# SCIENTIFIC AMERICAN

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

Vol. XXVIII.—No. 7. [NEW SERIES.] NEW YORK, FEBRUARY 15, 1873. [$3 per Annum, IN ADVANCE.]

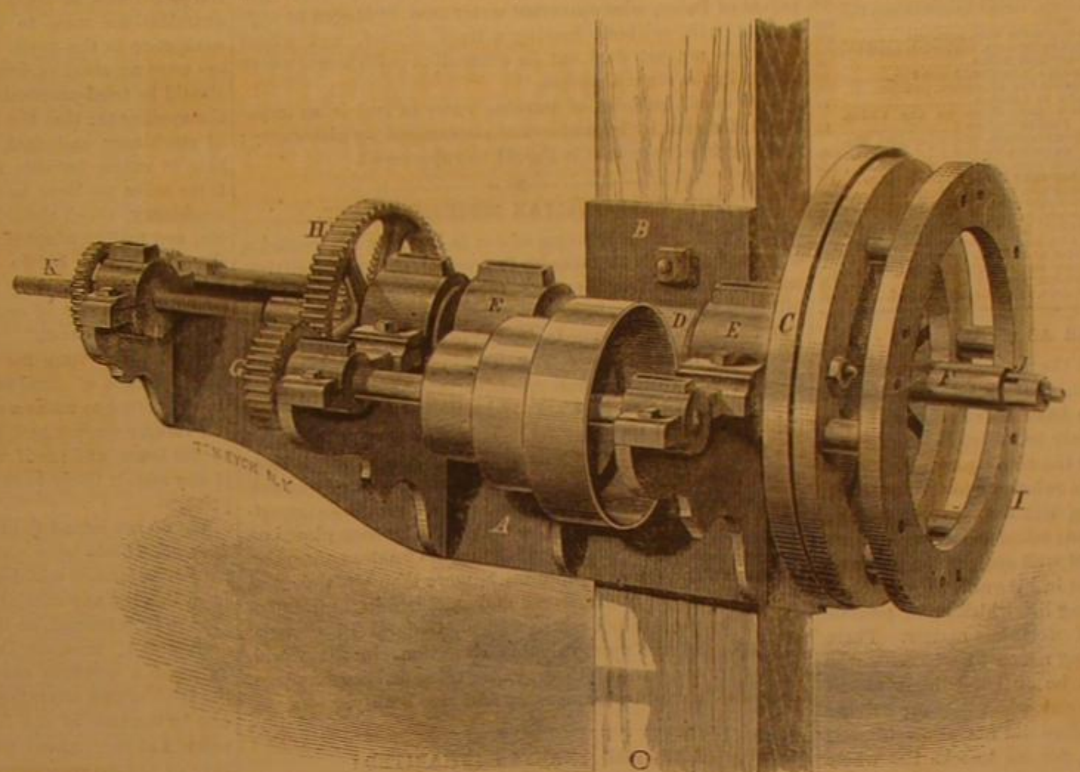

## BORING MACHINE.

The invention herewith illustrated is adapted to the boring and turning of pulleys, gears, spiders, etc. A is the bed or frame, which is cast in a single piece, and arranged to fasten to a post, as at B. C is the face plate which is cast with the hollow shaft, D. The latter fits in the boxes, E, and serves throughout its whole length as a bearing for the bar, F. The cone pulley receives motion from a suitable belt, and transmits it to the gear wheels, G and H. In the hub of the latter is a feather which, acting on a slot in the bar, F, communicates power to the latter.

The work to be bored is fastened upon the chuck, I, as in an ordinary lathe. If the exterior of the object is to be turned, a set screw in the shaft, D, is screwed down upon the bar, F, and motion is thus imparted to the shaft, D, face plate and chuck. The operation completed, the screw is loosened, the face plate set by a dog or pawl, and the cutter is adjusted in the hole, J, at the extremity of the bar, F, where it is held by the set screw shown. The shaft, D, now remains motionless, but the cutter rotates with the bar, F. The feed gear is set in motion by a reversible lever at the end of the machine (not shown). K the feed screw is held in position by a slot planed along its entire length and a stationary feather or lug to keep it from turning.

It is claimed that this device occupies but little room and will do twice the work of a lathe for the same purpose. It will bore any sized wheel, from ten inches upwards to any required size.

Further information may be obtained of Messrs. T. R. Bailey & Vail, of Lockport, N. Y. This is the same firm recently alluded to as manufacturers of the excellent form of key seat cutting machine, a short time since illustrated and described in our columns.




IMPROVED BORING MACHINE.

## PADDLE SHAFTS FOR PACIFIC MAIL STEAMERS.

Our illustration conveys an excellent idea of the immense size of two paddle wheel shafts, probably the largest ever forged, recently made by Messrs. Lazell, Perkins & Co., of Bridgewater, Mass., for the Pacific Mail Steamship Company. These are intended as spare shafts for the steamers Japan and China, to supply the deficiency in case of break down.

The one belonging to the Japan weighs 78,520 lbs., that of the China 68,400 lbs. They were transported from Bridgewater to San Francisco by rail, and reached the steamer, in the latter port, which was to transport them to their destination, the depot at Yokohama, Japan, in twenty days from the time of leaving the forge.

