed stone may also be in sections so long as it forms, as a whole, a parallel with the skirt of the stone.

HEMMER FOR SEWING MACHINES.—S. B. Lawrence, of Scarsdale, N. Y.—This hemmer attachment consists of a presser having a slot and point, and a detachable scroll secured by a screw or its equivalent. It also consists in a notch formed in the slot of the presser to allow the adjustment of the point of the scroll.

PLOWS.—William H. H. Doty, of Sonora, Ohio.—This invention has for its object to furnish a plow, so constructed that it may be readily adjusted for use as a double shovel plow, a single shovel plow, or a covering plow. The handles may be readily adjusted higher and lower, according to the hight of the plowman. The construction also enables the plow to be taken apart and packed in very small space for convenience of storage or transportation. A longitudinally adjustable frame, combined with a pair of handles pivoted thereto, and supported by adjustable braces, so that the handles and beams can be simultaneously and correspondingly adjusted, constitutes the claim of the patentee.

HOUSE BELLS.—Amos L. Swan, of Cherry Valley, N. Y.—This improvement in apparatus for ringing house bells consists in a double rocking cam and two slotted plates which connect the cam with the bell hammer, and in the general construction, arrangement, and combination of the parts and devices whereby, it is claimed, the apparatus is made much more positive in its action, ringing the bell whether the cord be pulled quick or slow.

BUNG INSERTER.—James Gillies, of Glasgow, Great Britain.—This invention consists in the construction of a device for inserting and removing screw threaded metallic bushes for the bung holes of casks and other like holes in other vessels. The tool is formed of a main round spindle, with a square head at top (for being turned by a powerful ordinary straight two armed wrench or lever, with the hole in the center, such as used for turning screw taps and wideners), having a toothed or serrated conical boss or segmental piece, mounted loosely and eccentrically on its lower end, where it is prevented from coming off by a screw nut. The spindle has a complementary segmental eccentric piece (of and opposite to the serrated eccentric piece) formed on it as a duplex cam, the two part cam fitting and filling the conical interior of the bush, so that when inserted in it the turning of the spindle in the eye of the eccentric of the boss by the wrench at the top, causes one or the other of the wings to act as an eccentric wedge or cam and press the teeth of the griping boss into the inner service of the bush, the griping action of the teeth increasing in proportion to the force required to turn or tighten and fix the bush, just also as the bush is getting further into the wood, which strengthens and sustains it for the necessary outward pressure of the cam tool, which can then get a stronger tap on the head to insure the non-slipping of the teeth within the bush. Both the spindle and griping boss are preferred to be made of the best steel and tempered especially at the acting parts, so as thus to maintain or lengthen the time of the wearing efficiency of the tool.

BLIND STOPS.—Perry A. Burgess, of Butler, Mo.—This invention is an improvement in the class of blind slat adjusters in which a bar is connected with the slats at one end thereof. The slats are provided with a pivot at each end near the rear edge, by which they are pivoted to the stiles, and they have another pivot at one end, near the inner edge, by which they are pivoted to the adjusting bar, which is fitted in a recess or rabbet in the inner edge of the style extending from one cross piece to the other. The pivots are placed as near to the outer edge of the adjusting bar as they may be with safety, and the bottom of the recess is near the pins so that the slats may close completely. A spiral spring is connected to the upper end of the adjusting bar and to the top of the blind, and adjusted to pull the bar up and close the slats when let free. A groove is formed in the blind frame for this spring, and a grooved plate fastened therein for attaching the spring and preventing the latter from wearing the wood. It is grooved to let the spring and the adjusting bar flush with the surface of the blind. A grooved catch plate with a series of holes is let into the frame at the lower end, and a catch with a thumb bit is jointed to the lower end of the bar to engage with the said holes and hold the blinds more or less open, as required. A spring on the lower end of the catch bar bearing on the catch keeps it in connection with the catch plate.

BASE BURNING COOKING STOVE.—William Clark, of Shelburne, Vt.—This invention relates to a new cooking stove, which is provided with a circular fireplace and rotary interior lining thereto, and with a feed cylinder for the automatic supply of coal, and other new arrangements of parts, whereby it is claimed to be an important improvement on the cooking stoves now in use. The invention consists chiefly in the arrangement of the aforementioned rotary firebox, which can be set or turned at will to regulate the draft, and which contains a removable cross partition to have but half a supply of coal, which can be brought under either portion of the top plate or under the oven, as may be desired. The invention also consists in a new arrangement of draft door, grate, oven, and water reservoir.

HOMINY MILLS.—Theodore Hudnut, of Terre Haute, Ind.—A long iron or steel shaft of suitable length and size is used for the purpose, and a wood shaft is fitted upon it, said shaft being as much shorter than the iron shaft as is necessary to have the latter project at each end to form the journals and receive the gearing for turning it. The wood shaft is secured by means of collars keyed to the iron shaft and bolted to the wood shaft, and it has four or more plain sides, according to the number of rows of cutters it is to carry, each side having a metal plate attached to it. These metal plates have lugs attached to them at intervals of the same distance apart it is required to have the cutters, the said lugs being arranged lengthwise transversely of the plates; and those of one row are placed a short distance laterally from those of the next rows either way, in such order that they form broken spiral rows around the shaft. The cutters consist of steel plates with the inner point of the cutting edges projecting over a true circle struck from the axis of the shaft, and are bolted to the arms between them. These arms are bolted to the lugs on the plates, being laid across said plates tangentially, so that they are confined against turning on the bolts by said plates. The collars are provided with broad plano-convex disks which keep the grain away from the bearings and in contact with the cutters. This arrangement of the arms or holders of the cutters permits of their being readily removed for repairing or removing the cutters.

LIQUID METER.—David W. Huntington and William A. Hempstead, of South Coventry, Conn.—The first part of this invention consists in an arrangement of valves and ports whereby, in a double cylinder meter, the piston of one cylinder actuates the valve for the other, and *vice versa*. The second part consists in an improved arrangement of valves for balancing them. The third part consists in a device for steadying the piston rods during the time of their greatest extension from the stuffing box of the cylinder; and the fourth part consists in the combination, with a water meter, of a mud and sand trap.

CLOVER HULLER AND CLEANER.—Thomas Church, Lewisburg, Pa.—This invention relates to a hulling cylinder constructed of cast iron staves attached to a wooden core, said staves having roughened exterior surfaces, and having also knobs or raised parts standing out from the periphery in circular rows, the case in which the cylinder works having a roughened interior surface with transverse grooves, in the same, which the raised parts of the cylinder traverse.

Practical Hints to Inventors.

MUNN & CO., Publishers of the SCIENTIFIC AMERICAN have devoted the past twenty-five years to the procuring of Letters Patent in this and foreign countries. More than 50,000 inventors have availed themselves of their services in procuring patents, and many millions of dollars have accrued to the patentees, whose specifications and claims they have prepared. No discrimination against foreigners; subjects of all countries obtain patents on the same terms as citizens.

How Can I Obtain a Patent?

is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row New York, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible, and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention, if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Re-Issues.

A re-issue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co. 37 Park Row, for full particulars.

Trademarks.

Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row New York.

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto-relievo, or bas relief; any new and original design for the printing of woolen, silk, cotton, or other fabrics; any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Rejected Cases.

Rejected cases, or defective papers, remodeled for parties who have made applications for themselves, or through other agents. Terms moderate Address MUNN & Co., stating particulars.

European Patents.

MUNN & Co. have solicited a larger number of European Patents than any other agency. They have agents located at London, Paris, Brussels Berlin, and other chief cities. A pamphlet pertaining to foreign patents and the cost of procuring patents in all countries, sent free.

MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an honest opinion. For such consultations, opinion, and advice, *no charge is made*. Write plain do not use pencil, nor pale ink; be brief.

All business committed to our care, and all consultations, are kept secret *and strictly confidential*.

In all matters pertaining to patents, such as conducting interferences procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information, and for pamphlets of instruction and advice,

Address

MUNN & CO.,

PUBLISHERS SCIENTIFIC AMERICAN,

37 Park Row, New York.

OFFICE IN WASHINGTON—**Corner F and 7th streets**, opposite Patent Office.

[OFFICIAL.]

Index of Inventions

For which Letters Patent of the United States were granted

FOR THE WEEK ENDING JANUARY 9, 1872, AND EACH BEARING THAT DATE.