These immense masses of iron are each $38\frac{1}{4}$ inches in largest diameter by 39 feet 8 inches and 37 feet 3 inches (respectively) long, and are made of the best Swedish scrap iron, worked with charcoal and open forge fires. The hammer used in forging them is 11 tuns in weight and has a ten foot stroke. It is believed to be the largest machine of its kind in use in the country. The time consumed in making and finishing the shafts was about six months, 350,000 lbs. of iron and 900,000 lbs. of coal being employed in their manufacture.

## Experimental Researches on the Treatment of Asphyxia.

By whatever means air is introduced into the lungs of an asphyxiated person, whether by pulmonary insufflation or artificial respiration, experience proves that its introduction is completely useless when the circulation is arrested. This happens in the case of a drowned person in some four or five minutes.

M. Le Bon, of Paris, further states that if the physiological causes be inquired into regarding the impossibility of restoring drowned animals to life after this short delay, it will be found that the heart always contains voluminous black clots of blood. To renew the movement of the heart when it has ceased is not difficult, but to force out these enormous clots, which completely block the passages, is manifestly impossible.

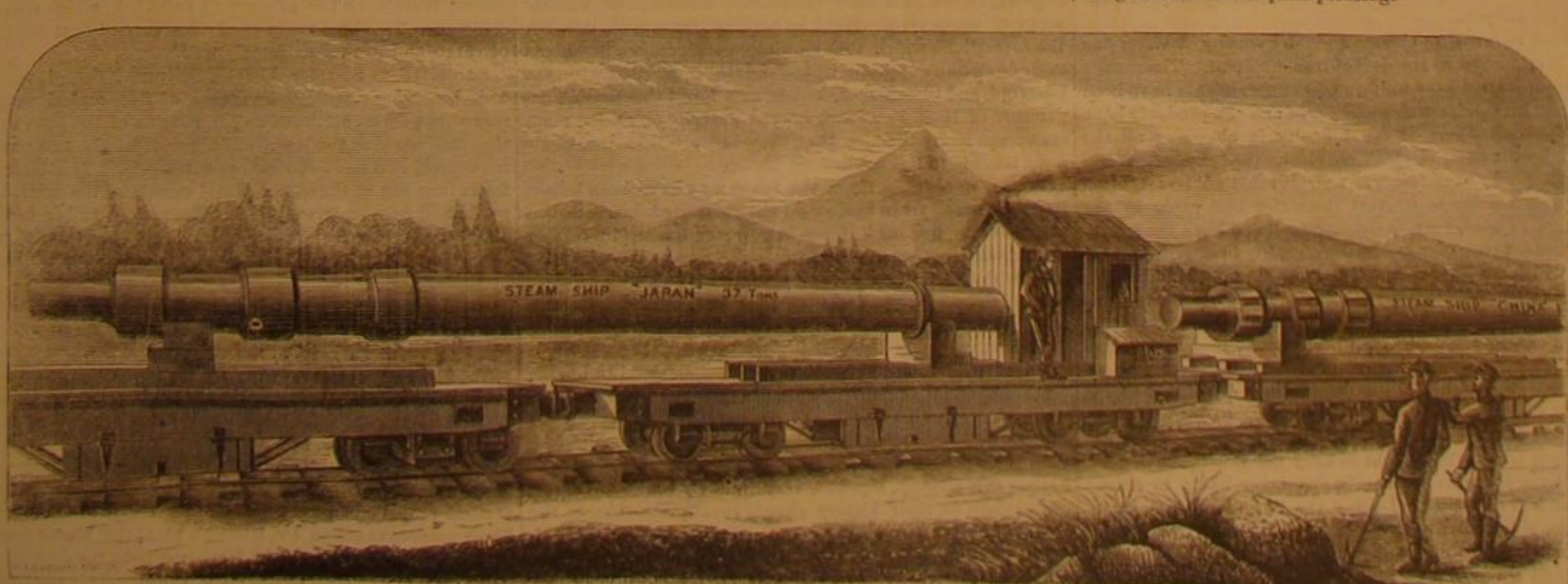
## Max Muller on Darwin.

In a lecture recently delivered in connection with the Liverpool Literary and Philosophical Society, Professor Max Müller addressed himself to the phase of Mr. Darwin's theory, which deals with the possibility of the higher animals acquiring the faculty of articulate speech.

The lecturer gave various illustrations of the essential difference between the expression of emotions and the expression of ideas or abstract conceptions, and argued at length as to the impossibility of mere emotional signs and sounds developing into articulate speech; and he ridiculed the notion that the materials of language being given, all the rest was a mere question of time, a natural gradation from the neigh of the horse to the poetry of Goethe. Man and animals possess emotional language in common, because man is an animal; but animals do not possess rational language, because they are not man. This distinction between emotional and rational language, so far from being fanciful and artificial, is radical, as proved by various evidence, especially by the testimony of pathology in reference to certain brain diseases. Rational language is to be traced back to roots, and every root is the sign of a general conception or abstract idea of which the animal mind is incapable. Mr. Darwin has said there are savage languages which contain no abstract terms; but the names for common objects, such as father, mother, brother, etc., are abstract terms, and unless Mr. Darwin is prepared to produce a language containing no such names, his statement, said the lecturer, falls to the ground as the misconception of the real nature of a general idea as distinguished from an emotion. This phase of the controversy lies within the Professor's peculiar domain, and he was able to entertain his audience with technical illustrations that in ordinary hands must have proved tedious, but in the hands of the most accomplished linguist of the day proved a source of wonder and amusement to his hearers. He concluded as he had begun, by maintaining that language is the true barrier between man and beast.

## Photo Obituaries.

The latest style in mourning is to have a black frame printed in the paper at the head of the obituary notice of your friend, in which a photo portrait of the deceased is pasted after the papers come from press. We have received a copy of the Marlboro' (Mass.) *Journal* containing such a photo obituary of an enterprising citizen of that place, and the general effect is quite pleasing.




TRANSPORTING PADDLE SHAFTS FOR PACIFIC MAIL STEAMERS ACROSS THE CONTINENT.

# Scientific American.

MUNN & CO., Editors and Proprietors.

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

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

TERMS.

| | |
|---|---|
| One copy, one year | $3 00 |
| One copy, six months | 1 50 |
| CLUB RATES { Ten copies, one year, each $2 50 | 25 00 |
| CLUB RATES { Over ten copies, same rate, each | 2 50 |

VOL. XXVIII., No. 7. [NEW SERIES.] *Twenty-eighth Year.*

NEW YORK, SATURDAY, FEBRUARY 15, 1873.


**Contents.**

(Illustrated articles are marked with an asterisk.)



## BURNING WATER AS FUEL.

It is astonishing how prevalent the notion is that water can be advantageously burned as fuel. All that can be said and written on the subject appears to have no effect, and easily deluded capitalists are always ready to invest in the newest contrivance that comes along for the above purpose. There has recently been a tedious suit in reference to the invention of Moses Thompson for burning wet tan, during which a ponderous volume of testimony was taken and a tangle of scientific evidence elicited that might well stagger the judge on the bench and the practical tanner in his yard, provided any of them have that faith in a long life which must precede the perusal of such an amount of worthless matter. There is the usual array of high sounding names of witnesses who testify as experts, and he must be an exceedingly expert angler after truth who can make out what they are driving at. It is clear that Judge Blatchford did not allow himself to be deluded by these experts, for he knocks the whole crowd off their feet and fires a round shot through the enemy's camp by the following conclusive sentence: "It is apparent from the evidence that Thompson was the first to discover and put in practice the true method of economically burning wet fuels, and obtaining from them better results than from equal quantities of dry fuels," which goes to show that the Judge believed the following claim put forth by Thompson: "The water in the fuel, in the presence of carbonaceous substances in the furnace, will be decomposed, giving its oxygen to the carbonaceous matter, dispensing with the draft and its cooling and wasteful influence, and rendering combustion so perfect that no smoke is visible." We hardly know whether the inventor proposes to shut the water and carbonaceous matter up in a strong box to "dispense with the draft," and, by the decomposition of the water and the re-combustion of the hydrogen, create a perpetual motion for affording heat such as the world never before saw, or not. The science of the proposition is too deep for us, and we cannot blame the Judge for being captivated by it. People will always believe in the perpetual motion whether in mechanics or in combustion, and it is better to join them to their idols and leave them alone. As our readers, however, do not belong to this class, it may be well to let in a little outside "draft" on the laws of combustion by way of ventilating the subject.

The heat required to elevate a given quantity of water one degree is employed as the unit of measurement. The results obtained are called heat units; and as experiments have been tried upon all combustibles and gases and the products have been tabulated, there is no difficulty in obtaining all the information that any one may require on the subject. When it is desig ed to burn water as fuel, it must not be forgotten that it is necessary to convert the water into vapor by the absorption of heat, then to decompose it and burn the hydrogen at the expense of oxygen over again, thus reproducing vapor, which when it escapes, after having passed through all of these stages, must carry away heat as irrecoverable as that blown off through the safety valve of a boiler. There is, therefore, no possible theoretical gain of heat in attempting to pass water through these circuitous processes.

Air-dried wood contains at best a large quantity of the elements of water, and most people prefer to burn the dry article. If the advocates for consuming wet wood were honest in their belief, they ought to keep the wood pile in soak all the time to prevent the disadvantages likely to accrue from the loss of water. During the last fifty years, something like sixty patents have been taken out in the United States relating to water gas in one form or another. The list affords a curious collection of attempts to accomplish impossible results, and it would be a real service to the country if they could be posted up as warnings to ambitious inventors. Sometimes the hydrogen of the water was carburetted by being passed over tar or oil; that is the favorite method with this class of gas inventors. The water must first be converted into steam, then decomposed by the glowing coals, and the resulting hydrogen brought in contact with turpentine or other hydrocarbons, when it is carburetted and ready to burn for both light and heat. Other inventors decompose the water by passing it through iron grates on which are placed the live coals; on closer examination it was discovered that they obtained their hydrogen at the expense of the iron of the grates, and this was pronounced to be decidedly too expensive for practical use. Another apparatus introduced steam through an iron tube; but finding the tube disappear, they substituted a fire clay mouthpiece and were disgusted to find the operation no longer successful. As long as there was any red hot iron to decompose the water, they got enough hydrogen; but when that was removed, the decomposition ceased. In general, the sixty patents were founded upon the principle of burning up some valuable substance, including the furnaces themselves, in order to obtain an apparent gain. They robbed Peter to pay Paul, and had to pay the penalty for such unscientific conduct. In 1850, the world was astonished by the famous water gas patent of Paine, who converted water into hydrogen or oxygen at will, without leaving a trace behind, and whose fame has not yet died out in connection with more recent efforts in the same direction.