Alarm for portable boxes, etc., Shepherd and Murden 122,540
Baby tender, C. N. Ziegler 122,546
Badge for hats, illuminated, W. J. Scott 122,663
Bagholder and truck, combined, P. C. Van Brocklin 122,685
Bale tie, J. T. Butler 122,572
Bed bottom, spring, B. H. Otis 122,645
Bed bottom, spring, S. Logan 122,618
Bee hive, H. Staggs 122,542
Bee hive, J. W. Gladding 122,598
Beer, apparatus for cooling, A. Foubert 122,592
Bell, sheet steel, J. E. Tencate 122,679
Bit brace, J. Rice 122,652
Blackboard rubber, Bigger and Pugh 122,511
Blind slats, device for moving, L. Gathmann 122,595
Bone black for filtering, artificial, W. H. Kelsey 122,526
Boot and shoe, J. A. F. Moroney 122,632
Boot and shoe, J. B. Field 122,519
Boot clamp for base ball players, E. S. Ellis 122,587
Bottle stoppers, fastening for, H. T. Dewey 122,579
Brick kiln, T. Lindsley 122,528
Brick machine, J. Ormerod 122,642
Bridge for cars, platform, A. Rank, (reissue) 4,708
Brooms, flanged collar for, H. A. Lee, (reissue) 4,706
Buckle, H. S. Woodruff 122,545
Buckle, Potter and Smith 122,533
Burner, vapor, S. G. Munn 122,637
Cans, sealing the nozzles of oil, J. A. Bostwick 122,512
Car brake, F. A. Canfield 122,564
Car, compartment, W. D. Mann 122,622
Car coupling, C. Eastin 122,586
Car coupling, Hughes, Nutting, and Aldrich 122,610
Car coupling, G. C. E. Weber 122,690
Car for railroads, smoke and cinder, S. Greacen 122,601
Car wheel, Rupp and Ott 122,661
Car wheels, casting, J. K. Sax 122,538
Cars, deflector for, J. A. Rockwood 122,655
Carriage wheel, C. Palmer 122,646
Carriages, axle box for, F. B. Morse 122,635
Cavil, J. A. Wood 122,692
Chain coupling, M. Osborn 122,644
Chamfering the rails of wagon bodies, C. Spofford 122,674
Cheese hoop, M. B. Fraser 122,520
Chimney cowl, S. Lutz 122,619
Clapboarding, F. Buscher 122,562
Clothes wringer, E. King 122,527
Cock connection, locked plug, J. B. Edson 122,517
Combing machine, E. Tavernier 122,678
Commode, chamber, T. Elkins 122,518
Composition for destroying vermin, P. Müller 122,582
Composition for lining water coolers, A. Mahler 122,623
Corn popper, W. F. Collier, (reissue) 4,703
Cultivator, cotton, M. B. Camp 122,515
Dredging machine, W. H. Lotz 122,529
Drill, ratchet, J. J. Switzer 122,677
Drill, rock, M. C. Bullock 122,514
Electromagnetic engine, H. S. Daggett 122,572
Electromagnetic safe protector, W. Duncan, (reissue) 4,704
Electromagnetic hotel annunciator, G. B. Scott 122,664
Embossing, R. J. Chute 122,569
Engine, dummy, T. C. Robinson 122,534
Engine, rotary, A. O'Leary 122,641
Engines, boiler for toy steam, R. Frisbie 122,593
Eye glass suspender, S. F. Merritt 122,629
Fare box, H. Baranger 122,549
Fastener, shutter, N. V. Merrill 122,628
Fish plate, fastening for, R. Anthony 122,547
Fluting machine, J. F. Hayen 122,607
Food or pearl wheat, article of, J. E. Weaver 122,543
Fountain and cooler combined, C. Lauby 122,617
Fuel, artificial, Febrey and Smith 122,590
Furnace, annealing, T. F. Hammer 122,604
Furnace, hot air, L. B. Tupper 122,684
Furnace, steam boiler, E. F. Griffin 122,521
Furnace for manufacture of iron, A. Reese 122,651
Gas apparatus, H. S. Maxim 122,625
Gas purifier, P. Munzinger, (reissue) 4,707
Gas and water mains, machine for tapping, G. Shelley 122,668
Grading and ditching scraper, C. D. and M. C. Meigs 122,627
Hammer, power, J. Palmer 122,647
Harvester, Q. F. Messinger 122,630
Harvester, corn, J. Burke 122,561
Harvester cutters, rifle for sharpening, W. H. Daniels 122,573
Hinge, J. D. Browne 122,559
Hinge, self-locking blind, O. S. Garretson 122,594
Hinges, manufacture of, L. Crooke 122,516
Hose, manufacture of rubber, J. Quin 122,649
Huller and cleaner, clover, T. Church 122,568
Implement, compound, Devoe, Rogers, and Beals 122,577
Insect destroyer, R. V. Shockey 122,541
Iron, manufacture of, J. J. Johnston 122,524
Iron, steel, &c., crucible for melting, W. F. Dunbar 122,585
Ironing machine, C. C. Thomas 122,680
Jack, hydraulic, Shaw and Eisenhardt 122,539
Journal box for lubricating axles, J. Schinneller 122,662
Key board, chromatic, H. Downes 122,584
Kiln, lime, D. T. Barrett 122,550
Knapsacks, mode of slinging, W. Hoffman 122,522
Knife sharpener, S. Gisinger 122,597
Knitting machine, J. Rose 122,535
Lamp chimney, mica, G. M. Bull 122,560
Liquors, apparatus for sging and mixing, S. C. Bruce 122,513
Lozenge machine, E. Gunther 122,602
Meat, manufacture of fluid, S. Darby 122,574
Medical compound, W. L. Simmons 122,672
Medical compound or salve, L. Masters 122,621
Meter, water, T. R. Timby 122,683
Milk cooler, C. H. Latham 122,616
Mill, grist, E. Harrison 122,606
Mill, smut, J. Wernwag 122,691
Mines, device for raising tailings from, W. A. Rogers 122,657
Movement, mechanical, J. H. McCamy 122,780
Nut lock, H. C. Stouffer 122,676
Packing, piston, J. J. Clause 122,570
Packing for piston rods, &c., metallic, D. Devore 122,578
Padlock, A. Berger 122,696
Paper, manufacture of, S. D. Baldwin 122,548
Paper bag machine, L. D. Benner 122,510
Parer, corer, and slicer combined, apple, G. Bergner 122,553
Pavement, concrete, S. Filbert 122,591
Piano, S. P. Brooks 122,557
Pipe coupling, W. Kearney 122,614
Pitcher, ice, J. Dawson 122,576
Plane, carpenter's, H. A. Holt 122,609
Planing machine, J. S. Graham 122,599
Planter, walking, M. W. Stevenson 122,675
Plow, J. Dodge 122,582
Powder kegs, safety conductor for, M. Ward 122,688
Powders, box for seidlitz, C. A. and I. S. Browne 122,558
Power at railway stations, utilizing, W. J. Plecker 122,648
Projectile for small arms, C. Maduell 122,620
Pruning knife, D. Morris 122,633
Pruning shears, R. Hall 122,603
Pulp, machine for the manufacture of wood, H. Dodge 122,581
Pulverizer, ball, D. Osborn 122,643
Railway, elevated, J. E. Serrell 122,667
Railway frog, W. Morris 122,634
Railways, construction of, T. R. Timby 122,682
Railways, hose jumper for street, J. Rue 122,660
Remedy, pile, L. Heins 122,608
Roofing, metallic, J. Siddons 122,670, 122,671
Rope walks, strand twisting machine for, J. Hinek 122,653
Row lock, A. E. Brockett 122,556
Saddle tree, S. E. Tompkins, (reissue) 4,709
Sandal, B. Johnston 122,525
Sash holder, G. W. Warren 122,689
Scraper, earth, M. Newton 122,639
Screen, coal, T. Farron 122,589
Screening apparatus, D. Kahnweiler 122,612
Seeder, plow, and roller, combined, O. B. Cheatham 122,567
Sewing machine, D. M. Smyth 122,673
Sewing machine, C. F. Bosworth 122,555
Sewing machines, ruffling attachment for, A. Johnston 122,611
Sewing machines, tuck marker for, G. McFadden 122,626
Sewing machines, tuck marking attachment for, A. C. Kasson 122,613
Shutter, fire proof, G. H. Knight 122,615
Spark arrester, W. G. Grasseler 122,600
Springs, machine for coiling, Rhinelander and Hornig 122,523
Stamping varnished surfaces, T. H. Müller 122,636
Stove, base burning, J. R. Hawkins, (reissue) 4,705
Stove platform, L. Miller 122,631
Table, ironing, P. Bostrom 122,554
Telegraph pole, T. Rogers 122,656
Telegraph printing apparatus, H. Van Hoevenbergh 122,687
Tenoning spokes and boring fellies, machine for, J. Bauman 122,551
Thill coupling, E. F. Shoenberger 122,669
Torpedo for oil wells, E. A. L. Roberts 122,654
Toy, J. W. Beatty 122,552
Trimming, plaited, A. Shultz 122,663
Truck, Van Haagen and Cooper 122,686
Tube joint, steam boiler, heater and condenser, J. Harrison, Jr. 122,606
Type, pointed, Miner and Moody 122,531
Valve, steam, Chapman and Spaulding 122,566
Valve, tank, J. H. Dorst 122,583
Valve for steam and air cylinders, exhaust, G. Westinghouse, Jr. 122,544
Vehicle, pleasure, C. W. Saladee 122,536
Vehicles, torsion spring for, C. W. Saladee 122,537
Vessels, propulsion of, T. B. Raymond 122,650
Vessels, propulsion of, H. Niles 122,640
Vessels, propulsion of, E. Matteson 122,624
Wagon, dumping, W. W. Carré 122,565
Washing machine, D. W. George 122,596
Watch frame, cover for, A. Combs 122,571
Watches and clocks, cleaning, W. W. Thompson 122,681
Water wheel, W. H. Elmer 122,588
Weather strip, J. M. Dils 122,580
Wrench, pipe, C. Neames 122,638
Wringing machine, J. G. Roth 122,658, 122,659

EXTENSIONS GRANTED.