This whole business of burning water as fuel is an imposition, fostered by ignorance and encouraged by dishonesty; and it is high time that it should be suppressed.

## THE METROPOLITAN MUSEUM OF ART.

The Metropolitan Museum of Art in this city has rented a large and splendid building on Fourteenth street, and will immediately proceed to prepare it for the reception and exhibition of the many rare objects now in possession of the society. The present lease is for eight years, the premises being only intended as a temporary place of deposit and exhibition. The large and splendid permanent Museum is to be erected in Central Park, and will be finished by the time the present lease expires. This temporary opening of the Museum in the lower part of the city is an excellent idea, as it will be conveniently accessible to all classes of our citizens, who will learn to understand and appreciate its importance. Among other curiosities that are to be soon placed on exhibition is the remarkable collection of Chaldean, Assyrian Phœnician and Grecian antiquities, more than ten thousand in number, recently discovered and exhumed in the island of Cyprus by the United States Consul, General Di Cesnola. This is one of the most valuable collections in the world, embracing ancient sculptures, vases, coins and ornaments, of the most elaborate workmanship and rare beauty.

## ARE THE PLANETS INHABITED?

The *Evening Mail* contains, under the above head, an argument tending to an affirmative answer to this question; but it is founded more on poetical imagination than on sober truth. The writer says: "Reasoning from analogy, it is hardly possible that such magnificent worlds as are within telescopic inspection, far surpassing our own in magnitude and celestial beauty, are solitary globes, destitute of living forms organized for enjoying as much as we," etc., and he ends with the statement that the spectroscope has demonstrated that the composition of these worlds as to their metallic resources is essentially like that of the earth; and he asks, finally, "why not in all other respects?"

The answer to this question is that in all other respects the conditions required for organic life are exceedingly complex. One of them is a temperature between 32° and 100° Fah., and this condition prevails only on two of the planets, the Earth and Mars; all the others are too hot, and their moons are too cold; at least, it is probable that the moons of Jupiter, Saturn, and Uranus are as thoroughly cooled off as our own moon, which is as totally unfit for the existence of organic life as the tops of our Himalayas. If the spectroscope had not demonstrated that the celestial bodies were compounded of the same elements as our earth, we might perhaps argue that, for other elements unknown to us, another range of temperature might be required for organic life, but the revelations which this admirable instrument has given exclude such a supposition; and as, in connection with the telescope and photometer, it has also taught us that a temperature of 1000° Fah. and upward prevails on all the planets except Mars, the idea that they are all inhabited *at the same time*, is fallacious.

We say *at the same time*; the moon may have been inhabited millions of years ago, when the surface of the earth was as red hot as that of Jupiter is now; and when by further cooling during thousands of centuries our earth will have become desolate, it may be the turn for Jupiter and other planets to become the scene of the most luxurious organic life.

A German saying is: "God works slowly, because He is eternal." No doubt the universe was not created in a hurry; planets have been revolving around central suns for millions of centuries, and according to unalterable laws have their periods of preparation, disturbance, evolution, organization, then their period of full organic development, and finally of decay; it is already, *a priori*, very unlikely that these different periods of their history should exactly coincide, as the planets differ individually and are placed in different conditions; the larger ones must cool slower than the smaller, and those further from the sun faster than those nearer to that orb. Each has its own individuality, its own history, and will go through the different periods of its destiny in its own time, a time so long that our longest historical period is comparatively a mere instant; while it sweeps in its course through spaces so large that all the empires of our earth are comparatively a mere handfull.

## THE NEW YORK STATE REWARD FOR IMPROVEMENTS IN CANAL NAVIGATION.

Our readers will remember that in 1871 the Legislature of the State of New York passed a law offering a reward of one hundred thousand dollars to the introducer of a plan, for navigating the Erie canal in this State, which should prove on actual trial, to be better and more economical than the existing method of towage by horses. The following were the chief requirements of the law:

A Board of Commissioners were appointed, consisting of George B. McClellan, Horatio Seymour, Erastus S. Prosser, David Dows, George Geddes, Van R. Richmond, Willis S. Nelson, George W. Chapman, William W. Wright, and John D. Fay, whose duty it was to practically test and examine all inventions that might be submitted to them, by which steam, caloric, electricity, or any motor other than animal power could be practically and profitably applied to the propulsion of boats upon the canals. Such tests and examinations were to be confined to the seasons of canal navigation in the years 1871 and 1872, and the Commissioners were required to demand that the competing inventions should be tried practically upon the canals at the expense of the applicants; that the boat should, in addition to its weight of machinery and fuel, be able to transport at least 200 tuns of cargo, be able to run at a speed of not less than three miles per hour, be easily stopped and backed by its own machinery, which should be simple, economical, and durable, and readily adapted to the present canal boats. Lastly, the law requires before an award is made that "*the Commissioners shall be fully satisfied that the invention or device will lessen the cost of canal transportation, and increase the capacity of the canal.*"

The limit of time for competition for the reward expired with the close of canal navigation last fall, and it may not be uninteresting to make a cursory review of the operations of the various competitors, give an outline of the construction of the boats, and see if we can determine who among them, if any one, is likely to carry off the hundred thousand dollar prize.