18,966.—IMPROVEMENT IN LOCOMOTIVE ENGINE WHEELS, granted to George S. Griggs, December 29, 1857.

18,874.—IMPROVEMENT IN BAGASSE FURNACES, granted to Moses Thompson, December 15, 1857.

DESIGNS PATENTED.

5,462.—CARPET PATTERN.—John H. Bromley, Philadelphia, Pa., assignor to John Bromley & Sons, same place.

5,463.—CAR SEAT END FRAME.—Thomas W. Brown, Belmont, Mass.

5,464.—DRAWER PULL.—Albert D. Judd, New Haven, Conn.

5,465.—TRELLIS.—Joseph G. Konvalinka, Astoria, N. Y.

5,466.—RIM OF VASES, ETC.—Jonathan Moore, Brooklyn, N. Y., assignor to himself and Abram Horton, same place.

5,467.—FLOOR OIL CLOTH PATTERN.—Joseph Robley, Brooklyn, N. Y., assignor to William M. Brasher & Co., same place.

5,468.—CARPET PATTERN.—John Howie Smith, Enfield, assignor to Hartford Carpet Company, Hartford, Conn.

5,469.—CIRCULAR REGISTER.—Edward A. Tuttle, New York city.

5,470.—HOT AIR AND VENTILATING REGISTER.—Edward A. Tuttle, New York city.

5,471.—HOT AIR AND VENTILATING REGISTER.—Edward A. Tuttle, New York city.

TRADE MARKS REGISTERED.

626.—WHISKY.—Barkhouse Brothers & Company, Louisville, Ky.

627.—PLOWS.—Bouton, Whitehead & Co., Naperville, Ill.

628.—LAMP CHIMNEYS.—Charles F. A. Hinrichs, New York city.

629.—DISINFECTANTS, ETC.—Marcellin, Warren & Co., New York and Brooklyn, N. Y.

630.—AQUEOUS SOLUTION OF BALSAMIC GUMS.—Oscar Oldberg, Washington, D. C.

631.—SEWING MACHINES.—The Finkle & Lyon Manufacturing Company, Middletown, Conn.

SCHEDULE OF PATENT FEES:

On each Caveat	$10
On each Trade-Mark	$25
On filing each application for a Patent, (seventeen 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 application for Extension of Patent	$50
On granting the Extension	$50
On filing a Disclaimer	$10
On an application for Design (three and a half years)	$10
On an application for Design (seven years)	$15
On an application for Design (fourteen years)	$30

For Copy of Claim of any Patent issued within 30 years $1

A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from ..... $1 *upward, but usually at the price above-named.*

The full Specification of any patent issued since Nov. 20, 1866 at which time the Patent Office commenced printing them ..... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information as to price of drawings in each case, may be had by addressing

MUNN & CO.,
Patent Solicitors, 37 Park Row, New York.

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

19,206.—HYDRANTS.—Granted to Washburne Race and S. P. C. Mathews, January 26, 1858; reissued July 18, 1871. Hearing January 10, 1872.

19,347.—INDIA RUBBER DOOR MATS.—Granted to Edwin M. Chaffee, February 16, 1858. Hearing January 31, 1872.

19,490.—METALLIC TIES FOR COTTON BALES.—Granted to Frederic Cook, March 2, 1858. Hearing February 14, 1872.

19,222.—SEED PLANTERS.—Granted to James D. Willoughby, January 26, 1858. Hearing January 10, 1872.

19,191.—MAKING BLADES FOR PENCIL SHARPENERS.—Granted to Walter K. Foster, January 26, 1858. Hearing January 10, 1872.

19,328.—CANE GUNS.—Granted to J. F. Thomas, February 9, 1858. Hearing January 24, 1872.

19,252.—PLATE FRAMES FOR PHOTOGRAPHIC CAMERAS.—Granted to William Lewis and William H. Lewis, February 2, 1858. Hearing January 17, 1872.

19,200.—STRAW CUTTERS.—Granted to Jacob H. Mumma, January 26, 1858; reissued September 6, 1859, March 29, 1864, and March 7, 1865. Hearing January 10, 1872. Postponed to January 20, 1872.

19,465.—CARPET BEATING MACHINE.—Granted to Joseph Harris, Jr., and Daniel Holmes, February 23, 1858; reissued May 13, 1862. Hearing February 7, 1872.

19,258.—FLASKS FOR CASTING WHEELS.—Granted to Frederick Nishwitz, February 2, 1858. Hearing January 17, 1872.

19,321.—PLOWS.—Granted to George Watt, February 9, 1858; additional improvements August 2, 1859; reissued August 4, 1868. Hearing January 24, 1872.

19,696.—GRINDING ATTACHMENT TO PUG MILLS.—Granted to David H. Gage, March 23, 1858. Hearing March 6, 1872.

19,318.—LAP JOINTS FOR BELTING.—Granted to Henry Underwood, February 9, 1858; reissued January 1, 1867. Hearing January 24, 1872.

19,384.—BANK CHECK CANCELER.—Granted to William M. Simpson, February 16, 1858. Hearing January 31, 1872.

19,370.—KNITTING MACHINES.—Granted to Joseph K. Kilbourn and Edward E. Kilbourn, February 16, 1858. Hearing January 31, 1872.

19,346.—PROPELLING CANAL BOATS.—Granted to Herman Camp, February 16, 1858. Hearing January 31, 1872.

19,398.—HYDRAULIC VALVES.—Granted to Calvin Woodward and George M. Woodward, February 16, 1858. Hearing January 31, 1872.

19,377.—HARVESTERS.—Granted to Frederick Nishwitz, February 16, 1858; reissued March 5, 1861, and again reissued in two divisions, April 13, 1869. Hearing January 31, 1872.

19,349.—SHINGLE MACHINES.—Granted to George Craine, February 16, 1858. Hearing January 31, 1872.

19,420.—HORSE RAKES.—Granted to William Horning February 23, 1858. Hearing February 7, 1872.

19,462.—STRAW CUTTERS.—Granted to Thomas H. Willson and Daniel T. Willson, February 23, 1858. Hearing February 7, 1872.

19,412.—SHOVEL PLOW OR CULTIVATOR.—Granted to Paul Dennis, February 23, 1858; reissued August 4, 1863. Hearing February 7, 1872.

19,417.—COTTON GINS.—Granted to Benjamin D. Gullett, February 23, 1858. Hearing February 7, 1872.

19,461.—SHOE PEG MACHINE.—Granted to Abijah Woodward, February 23 1858. Hearing February 7, 1872.

19,525.—SPLICE FOR JOINTS OF RAILROAD RAILS.—Granted to Mark Fisher, March 9, 1858. Hearing February 21, 1872.

19,979.—SEWING MACHINES.—Granted to Charles F. Bosworth, April 20, 1858. Hearing April 4, 1872.

19,487.—CONTINUOUS METALLIC LATHING.—Granted to Birdsall Cornell, March 2, 1858. Hearing February 14, 1872.

19,517.—MACHINE FOR FORMING SHEET METAL PANS.—Granted to E. A. Smead, March 2, 1858. Hearing February 14, 1872.

19,483.—HARVESTERS.—Granted to Jesse S. Butterfield, March 2, 1858; reissued in two divisions January 15, 1867. Hearing February 14, 1872.

19,572.—MACHINES FOR PACKING FLOUR.—Granted to J. Mattison, March 9, 1858. Hearing February 21, 1872.

19,510.—RAISING DOUGH.—Granted to James Perry and Elisha Fitzgerald March 9, 1858. Hearing February 21, 1872.

19,638.—COMBINED FLOATING ANCHORS AND LIFE PRESERVERS.—Granted to to Joseph Humphries, March 16, 1858. Hearing February 28, 1872.

19,719.—STOP MOTION FOR HAIR CLOTH LOOMS.—Granted to Rufus J. Stafford, March 23, 1858. Hearing February 6, 1872.