We do not intend to give the particular numerical order in which the boats were put upon the canals, but for convenience of reference will designate each exhibit at random. If from this list any exhibitors have been omitted, we shall be glad to be informed, so that correction may be made.

Exhibit 1. Steamer Dawson. Inventor, Thomas Main. This was a common canal boat altered for the purposes of the trial, which alteration consisted in making a concave recess in the bow of the boat, in which a common propelling screw was set. About 20 horses power were employed, 200 tuns of freight were carried, and a speed in excess of three miles an hour, on an average, was obtained, except when detained by lockage. The average running time through the canal was 2·02 miles per hour.

Exhibit 2. Steamer Baxter. An ordinary canal boat fitted with two stern propellers of the ordinary construction, driven by one of William Baxter's patent compound engines. The only peculiarity claimed for this boat was that she was simple, and could be run on less coal than any other boat; and such indeed proved to be the fact. She made two or three successful trips through the canal, and proved to be a useful and economical boat.

Exhibit 3. Steamer Montana. An ordinary canal boat fitted with a single 9 foot feathering wheel encased in a box in her stern. A. H. Brown, inventor. Forty horse tubular boiler, 2 engines 9 × 18, direct action. Burns less than one tun coal in 24 hours. Speed 3½ miles an hour loaded, and 5¼ miles light. Ran very well.

Exhibit 4. Steamer Hemje. Charles Hemje, inventor. This was a well modeled boat, provided with an ordinary stern screw propeller, and the chief peculiarity consisted of a cylinder in which the screw was enclosed. This cylinder was movable and served as a rudder, and was used to steer the vessel. By turning the cylinder, the column of water ejected from it by the screw was deflected, which assisted steerage. This boat made good time, carried over 200 tuns of cargo, and worked extremely well.

Exhibit 5. Steamer Eureka. Hiram Niles, inventor. This boat was propelled by means of two conical shaped screw propellers, arranged on the outside of the bow, upon the same angle as the bow. The points of the two screws converged, like the two lines of a triangle. This boat ran faster than any of the experimental vessels on the canal, and performed extremely well. But she proved rather heavy, and, in order to carry 200 tuns of cargo, required 7 feet of water, which the canal did not, on an average, afford. Built by Niles, Buffalo.

Exhibit 6. Steamer Port Byron. Inventor, F. M. Mahan. Through the hull of this boat, from bow to stern, runs a trunk or water way, and in the after part of the boat a common paddle wheel is set within a chamber, which forms a part of the trunk. The motion of the wheel draws in water at the bow, and discharges it at the stern. This boat made successful trips, and operated very well.

Exhibit 7. Steamer Forest City. Built at Russel and Eads yard, Buffalo. An ordinary canal boat fitted with two vertical propellers, placed one on each side of the stern. These propellers are on Dr. Hunter's plan, the blades feathering, and so made as to be feathered from the deck so as to act on the water at any desired angle. This facilitates

steering, as the propellers may be made to act sidewise, or in line with the vessel's keel. This boat performed well, made good time, and carried 200 tuns.

Exhibit 8. Steamer Excelsior. This boat, built of iron, was fitted with Mallory's patent propeller, which is constructed somewhat on the principle just described. By its use the vessel is steered as well as propelled. The blades of the propeller are made to feather from within the boat, and they act upon the water at any angle desired. Very good results were obtained, although we believe the owners did not compete in carrying cargo.

Exhibit 9 Steamer Geo. M. Pheter. This was an old canal boat altered for these experimental purposes. A little abaft the middle of the boat, an opening on each side is made and water ways or trunks inserted, which converge into one discharging trunk at the stern. In each trunk a 4½ feet screw is placed. Engine, 40 horse power. This boat made one trip and operated very well. Built by Russel & Eads.

Exhibit 10. Steam Pump boat. Propelled by a piston at the stern, operating in a cylinder. Results not satisfactory.

Exhibit 11. Steam Pole boat. Propelled by poles which were made to operate on the bottom of the canal and push the boat along. Results not satisfactory.

Exhibit 12. Steamer Vermont. Endless belt of paddles on each side of the vessel, passing over rollers at stem and stern of boat. Results not satisfactory.

Exhibit 13. Stern wheel steamer. A recess in the stern in which an ordinary paddle wheel was placed. Resembled the ordinary stern wheel steamers. Result not very satisfactory.

Exhibit 14. Tow path locomotive. This was a trial of Williamson's road steamer Enterprise, placed on tow path of the canal. It was a twenty-four horse steam engine, mounted on three wheels, with a hinged smoke stack. Four boats, three loaded and one light, were attached by rope to the steamer, which made four and a quarter miles per hour with them, and ran from Albany to Port Schuyler. The experiment was considered to be a success, demonstrating that towage could be expeditiously and economically accomplished by this method. But it is alleged that the tow path of the Erie canal is unsuited for road steamers in many parts, and would need, in order to permit their successful use, an improvement and strengthening of the path, involving great expense. This trial was not within the limits of the competition, which applied only to devices for propulsion not moving upon the bank.

Exhibit 15. Steam rope towage. This method consists in having a wire rope laid on the bottom of the canal along its whole length. A steam tow boat is employed, on which there are a series of gripping rollers; the rope is brought on deck and passed between the rollers, which are driven by steam and pull the boat along, with other boats in tow. This is known as the Belgian system, and works very well on the few miles for which it has been adopted on the Erie canal. Full accounts have been heretofore given, in our paper, of its operation. This method was excluded from the present competition.

Exhibit 16. Steamer Success. Captain W. F. Goodwin, inventor. The distinctive feature of this exhibit consisted in having a train of boats, specially made to join and work together. No other exhibit on the canal presented this feature. The propelling power was contained in the front boat, the bow of which was provided with a hollow paddle wheel, extending entirely across the bow, and well enclosed. The exterior of the wheel was provided with a band of cogged teeth, with which meshed the teeth of a driving pinion, and motion was thus communicated to the wheel. Twenty horse power engines. This exhibit brought through the canal and down to New York a cargo of 13,200 bushels of corn, or 400 tuns, in 10½ days running time. In respect to cheapness of running per tun of cargo carried, this exhibit of train boats was a decided success, and the inventor is confident that the principles of construction are in the main correct, and that, with such modifications as the experience gained on the canal has suggested, he will be able to solve the problem of canal steam navigation in the most satisfactory manner.

It may be said, in respect to nearly all of these exhibits, that they have demonstrated that canal boats may be successfully operated by steam power. But have any of them fully and satisfactorily fulfilled the intent and conditions of the law? We think not. Before any of the exhibitors can expect an award, the Commissioners "shall be fully satisfied that the invention or device will lessen the cost of canal transportation and increase the capacity of the canals." It is evident that none of the exhibitors are entitled to an award, for they have all come short of these requirements. The next inquiry is whether any of the exhibits are likely, on further trials and the addition of new improvements, to accomplish the design of the law? It seems to us that an affirmative answer may be conclusively deduced from the results of the experiments, and we will proceed briefly to point out the reasons.

It was demonstrated, by a majority of the boats tried, that they could steam through the canal, except for detentions, at about one third the cost of horse towage. But a single steamboat, if delayed, rapidly runs up expenses, as the cost of maintenance is almost the same, whether moving or standing still.

It was further demonstrated that one steamer could carry nearly 200 tuns of cargo, and tow three additional boats carrying 240 tuns each, making in all 920 tuns of cargo, with but little additional expense over the cost of running a single steamer, and it became evident that the solution of the canal problem depends upon the successful running of boats in trains. But it was also demonstrated that, in the present defective condition of the canals, the crowd of horse boats, the rocks, wrecks, sedimentary deposits, shallow places and other obstructions, the towage of boats by lines in the ordinary way was productive of great confusion and serious delays. If the towing boat slacks in speed, the boats in tow jam together; they collide with horse boats, and are in other respects comparatively unmanageable.

It is, then, to the introduction of better means of working and controlling boats in trains that we are to look, in order to lessen the cost of transportation or increase the capacity of our canals.

In respect to this matter, the suggestion which has been made, of placing side screws at the bows of the front boat so as to work the boat laterally when steerage way is lost, we consider to be of much importance. Resort is at present had to poling by hand, a slow and laborious operation. If some quick and ready method of applying steam power could be introduced as a substitute for poling, almost half the difficulty of canal navigation would be overcome.

Another appliance needed for train navigation is the placing of steam power in the rear boat. The principal towage power should be in the front boat; but there should be a reserve power at the stern, to assist in guiding the train and swaying the train promptly as circumstances require. Other minor improvements will suggest themselves to experimentors. But those we have specially mentioned, it seems to us, are absolutely required.

Another deduction, made evident from the results of these experiments, is that the limit of time fixed by the Legislature for the competition was altogether too short. The construction of experimental machinery of any kind is always more or less slow, and alterations have to be frequently made to adapt new inventions to practice. Many of the competitors in the present case were compelled to go through the canal with defective machinery, for lack of time to change or strengthen it.

Then again, by some remarkable fatuity, the canal officials, when applied to by competitors for information as to the depth of the canal, invariably replied that it was 7 feet in mean depth; width at surface, 70 feet, bottom, 56 feet. Many of the competitors built their boats to run in this water, but found, on entering the canal, that 6 feet of water was all they had to depend on, and this only in the center of the canal, the sides shoaling very rapidly, whereby the boats were frequently grounded and greatly injured.

The exhibitors have joined in a memorial to the Legislature, asking for an extension of the time for trials and the apportionment, for the purposes of new trials, of those parts of the canal that more nearly furnish the volumes and depths of water that were originally and impliedly assured to them by the law under which they engaged in the competition.

The subject is one of great importance to the State; and if the Legislature will now grant the petition of the memorialists, and encourage their enterprising efforts, we have no doubt that, ere another two years have elapsed, valuable methods for practically reducing the cost of transportation and increasing the capacity of the canals will have been produced.