19,741.—RAILROAD CAR AXLE BOXES.—Granted to R. N. Allen, March 23 1858; reissued December 20, 1864. Hearing February 6, 1872.

19,548.—MODE OF TIGHTENING AND SECURING THE KEYS OF JOURNAL BOXES OF CONNECTING RODS OR PITMEN.—Granted to Levi Dederick, March 9 1858. Hearing February 21, 1872.

19,619.—MACHINE FOR PLANING BLIND SLATS.—Granted to Charles Carlisle and Leonard Worcester, March 16, 1858. Hearing February 28, 1872.

20,235.—FLY NETS.—Granted to Robert Wilson, May 11, 1858. Hearing April 24, 1872.

20,238.—SASH FASTENERS.—Granted to Frederick W. Brocksieper and Joseph B. Sargent, May 11, 1858. Hearing April 24, 1872.

19,594.—VALVES FOR STEAM ENGINES.—Granted to Isaac Van Doren, March 9, 1858.—Hearing February 21, 1872.

19,787.—WINDLASSES.—Granted to Joseph P. Manton, March 30, 1858. Hearing March 13, 1872.

19,806.—ROTARY CUTTERS FOR TONGUEING AND GROOVING.—Granted to James A. Woodbury, March 30, 1858.—Hearing March 13, 1872.

19,637.—GRAIN SEPARATORS AND CLEANERS.—Granted to Simeon Howes and Gardner E. Throop, March 16, 1858. Hearing February 28, 1872.

19,654.—MACHINES FOR TRIMMING BOOKS.—Granted to A. C. Semple, March 16, 1858. Hearing February 28, 1872.

19,626.—PHOTO-LITHOGRAPHY.—Granted to James A. Cutting and L. H. Bradford, March 16, 1858; reissued July 31, 1860. Hearing February 28, 1872.

19,683.—HOT AIR FURNACES.—Granted to John Child, March 23, 1858. Hearing March 6, 1872.

19,747.—WIRE STAPLES.—Granted to Byron Boardman, March 30, 1858; reissued March 6, 1866. Hearing March 13, 1872.

19,819.—LIGHTNING CONDUCTORS.—Granted to Oren White, March 30, 1858. Hearing March 13, 1872.

19,820.—HUBS OF CARRIAGE WHEELS.—Granted to James M. Whitney, March 30, 1858. Hearing March 13, 1872.

19,644.—SAWING MACHINES.—Granted to Henry H. Low, March 16, 1858. Hearing February 28, 1872.

19,718.—TURNING AND SLIDING TABLES FOR RAILROADS.—Granted to William Sellers, March 23, 1858; reissued August 10, 1858. Hearing March 6, 1872.

20,078.—MODE OF PROTECTING GILDING ON GLASS.—Granted to Peter V. Mathews, April 27, 1858. Hearing April 10, 1872.

19,783.—COMBINATION OF LEAD PENCIL AND ERASER.—Granted to Hymen L. Lipman, March 30, 1858. Hearing March 13, 1872.

19,767.—MACHINE FOR TESTING AND MEASURING THE STRENGTH OF CAR SPRINGS.—Granted to Perry G. Gardiner, March 30, 1858. Hearing March 13, 1872.

19,770.—CONSTRUCTING DOLL HEADS.—Granted to Ludwig Greiner, March 30, 1858. Hearing March 13, 1872.

19,786.—LATHE CHUCKS.—Granted to John L. Mason, March 30, 1858. Hearing March 13, 1872.

20,192.—METHOD OF SEATING THE MOVABLE CUTTERS IN EXPANSIVE BITS.—Granted to William A. Clark, May 11, 1858; reissued June 22, 1869. Hearing April 24, 1872.

19,885.—ICE PITCHERS.—Granted to Ernest Kaufmann, April 6, 1858. Hearing March 20, 1872.

19,824.—APPARATUS FOR SUPPLYING AND MEASURING SYRUPS IN SODA WATER.—Granted to Edmund Bigelow, April 6, 1858; reissued May 4, 1858, and December 4, 1866. Hearing March 20, 1872.

Value of Extended Patents.

Did patentees realize the fact that their inventions are likely to be more productive of profit during the seven years of extension than the first full term for which their patents were granted, we think more would avail themselves of the extension privilege. Patents granted prior to 1861 may be extended for seven years, for the benefit of the inventor, or of his heirs in case of the decease of the former, by due application to the Patent Office, ninety days before the termination of the patent. The extended time inures to the benefit of the inventor, the assignees under the first term having no rights under the extension, except by special agreement. The Government fee for an extension is $100, and it is necessary that good professional service be obtained to conduct the business before the Patent Office. Full information as to extensions may be had by addressing

MUNN & CO., 37 Park Row.

Inventions Patented in England by Americans.

From December 12 to December 18, 1871, inclusive.

[Compiled from the Commissioners of Patents' Journal.]

BLENDING INKS.—T. L. McCready (of New York city), London, England.
CENTRIFUGAL MACHINE.—S. S. Hepworth, New York city.
COUPLING.—J. R. Taber (of Fairhaven, Mass)., London, England.
GALVANIC BATTERY.—J. Smith, New York city.
GENERATING GAS.—W. Elmer, New York city.
HOISTING APPARATUS, ETC.—C. R. & N. P. Otis, Yonkers, N. Y.
WATER PROTECTOR.—W. B. Farwell (of New York city), London, England.

Foreign Patents

The population of Great Britain is 31,000,000; of France, 37,000,000; Belgium, 5,000,000; Austria, 36,000,000; Prussia, 40,000,000; and Russia, 70,000,000. Patents may be secured by American citizens in all of these countries. Now is the time, while business is dull at home, to take advantage of these immense foreign fields. Mechanical improvements of all kinds are always in demand in Europe. There will never be a better time than the present to take patents abroad. We have reliable business connections with the principal capitals of Europe. A large share of all the patents secured in foreign countries by Americans are obtained through our Agency. Address MUNN & Co., 37 Park Row, New York. Circulars with full information on foreign patents, furnished free.

Advertisements.

The value of the SCIENTIFIC AMERICAN *as an advertising medium cannot be over-estimated. Its circulation is ten times greater than that of any similar journal now published. It goes into all the States and Territories, and is read in all the principal libraries and reading-rooms of the world. We invite the attention of those who wish to make their business known to the annexed rates. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. If it is worth 25 cents per line to advertise in a paper of three thousand circulation, it is worth $2.50 per line to advertise in one of thirty thousand.*

RATES OF ADVERTISING.

Back Page - - - - $1·00 a line,
Inside Page - - - 75 cents a line
for each insertion.

Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.

ALDERMEN'S ROOM, CITY HALL, BOSTON, Dec. 25, 1871.

J. W. BARTLETT, ESQ., No. 569 BROADWAY. DEAR SIR: I fully agree with the testimony of General Roome, of the Manhattan Gas Light Co., in regard to your Street Lamps. They are superior to any I have ever seen in every particular. Those in use here "shine for themselves," and are admired by all. I believe the object of street lamps to be the lighting of the streets. The difference between yours and the others in use here is nearly as great as between the fluid and gas lamps. Yours truly, SAM'L S. LITTLE.

"Quite eclipses the more conservative periodicals of the day."—*Boston Journal, Mass.*

THE GALAXY

Meets the Wants of Every Member of the Family.

IT CONTAINS THOUGHTFUL ARTICLES BY OUR ABLEST WRITERS.
IT CONTAINS SKETCHES OF LIFE AND ADVENTURE.
IT HAS SERIAL STORIES BY OUR BEST NOVELISTS.
IT HAS SHORT STORIES IN EACH NUMBER.
IN EACH NUMBER IS A COMPLETE REVIEW OF THE WORLD OF LITERATURE.
IT IS A BLESSING TO ANY FAMILY.

NOW IS THE TIME TO SUBSCRIBE!

Price 35 Cents per Number.
SUBSCRIPTION PRICE.....$4 PER YEAR.

SEND FOR PROSPECTUS.

SHELDON & COMPANY,
NEW YORK.

SAVE 20 DOLLARS.

BUY the CELEBRATED **WILSON SHUTTLE SEWING MACHINE.** The best in the World. For Sale Everywhere. AGENTS WANTED in unoccupied Territory. For Illustrated Circulars, Address, WILSON SEWING MACHINE CO., Cleveland, O.; 1 St. Louis, Mo.; Phila., Pa.; or, 707 Broadway, N. Y.

MECHANICAL DRAWING.

UNCLE RAPHAEL'S LESSONS ON MECHANICS and DRAUGHTING, in WORK AND PLAY, are worth ten times the cost of the Magazine. Only $1.00 per year. Send 10 cents for Jan. No., containing first Lesson, new series. MILTON BRADLEY & CO., Publishers, Springfield, Mass.