## ARMY AND NAVY PATENTS.

The question has lately arisen whether officers in the army and navy are entitled to the same privileges, as relating to patent rights on military inventions, as are accorded to private individuals, and whether the Government should compensate such inventors, by royalty or otherwise, for such use as it may make of their devices. The subject is one which has long been agitated in both arms of the service, in which it is the general opinion that the absorption, by the country, of private privileges, whether patents or inventions or shares of copyright of professional books, works an injustice, besides tending to check a spirit of investigation and a desire to perfect crude ideas which might, if fostered, prove of material benefit to the nation. The provisions of the bill recently introduced in the Senate to allow to the widow of Rear Admiral Dahlgren a suitable compensation for the use, in the navy, of her husband's patented guns and projectiles, bring the matter prominently before the public, and afford an opportunity for a decision which will furnish a precedent for the future.

To our mind, there is but one view to be taken of the subject. The officers of the army and navy enter the service at an extremely early age, and for the residue of their lives are the wards of the nation. Educated and supported at the expense of the people, their first duty is manifestly to their country. It is clearly a moral and, by the implied contract which they assume, a legal obligation upon them to devote their best efforts in return for the benefits they receive. Clearly, therefore, if they so employ the advantages freely afforded them in such a manner as to render the same productive of valuable results, such fruit of their efforts belongs not to themselves but to the country which, for this very specific end, has intrusted to their keeping the knowledge, of which their ideas are but the outgrowth.

To descend from general principles to a definite case, if phe Government pays one of its servants to perform certain work, if such services comprise the experimenting upon, txamination and improvement of munitions of war, for exemple, it is evident that, if no especial result be attained aroportionate to the value expended in conducting such investigations, the loss will fall, not upon the individual but upon the nation. Why then, on the other hand, if he be successful in fulfilling the very labor which he is paid for performing, should the servant, who runs no risk, receive an extra compensation, while the Government, which incurs the entire responsibility, is obliged to expend even a greater sum than if his toll had been fruitless?

We do not deny the right of a military employee to obtain a patent on an original device, if such be his inclination. But we believe that the authority of the nation over matters which are clearly within the line of his duty, as is the case with the designing of improvements or inventions of a professional nature, is paramount; and, while the patent should hold good as against all the rest of the world, the Government should be entitled to its free use and enjoyment.

In the special instance of the claim of Mrs. Dahlgren, we agree with Senator Morrill in his opinion that its grant will establish a dangerous and impolitic precedent. As regards the intrinsic merits of the case, however, we consider that it would be but a graceful and just recognition of the worth and appreciation of the services of an able, faithful, and brave officer if Congress would appropriate an adequate sum for the maintenance of his family; not in satisfaction of any claim, but as the free and unrestricted gift of the people in whose service his life was passed.

## THE EMPLOYMENT OF WOMEN.

The presence of Miss Emily Faithfull in this country at the present time has revived the discussion of the woman question, and been the occasion of public assemblages to consider a report upon the best form in which to disseminate correct information and influence popular opinion on the subject. A meeting was held a few evenings since at Steinway Hall which must have given great encouragement to the advocates of the new movement. It was not one of the unfeminine exhibitions with which we are too familiar in New York, the tendency of which has been to repel delicate and sensitive women from taking any part, but it was a dignified, refined assemblage of the very best representatives of the sex to be found in New York. The woman artist, the author, the teacher, the artisan, the editor, and every trade into which woman has been able to find her way, were represented by their chosen delegates. There was no loud talking, no expression of woman's rights, no complaints, no recrimination, but a straightforward presentation of facts and statistics that must have carried conviction to any but the most selfish and mercenary hearer. Mrs. Henry M. Field, formerly Director of the School of Design for Women, presided and introduced Miss Faithfull to the audience. Miss Faithfull's address was reported in full in the morning papers and need not be repeated here, but the ideas suggested in it, and the remedies for the evils complained of which were there advocated, are deserving of careful study and consideration on the part of mechanics, tradesmen, and thoughtful citizens everywhere. If we study the progress of invention we shall find that, in many directions, some new contrivance has invaded the special avocations of women and taken from them the ability to earn a subsistence by work which at one time was their monopoly. Not many years ago the baking, brewing, spinning and weaving were conducted by women at home in the domestic circle. It enabled the females to contribute to the support of the family, and oftentimes the sister sustained the brother at college without being compelled to leave the sacred precincts of the home circle. Some of the best men in our country owe their opportunities for education to the self-devotion of women at home. How does the case stand at the present time? The baking is conducted by men, even in small towns. Machinery for sifting, stirring, and kneading the flour has been invented, which must be superintended by men, and it is only in limited circles that bread baking can be conducted at home. It is true that men complain that women know too little about baking, but that has nothing to do with our argument, and we must let the women defend themselves from the aspersion. The fact is that baking on a large scale has been taken away from the women.

The same historical record must be made in reference to brewing. Home brewed ale was the favorite beverage in Old England and in New England, many years ago. The farmer's daughter could formerly contribute largely to the support of the family by her skill in compounding a domestic brew. Perhaps they seasoned the beverage too well, for the taste for it increased more largely than the supply, and it soon became necessary to establish immense breweries, to be again supervised by men, and this part of woman's avocation was gone. So we could go on drawing illustrations from the great mills for spinning and weaving, only that in these latter mills women are permitted to earn a support, and there has been some compensation to them for the wholesale theft of what was formerly the chief home avocation of our grandmothers. Enough has been said to show the encroachments upon woman's peculiar province by the invention of machinery and the introduction of modern improvements. These inventions and improvements have certainly tended to advance the prosperity of mankind, and it ought not to be made a reproach upon our civilization that they have been made at the expense of the women. It was claimed at the meeting that the sex was entitled to some recompense for the wholesale robbery.