Cable SCREW WIRE

BOOTS AND SHOES, easiest and best.

Silver TIPPED SHOES

NEVER WARE THROUGH at the toe.

A CAREFULLY SELECTED assortment of

PATENT RIGHTS

Constantly on hand and for sale, either for cash or on royalty. We offer those only, which, after a business experience of fourteen years, we can thoroughly endorse, both in a pecuniary and mechanical aspect. Manufacturers and capitalists negotiating through us will therefore continue to find safe and profitable investments, as in former years. See advertisements in the New York daily papers. Patentees and Inventors will do well to communicate with us for terms, &c. E. E. ROBERTS & CO., Consulting Engineers, 15 Wall St., New York.

FROM FORCED SALES.—Ladies' Solid Gold Leontine Chains, $14, $18, and $20 each; usual prices, $22, $25, $32. Ladies' Solid Gold Opera Chains, most beautiful styles, $38 to $45 each; usual prices, $55 to $66. Gents' Vest Solid Gold Chains, $20 to $35 each; usual prices, $30 to $65. You want one of these at nearly half the prices you have been paying for the same goods. Any articles C. O. D., privilege to examine. Two sent from which to take a choice.
F. J. NASH, 712 Broadway, New York.

"Worthy of the fullest confidence."—*Christian Advocate, N. Y.* "Just what he represents them."—*Christian Union.* "All that Mr. Nash says may be depended upon."—*Christian at Work.*

(H 741 Ct) THE MOST PERFECTED

HYDRAULIC MACHINES

FOR MAKING
MACCARONI, VERMICELLI, ETC.,
MADE BY
Machine Works and Iron Foundry,
ST. GEORGES, NEAR ST. GALL, SWITZERLAND.
SPECIALITY, PRIZE MEDAL, LONDON, 1862.
ALSO, MAKERS OF FIRST CLASS
EMBROIDERING MACHINES.

Narrow Gage Railways

BY C. E. SPOONER, C. E. Fully illustrated. 8vo. Cloth. $4.50. D. VAN NOSTRAND, Publisher, 23 Murray St., and 27 Warren St., New York.

A HAND-BOOK ON SILEX.—Embraced in three practical treatises:
I. On Soluble Glass and all its latest applications.
II. On Glass-making in all its details of manufacture.
III. A guide for Soap-making.
The work contains 347 pages, and may be mailed on remitting $5.20 to
L. & J. W. FEUCHTWANGER,
No. 15 Cedar St., New York.

A VALUABLE FAMILY LINIMENT.—Sure cure for rheumatism. Send one dollar, and get a receipt, or stamp for circular. Address
E. E. ROUTZAHN, Box 76, Frederick, Md.



Reynolds'

TURBINE WATER WHEELS.

The Oldest and Newest. All others, only imitations of each other in their strife after complications to confuse the public. We do not boast but quietly excel them all in staunch, reliable, economical power. Beautiful pamphlet free. GEO TALLCOT, 96 Liberty st., New York.
Gearing, Shafting.

GREAT SUCCESS of the HYDRAULIC ROTARY GOVERNOR on Water Wheels. It gives exact speed under all changes. SILVER MEDALS awarded. No pay till tested. J. S. ROGERS, Tr., 19 John st., Boston

---



WONDERFUL PHILOSOPHICAL PHENOMENA!
Amusing but Surprising
SPECTRAL ILLUSIONS!
Ghosts seen everywhere! *Good Fun for the Evening Circle.* Will be sent post paid, for 50 cts., with full directions.
L. WALKER & Co. Box 4099 Boston.

MODELS FOR THE PATENT OFFICE, and experimental machinery of all kinds. HOLSKE MACHINE CO., 279 Cherry St., New York, near Jefferson St. A special shop for Patent Models. Many years experience. Refer to Scientific American Office.

CAST STEEL CASTINGS

To pattern! Send patterns, prepaid, by "American M. U. Express Co." Direct "Union Steel and Iron Works," Rhinebeck, N. Y. Office, 57 Cedar St. New York.
MORSE & BENNET.

PATENT TWINE CUTTER.—The patentee of the Twine Cutter illustrated in Scientific American of Jan. 13, 1872, desires to sell, on reasonable terms, a portion of the patent for the United States and Great Britain, or will license to manufacture on royalty. Eastern and Middle State Manufacturers will be treated with liberality, if they engage in the manufacture. It is believed to be the most convenient implement for the purpose invented. The feature of always having the end of twine at hand after cutting, ready to regrasp, is very important. For terms and further particulars, address
CHAS. C. LEWIS, Gainesville, Ala.

AGENT for sale of
PATENT ARTICLES
for the State of Texas.
CHAS. U. ELEY,
P. O. Box 81, Galveston, Tex.



THE AMERICAN VOLUNTEER,
A WEEKLY JOURNAL,
Devoted to the interests of Soldiers and Sailors of the late war, containing important information for all Soldiers, Sailors, and their Heirs. An eight page paper, brimful of matter for the fireside. Specimen free.
Address
LOWRY, BROWN & CO.,
Pittsburgh, Pa.

TO OIL MANUFACTURERS and Refiners. A Gentleman with twenty years' experience as manufacturer and refiner of animal, vegetable, and mineral Oils, desires employment as superintendent or assistant. His specialty is the production of neutral Paraffin Oil, and also the refining of Canada and Kentucky Petroleum. Address G. W. K., care of Charles Khuen, Druggist, 67 Forsyth Street, New York.

SEND $1.25, and receive free, by mail, sample Hand Corn Sheller—best ever patented. *Agents Wanted.* MIDDLETON & Co., Harrisburg, Pa.

FOR SALE CHEAP—A Heavy Back-geared Revolving Head Screw Machine. Windsor pattern, with tools for making Set Screws. Address,
W. G. BURKE, Nashua, N. H.

Wood and Iron Working Machinery,

Gauge Lathes for all kinds of handles and Cabinet Maker's work. Chair Machinery, etc.; Upright Drills; Key Seat Machinery; Stave and Shingle Machinery, etc. etc.
Address, for catalogue,
T. R. BAILEY & VAIL, Lockport, N. Y.

FOR SALE—All the machinery, patterns and fixtures of a Machine Shop, necessary to employ 30 to 40 men with abundance of business. For particulars, address F. W. KRAUSE, 76 West Washington St., Chicago, Ill.

FOR SALE, on the most reasonable terms, a Water and Steam Power Mill, 8 foot Head, and Forty Horse Power Engine—225 Acres of good Land, one half timber. Part or whole for sale or trade. Situated in South Eastern Kansas. For particulars, address
J. A. BEAM, Verdi, Wilson Co., Kansas.

SHAFTING with PATENT HANGERS
A Specialty, also Power Looms, Spooling, Winding, Beaming & Sizing Machines of latest improvements, manufactured by THOS. WOOD, 2106 Wood st., Phila., Pa.

WOOD WORKING MACHINERY



MOLDING, MORTISING, TENONING & SHAPING MACHINES;
BAND SAWS, SCROLL SAWS
Planing & Matching MACHINES, &c.,
For RAILROAD, CAR, and AGRICULTURAL SHOPS, &c., &c.
Superior to any in use.
J. A. FAY & CO.,
CINCINNATI, OHIO.

GREAT REDUCTION IN PRICES

OF LE COUNT'S PATENT HOLLOW LATHE DOGS, and his Machinist Clamps of both Iron and Steel.
His ex. anding Mandril is a first class tool, which has long been needed by every Machinist.
Send for latest circular.
C. W. LE COUNT,
South Norwalk, Conn.

$425 A MONTH! Horse and carriage furnished. Expenses paid. H. B. SHAW, Alfred, Me

---

NEW CENSUS AND PATENT LAWS

A new edition of the Patent Laws, with official rules for proceeding before the Patent office, etc., including Census for 1870, complete. It shows the population by counties of all the States and Territories, and population of cities of over 10,000 inhabitants. Important to every patentee who has rights to sell. It enables him to calculate the value of territory, by the population.
Price, bound, 25 cents. Mailed on receipt of price.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN,
New York City.

Washington Iron Works,

MANUFACTURERS of Steam Engines and Boilers, Saw Mills, Flouring Mills, Sugar Cane Mills, White's Patent Double Turbine Water Wheel, Gray's Patent Cotton and Hay Press, Baker's Anti-Friction Lining Metals, and American White Brass, Iron and Brass Castings, and general Machinery. Send for Circular to Office, 50 Vesey st., New York.



"Buckeye" Hominy Mill.

IN THE WORKING OF THIS MILL the Corn requires no preparation except shelling. It has a regular feed and discharge, and needs but little attention. IT IS COMPLETE IN ITSELF. Hominy can be made from common as well as flint corn. It occupies very little room, and any miller can work it. There is nothing the miller can manufacture to a better profit than Hominy. Send for descriptive pamphlet. BALTIMORE PEARL HOMINY CO., Baltimore, Md., Sole owners of Patent.

ELGIN WATCHES.

"It is generally known that *American Watches* are, all things considered, the *best in the world*; but the public may not be aware that the *best of these*, such as are specially adapted to the use of railway men, travelers, and those to whom *absolutely accurate* time is a matter of necessity, *are made at Elgin, Ills.*"—*Forney's Weekly Press*, Philadelphia.

The Elgin Illustrated Almanac for 1872, printed with original pictures, and in a superior manner, by the Aldine Press, of New York, is now ready for distribution.

Jewelers throughout the country are supplied with them, for gratuitous circulation, or copies will be sent free to any address upon application to **NATIONAL (Elgin) WATCH CO.**, 162 West Washington St., Chicago, Ills., or No. 1 Maiden Lane, New York.

PATENTS BOUGHT AND SOLD.
E. H. GIBBS & CO., 11 Wall St., N.Y.

ARTIFICIAL STONE OR CEMENT PIPE MACHINERY.
Use any power you please.
J. W. STOCKWELL & CO.,
28 & 163 Danforth St., Portland, Me.

FOR SALE—100 Shares Stock in the Slifer, Walls & Shriner Mfg. Co. C. DAVIS, Lewisburg, Pa.

THE FREAR ARTIFICIAL STONE.
INCOMBUSTIBLE, AND UNSURPASSED IN DURABILITY.
Upwards of 400 houses erected of it, in Chicago; Toledo, Buffalo, Elmira, New Orleans, New Haven, Albany, Brooklyn, and elsewhere. It can be sold at less than half the cost of labor on the natural material. Orders for stone received at the office of THE NEW YORK FREAR STONE Co., N. Y. Life Ins. Co. Building, Nos. 346 and 348 Broadway, corner of Leonard St., New York.

EXTRACTS & CARMINES OF **INDIGO.** TAYLOR & BARKER, Manf'g Chemists, Lowell, Mass.

THE WOODWARD
STEAM PUMP.

Woodward Pat. Improved Safety Steam Pump and Fire Engine, Steam, Water, and Gas Fittings of all kinds. Dealers in Wro't-iron Pipe, Boiler Tubes, etc. Hotels, Churches, Factories, and Public Buildings heated by Steam, Low Pressure. Woodward Co., 76 and 78 Center st., N. Y.

MACHINERY, NEW and 2d-HAND.—Send for Circular. CHAS. PLACK & CO., 60 Vesey st., New York.

ELECTRO-MAGNETS—Galvanic Batteries of all kinds—Telegraph Instruments, Wire, and every device in the Electrical line, manufactured by C. WILLIAMS, Jr., 109 Court Street, Boston, Mass.
(ESTABLISHED IN 1856.)

Chemical Analysis. Address Prof. J. C. DRAPER, 429 Lexington Avenue, New York City.

HINKLEY KNITTING MACHINE

The Simplest, Cheapest, and Best in use! Has but one needle! A Child can Run it. **Agents wanted in every Town.** Send for Circular and Sample Stocking, to
HINKLEY KNITTING MACH. CO., Bath, Me.

1832. SCHENCK'S PATENT. 1871.

WOODWORTH PLANERS

And Re-Sawing Machines, Wood and Iron Working Machinery, Engines, Boilers, etc. JOHN B. SCHENCK'S SONS, Matteawan, N. Y., and 118 Liberty st., New York.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman on patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK,
P. O. Box 1,067 Boston, Mass.
N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

E. M. MAYO'S BOLT CUTTER, patented in 1867, improved in 1871, is the best in use. Send for illustrated Circular. Cincinnati, Ohio.

Niagara Steam Pump.

CHAS. B. HARDICK,
23 Adams st., Brooklyn, N. Y.

LATHE CHUCKS—HORTON'S PATENT from 4 to 36 inches. Also for car wheels. Address E. HORTON & SON, Windsor Locks Conn.

ALCOTT'S LATHES for Broom, Fork, Hoe, and Rake Handles, Chair Rounds, &c.
HILLS & HOAG, 32 Court and St., New York.

PATENT Emery Grinders, Twist Drills, Fluted Hand Reamers, &c., unsurpassed for elegance of design, workmanship, and durability. These indispensable Tools can be purchased of us for less than half their cost in an ordinary machine shop. Illustrated catalogue free. AMERICAN TWIST DRILL CO., Woonsocket, R. I.

STEEL CASTINGS

TO PATTERN; tensile strength equal to wrought iron; will rivet over, bend, or case harden. Heavy work at low prices. PHILIP S. JUSTICE,
14 North 5th st., Phila.; 42 Cliff st., New York.

AGENTS, LOOK—$3 to $20 per day easily made—easy and respectable business—useful article—every body wants one—success sure. Send stamp for circulars. EUREKA RUBBER TYPE CO., 615 Broadway, N. Y.

Andrew's Patents.

Noiseless, Friction Grooved, or Geared Hoisters, suited to every want.
Safety Store Elevators. Prevent Accident, if Rope, Belt, and Engine break.
Smoke-burning Safety Boilers.
Oscillating Engines, Double and Single, 1-2 to 100-Horse power.
Centrifugal Pumps, 100 to 100,000 Gallons per Minute. Best Pumps in the World, pass Mud, Sand, Gravel, Coal, Grain, etc., without injury.
All Light, Simple, Durable, and Economical. Send for Circulars.
WM. D. ANDREWS & BRO.,
414 Water street, New York.

P. BLAISDELL & Co.,

MANUFACTURERS OF FIRST CLASS **MACHINISTS' TOOLS.** Send for Circulars.
Jackson st., Worcester, 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, Kloman & Co. Union Iron Mills, Pittsburgh Pa.

SWIVEL HEAD ENGINE LATHES

GAGE MACHINE WORKS.
WATERFORD, N.Y.

WOODBURY'S PATENT

Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, 91 Liberty street, N. Y.;
Send for Circulars. 67 Sudbury street, Boston.

Machinist's Tools.

AT low prices, 97 to 113 R. R. Ave., Newark, N. J. E. & R. J. GOULD successors to Gould Machine Co.

WOOD-WORKING MACHINERY GENERALLY. Specialties, Woodworth Planers and Richardson's Patent Improved Tenon Machines. Nos. 24 and 26 Central, corner Union st., Worcester, Mass.
WITHERBY RUGG & RICHARDSON.

MACHINISTS.

Illustrated Catalogue and Price List of all kinds of small Tools and Materials sent free to any address. GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.

Milling Machines.

STANDARD, UNIVERSAL, INDEX AND PLAIN, in every variety, of unequalled design and first class workmanship. Send for illustrated catalogue to the BRAINARD MILLING MACHINE COMPANY, 80 Milk Street, Boston. Works at Hyde Park.

AGENTS WANTED. Agents make more money at work for us than at anything else. Particulars free. G. STINSON & Co., Fine Art Publishers, Portland, Me.

To Electro-Platers.

BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction, manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield street, Boston, Mass. Illustrated catalogue sent free on application.

FOOT LATHES, best in the country. WOODMAN & PIKE, Lake Village, N. H. Circulars free.

BURDON IRON WORKS.—Manufacturers of Pumping Engines for Water Works, High & Low Pressure Engines, Portable Engines and Boilers, of all kinds, Sugar Mills, Screw, Lever, Drop, & Hydraulic Presses, Machinery in general. HUBBARD & WHITTAKER, 10 Front st., Brooklyn.

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 st. New York. 17 1

SHINGLE AND BARREL MACHINERY.—Improved Law's Patent Shingle and Heading Machine, simplest and best in use. Also, Shingle Heading and Stave Jointers, Stave Equalizers, Heading Planers Turners, etc. Address TREVOR & Co., Lockport, N.Y.

PUMPS.—For Description, Price Lists etc., of the Best Centrifugal Pump ever invented, with Overwhelming Testimony in its favor, send for new illustrated pamphlet (42 pp.) to Messrs. HEALD, SISCO & CO. Baldwinsville, N. Y.

PROPELLER PUMPS.

Any capacity and elevation. See Sci. Am., Aug. 19, '71
W. B. BUCK, Sec., 67 N. Front St., Philadelphia, Pa.



You ask WHY we can sell First Class 7 Octave Pianos for $290? We answer—It costs less than $200 to make any $600 Piano sold through Agents, all of whom make 100 per ct. profit. We have no Agents, but ship direct to families at Factory price, and warrant Five Years. Send for illustrated circular, in which we refer to 200 Bankers, Merchants, &c. (some of whom you may know) using our Pianos in 40 States and Territories.
U. S. Piano Co., 865 Broadway, New York.

PATENT IMPROVED
VARIETY MOLDING MACHINERY,
And Adjustable
CIRCULAR SAW BENCHES.
For Machines and information, address
J. P. GROSVENOR, Lowell, Mass.

$375 A MONTH—Horse and outfit furnished. Address NOVELTY CO., Saco, Me.

ORCHESTRAL, MEDIUM and COLIBRI MATHUSHEK PIANO FORTES.
Acknowledged the best in the world for tone, touch and durability. Descriptive Pamphlets free. Address MATHUSHEK PIANO M'F'G CO., New Haven, Conn.

CINCINNATI BRASS WORKS.—None but best quality of Brass Work for Engine Builders and Steam Fitters. F. LUNKENHEIMER, Proprietor.

OTIS' SAFETY HOISTING Machinery.

OTIS, BROS. & CO.
No. 348 BROADWAY, NEW YORK.

Subscribers—Who wish to have their volumes bound, can send them to this office. The charge for binding is $1·50 per volume. The amount should be remitted in advance, and the volumes will be sent as soon as they are bound.

Advertisements.

Advertisements will be admitted on this page at the rate of **$1·00** *per line for each insertion. Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

VULCANIZED RUBBER

Adapted to Mechanical Purposes. New York Belting and Packing Co., 37 & 38 Park Row.

ASPHALTE ROOFING FELT.



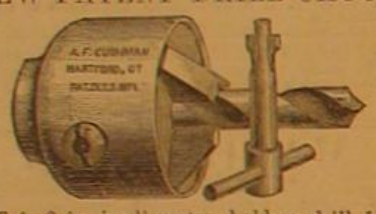
A WELL test d article of good thickness and durability, suitable for steep or flat roofs; can be applied by an ordinary mechanic or handy laborer. Send for circular and samples to E. H. MARTIN, 70 Malden Lane, and 9 Liberty Street, N. Y.,

SEWING MACHINE.—For Sale, the patent right of the only thoroughly practical rotating shuttle Machine in existence, or would treat with parties with a view to forming a general stock company. To see model, and for full particulars, enquire
I. H. FREY, 133 W. 23d St., New York.

STEAM PIPE AND BOILER COVERING.

ECONOMY, Safety, Durability. CHALMERS SPENCE Co., foot E. 9th st., N.Y., 1302 N. 2d st., St. Louis.

NEW PATENT DRILL CHUCK.



IT is 2 in. in diameter, holds a drill from 1-64 to 1-2 in., operates with a key, and is warranted to be stronger and more durable than any other. Price, $20. Agents wanted. Address,
A. F. CUSHMAN, Hartford, Conn.

American Saw Co., Manufacturers of



And Perforated Circular and Long Saws. Also Solid Saws of all kinds. No. 1 Ferry st., corner Gold street, New York. Branch Office for Pacific Coast, No. 606 Front street, San Francisco, Cal.

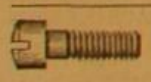
IRON PLANERS, ENGINE LATHES, Drills, and other Machinists' Tools, of superior quality, on hand, and finishing. For sale low. For Description and Price address NEW HAVEN MANUFACTURING CO., New Haven, Conn.



BEST DAMPER REGULATOR for Steam Boiler. Send for Circulars.
MURRILL & KEIZER, Balt., Md.

Working Models

And Experimental Machinery, Metal, or Wood, made to order by J. F. WERNER, 62 Center st. N.Y.



MILLED MACHINE SCREWS of superior quality made to order from sample or drawing.
BROWN & SHARPE M'FG CO., Providence, R. I.

WIRE ROPE.

JOHN A. ROEBLING'S SONS,
MANUFACTURERS, TRENTON, N. J.

FOR Inclined Planes, Standing Ship Rigging, Bridges, Ferries, Stays, or Guys on Derricks & Cranes, Tiller Ropes, Sash Cords of Copper and Iron, Lightning Conductors of Copper. Special attention given to hoisting rope of all kinds for Mines and Elevators. Apply for circular, giving price and other information. Send for pamphlet on Transmission of Power by Wire Ropes. A large stock constantly on hand at New York Warehouse No. 117 Liberty street.

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 CORLISS PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price lists mailed on application to
JONES & LAUGHLINS,
139 Water street, Pittsburgh, Pa.
☞ Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 128 Chambers street, N. Y.



ORIENT SAFETY LAMPS,

Entirely of metal, are the only lamps in use which can neither break, leak, nor explode. Are ornamental and cheap. Adapted to all household uses; also, to stores, factories, churches, &c.

AGENTS MAKE $10 A DAY SELLING THESE LAMPS.

Manufactured by
WALLACE & SONS,
29 Chambers St., New York.

B. F. STURTEVANT,

PATENTEE AND SOLE MANUFACTURER OF

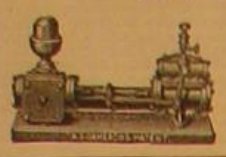
PRESSURE BLOWERS & EXHAUST FANS

72 SUDBURY STREET, BOSTON, MASS.

SEND FOR CATALOGUE, ILLUSTRATED WITH 40 ENGRAVINGS.

A. S. CAMERON & CO.,

ENGINEERS,



Works, foot of East 23d street, New York city.

Steam Pumps,

Adapted to every possible duty.
Send for a Price List.

McNab & Harlin Man'f'g. Co.

Manufacturers of
BRASS COCKS, PLUMBERS' BRASS WORK, Globe Valves, Gauge Cocks, Steam Whistles, and Water Gauges, Wrought Iron Pipe and Fittings, BRASS AND COMPOSITION CASTINGS,
NO. 56 JOHN STREET, NEW YORK.



BABCOCK Fire Extinguisher.

"ABSOLUTELY THE BEST PROTECTION AGAINST FIRE!"
Send for "It's Record."
F. W. FARWELL, Secretary.
407 BROADWAY, N. Y.
656 WABASH AVENUE, CHICAGO.

Diamond Pointed STEAM DRILLS.

THE adoption of new and improved applications to the celebrated Leschot's patent, have made these drills more fully adaptable to every variety of ROCK DRILLING. Their unequalled efficiency and economy are acknowledged, both in this country and Europe. The Drills are built of various sizes and patterns; WITH AND WITHOUT BOILERS, and bore at a uniform rate, of THREE TO FIVE INCHES PER MINUTE in hard rock. They are adapted to CHANNELLING GADDING, SHAFTING, TUNNELLING, and open cut work; also, to DEEP BORING FOR TESTING THE VALUE OF MINES AND QUARRIES. TEST CORES taken out, showing the character of mines at any depth. Used either with steam or compressed air. Simple and durable in construction. Never need sharpening. Manufactured by
THE AMERICAN DIAMOND DRILL CO.,
No. 61 Liberty St., New York

HUTCHISON & CO.,
Commission Merchants for the sale of Steam Pumps, Engines, Boilers, Machinery, and Manufacturers' Supplies, corner of Wood Street and Second Avenue, Pittsburgh, Pa.

CREDIT & CAPITAL.

McKILLOP, SPRAGUE & CO.

will issue about the first of January, 1872, their Semi-Annual Volume of the

Commercial Agency Register.

It will be the most COMPLETE AND VALUABLE work of the kind ever published. This is the only *Reference Guide* giving a close estimate of the CAPITAL of each firm, in connection with their CREDIT ratings.

This Agency was established in 1842, and the COMMERCIAL REGISTER has become a *Standard Work* for the Bank and Counting Room.

ASSOCIATE OFFICES.
JOHN McKILLOP & CO., Philadelphia, Pa.
JAMES WM. KIMBALL, Boston, Mass.
JOHN McKILLOP & CO., Baltimore, Md.
TAPPAN, McKILLOP & CO., Chicago, Ill.
TAPPAN, McKILLOP & CO., Cincinnati, Ohio.
LATHROP, McKILLOP & CO., St. Louis, Mo.
TAPPAN, McKILLOP & CO., Milwaukee, Wis.
TAPPAN, McKILLOP & CO., Detroit, Mich.
TAPPAN, McKILLOP & CO., Toledo, Ohio.
MOORE & McKILLOP, Quincy, Ill.
WRIGHT, McKILLOP & CO., Kansas City, Mo.
STRONG & HEDENBERG, St. Joseph, Mo.
TAPPAN, McKILLOP & CO., St. Paul, Minn.
HOPE, McKILLOP & CO., San Francisco, Cal.
HOPE, McKILLOP & CO., Portland, Ore.
MURRAY, MIDDLEMISS & CO., Montreal, Canada.
MURRAY, MIDDLEMISS & CO., Toronto, Canada.
PURCELL, BOSS & CO., Albany, N. Y.



LUBRICATORS.

DREYFUS' celebrated Self-acting Oilers, for all sorts of Machinery and Shafting, are reliable in all seasons, saving 75—95 per cent. The Self-acting Lubricator for Cylinders is now adopted by over 80 R. R. in the U. S., and by hundreds of stationary engines. Send for a circular to NATHAN & DREYFUS, 108 Liberty St., N.Y.

Trade-Mark Patents.

MUNN & CO. desire to call the attention of manufacturers and business men generally, to the importance of the law of patents, as applied to trade-marks for business purposes.

Any person, firm, or corporation, domiciled in the United States, or in any foreign country affording similar privileges to citizens of the United States, can obtain the right to the exclusive use, for THIRTY YEARS, of any TRADE-MARK, consisting of any new figure, or design, or any new word, or new combination of words, letters, or figures upon their manufactures.

This protection extends to trade-marks already in use or any length of time, or about to be adopted.

Full information on this important subject can be obtained by addressing
MUNN & CO.
37 Park Row, New York.

Swain Turbine.

"Our Low-Water Wheel from this on"

WILL DO TEN PER CENT MORE WORK on small streams, in a dry season, than any wheel ever invented. Gave the best results, in every respect, the Lowell Tests.

For Report of tests at Lowell, with Diagrams and Tables of Power address
THE SWAIN TURBINE CO.,
North Chelmsford, Mass.

Pennock's Patent Iron Bending Machine,

INVALUABLE in Car and Machine Shops. Saves several times its cost in one year's use. Instantly adjustable to thickness, and bends at any desired angle. Price, $150. Address
THE PENNOCK MANUFACTURING CO.,
Kennett Square, Chester Co., Pa.

TRADE MARK

Union Stone Co.,

Patentees and Manufacturers of
ARTIFICIAL STONE & EMERY WHEELS,
and Artificial Stone and Emery Wheel Machinery and Tools. Send for circular. **29 Kilby Street, BOSTON, MASS.**

WIRE ROPE.

STEEL, CHARCOAL and B. B., of the very best quality, suitable for Ships, Rigging, Suspension Bridges, Guys, Derricks, Inclined Planes, Hoisting purposes, &c. A Large Stock constantly on hand at
JOHN W. MASON & CO.'S,
43 Broadway, New York.

L. W. Pond---New Tools.

EXTRA HEAVY AND IMPROVED PATTERNS

LATHES, PLANERS, DRILLS, of all sizes; Vertical Boring Mills, ten feet swing, and under. Milling Machines, Gear and Bolt Cutters; Hand Punches and Shears for Iron.
Office and Warerooms, 98 Liberty st., New York; Works at Worcester, Mass.
A. C. STEBBINS, New York, Agent.

VENEERS,

HARDWOOD BOARDS.

Large and choice assortment of
FRENCH BLACK WALNUT, AMBOINE, THUYA, HUNGARIAN ASH;
Together with a complete stock of DOMESTIC FINE FIGURED VENEERS, BOARDS AND PLANK.
☞ Send for catalogue and price list.
G. W. READ & Co., 170 & 172 Center St., N. Y.
Factory, 186 to 200 Lewis st., between 5th and 6th sts.

Leffel's Improved Turbine.



NEARLY SIX THOUSAND of them in use; under heads from 1½ to 240 feet.
☞ Send for our pamphlet, one hundred and twenty pages.
JAMES LEFFEL & CO.,
Springfield, Ohio, and New Haven, Conn.

IRON STEAMSHIP BUILDERS.

NEAFIE & LEVY, *PENN WORKS.*

MARINE ENGINES, BOILERS, AND BUILDERS OF COMPOUND ENGINES,
PHILADELPHIA, PA.

STEAM ENGINES & BOILERS

From 4 to 500 horse power, including Corliss Engines, Slide Valve Stationary Engines, Portable Engines, etc. Also, Circular Saw Mills, Shafting, Pulleys, etc. Wheat and Corn Mills, Circular Saws, etc.
Send for Price List.
WOOD & MANN,
Steam Engine Company
WORKS—UTICA, N. Y.
PRINCIPAL OFFICE—**42 Cortlandt st., New York.**



REYNOLDS & CO.

MANUFACTURE
Screws & Bolts
For Machinery of every variety.
ALSO
Bridge and Roof Bolts, STEEL & IRON SET SCREWS
A specialty. Also, Small Articles for Patentees, in great numbers, at
No. 145 East st., New Haven Conn.

THE BEST SAW GUMMER OUT, ONLY $15; Emery Grinders, at $25, $40, and $100; Diamond Turning Tools, $15; Solid Emery wheels of all sizes; The above standard goods are all of our own manufacture. Address THE TANITE CO., Stroudsburg, Monroe Co., Pa

TODD & RAFFERTY, Manufacturers of Steam Engines, Boilers, Flax, Hemp, Tow Bagging, Rope and Oakum Machinery. Steam Pumps and Governors always on hand. Also Agents for the New Haven Manufacturing Co.'s Machinists' Tools. ☞ We invite especial attention to our new, improved, Portable Steam Engines. Warerooms, 10 Barclay st.; Works, Paterson, N. J.

PORTABLE STEAM ENGINES, COMBINING the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than **900** being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
J. C. HOADLEY & CO., Lawrence, Mass.
46 Cortlandt st. New York.

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

HARTFORD *Steam Boiler* INSPECTION & INSURANCE CO.

CAPITAL.....$500,000

ISSUES POLICIES OF INSURANCE, after a careful inspection of the Boilers, covering all loss or damage to

Boilers, Buildings, and Machinery,

—ARISING FROM—

STEAM BOILER EXPLOSIONS.

The business of the Company includes all kinds of

STEAM BOILERS,

STATIONARY, MARINE, AND LOCOMOTIVE.

Full information concerning the plan of the Company's operations can be obtained at the

HOME OFFICE, in Hartford, Conn.,

or at any Agency.
J. M. ALLEN, President. C. M. BEACH, Vice Pres.
T. H. BABCOCK, Secretary.

BOARD OF DIRECTORS:

J. M. Allen.....President.
Lucius J. Hendee.....President Ætna Fire Ins. Co.
F. W. Cheney....Ass't Treas. Cheney Bros. Silk Mfg. Co.
John A. Butler.....Pres. Conn. River Banking Co.
Charles M. Beach.....of Beach & Co.
Daniel Phillips.....of Adams Express Co.
G. M. Bartholomew.....Pres't American Nat'l Bank.
R. W. H. Jarvis.....Pres't Colt's Fire-Arms Mfg. Co.
E. M. Reed.....Sup't Hartford & N. Haven Railroad.
Hon. Chas. M. Pond.....Tres. State of Connecticut.
T. O. Enders.....Sec. Ætna Life Ins. Co.
Leverett Brainard.....of Case, Lockwood & Co.
GEN. WM. B. FRANKLIN, Vice Pres't Colt's Pat. Fire-Arms Man'f'g Co.
Austin Dunham.....Pres. Willimantic Linen Co.
Geo. Crompton.....Crompton Loom Works, Worcester.
Earl P. Mason...Pres't Prov. & Wor. R. R., Providence.
Wm. Adamson .of Baeder, Adamson & Co., Philadelphia.
New York Office.....**239 Broadway.**

THOS. S. CUNNINGHAM, Manager.
R. K. McMURRAY Inspector.

PAT. SOLID EMERY WHEELS AND OIL STONES, for Brass and Iron Work, Saw Mills, and Edge Tools. Northampton Emery Wheel Co. Leeds, Mass.

SCIENTIFIC AMERICAN



For 1872.

A year's numbers contains over 800 pages and makes two volumes, worth as a book of references, ten times the subscription price

ENGRAVINGS

by our own artists, will not only be given, of all the best Inventions of the day, but especial attention will also be directed to the description and illustration of

LEADING MANUFACTURING ESTABLISHMENTS, MACHINES, TOOLS AND PROCESSES.

Inventors and Patentees

will find in each number an official List of Patents, together with descriptions of the more important Inventions. We shall also publish reports of decisions in Patent Cases and points of law affecting the rights and interests of Patentees.

THE NEW VOLUME OF SCIENTIFIC AMERICAN

commenced JANUARY FIRST; therefore, now is the time to organize Clubs and to forward subscriptions. Clubs may be made up from different post offices.

TERMS FOR 1872.

One copy, one year		$3.00
One copy, six months		1.50
One copy four months		1.00
CLUB RATES	Ten copies, one year, each $2.50	25.00
	Over ten copies, same rate, each	2.50
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress,"		10.00
One copy of Scientific American for one year, and one copy of "Science Record,"		4.00
Ten copies of "Science Record," and ten copies of the Scientific American for one year,		35.00

CLUB PREMIUMS.

Any person who sends us a yearly club of ten or more copies, at the foregoing club rates, will be entitled to one copy, gratis, of the large steel plate engraving, "Men of Progress."

Remit by postal order, draft or express.

The postage on the Scientific American is five cents per quarter, payable at the office where received. Canada subscribers must remit, with subscription, 25 cents extra to pay postage.

Address all letters and make all Post Office orders or drafts payable, to

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