There are plenty of avocations which men have monopolized which they ought to be willing to exchange for the stolen property they now hold in their hands. For example, there are 14,000 appointments under government, not including post offices, of which women get 600; there are 250,000 clerkships of all sorts, in shops, telegraph, insurance and other offices, for which women are peculiarly fitted, and yet they get no more than a beggarly 7,000. Now would it be asking too much of some of the lubberly, hulking fellows, whose sinews and muscles are evidently intended for deeds of prowess and strength, to give up jumping counters, doing up parcels in red tape, directing wrappers, and keeping petty accounts, and to turn their attention to some of the avocations for which women are unfitted and where their strength can have full play? There are many employments to which women are not physically adapted, such as hunting, trapping, mining, manning ships, running heavy machinery, farm labor, engineering, and the outdoor exposure of expressmen, conductors, hackmen, drivers, and a long list quite enough to afford men an opportunity to earn the lion's share of wages and keep matters generally under their control. The statistics of New England show that, while men have devised methods for adding to their wealth, the ability of women to earn a livelihood has diminished. In Massachusetts alone there are 50,000 more women than men. The men have rushed to large cities to look after clerkships or to do the counter jumping, while shipbuilding languishes and the famous New England sailors are fast becoming a myth. In the meantime the daughters of the land remain at home, and, having been deprived of the industries alluded to above, as their numbers increase and the ways and means of earning a support decreases, it is natural that they should feel some anxiety for the future, and demand a larger share in the distribution of work. There are more than 2,000,000 women in England who are compelled to support themselves, and with them the struggle is one of life or worse than death. Miss Faithfull established the *Victoria Magazine* in order to advocate the cause of women and give employment to her own sex in the composing room. Her example has been followed in this country, and in many printing offices women are now constantly engaged. This is one step gained, but it ought to be followed by many others.

It has been said that females are more conscientious and naturally honest than men. If that be true, in times like the present, when charges of bribery, defalcation and dishonesty are freely made on all sides, it would be well worth the experiment to see if the gentler sex are better able to resist the temptations that always surround positions of responsibility or trust.

One thing is very certain, the right of woman to her share of honest labor cannot be put down by ridicule or despotism. It must be met fairly and squarely, and now that it has been taken up by our most refined and gifted women, we trust that the question will be soon settled to the entire satisfaction of all parties.

### ARSENIC COLORS.

Since the publication of our article on arsenic pigments, we have received numerous letters enclosing specimens of calico, wall paper, etc., asking our opinion in reference to their poisonous character. We have had some of these examined by competent chemists, and in all instances sufficient traces of arsenic have been found to prove the dangerous character of the articles presented. From Lee, Mass., we have a sample of calico in which the green band is colored with arsenic, and no washing would render it safe to wear such goods. The misfortune is that even some of the aniline colors are so impregnated with arsenic that they are as dangerous as the older Scheele's green, of which we recently complained. Toy books with green covers are always to be suspected, and in fact the only absolutely safe thing to do is to avoid green colors altogether. The detection of arsenic is so simple that any one can perform the experiment in a few moments. We cut off a piece of suspected calico and immersed it in some strong ammonia, which we had poured into a tumbler; a blue color at once indicated the presence of copper. A drop of the blue liquid put upon a crystal of nitrate of silver turned immediately canary yellow, which reaction denoted arsenic. This is an experiment that anybody can try. To confirm our suspicions we poured some of the liquid into a Marsh apparatus, and easily obtained the well known deposit of metallic arsenic on glass or porcelain. With wall paper a neat and easy way is to put a drop of nitric acid on the green spot, then a drop of ammonia, when the color will turn blue, and on addition of a drop of nitrate of silver, if arsenic be present, a yellow stain will spread in a ring to the outer extremity.

### FREE MAIL PRIVILEGES ENDED.

Hitherto the right to frank letters of any size has been granted to the President, Ex-Presidents, the Vice President and former Vice Presidents, to members of Congress, the Secretary of the Senate and the Clerk of the House, the privilege extending to free letters not exceeding two ounces and public documents weighing not over three pounds. The governor of any State could forward official documents to the governors of other States. Cabinet officers, their assistants, commissioners and heads of bureaus, the general and adjutant general of the army, the superintendent of the coast survey and his assistant, and chief clerks of departments were allowed free transmission of official but not of private correspondence. Deputy postmasters could send free all documents relating to the business of their respective offices, and those whose compensation did not exceed $200 per annum in 1846 were entitled to the privilege of forwarding and receiving free all communications not exceeding one half ounce in weight.

This is what is termed the "franking privilege." Devised at a time when the postage on letters varied from five to twenty-five cents, it was a necessary relief to the government officers, whose salaries would have been materially diminished had they been obliged to pay such high rates for their voluminous correspondence from their private incomes. Since the introduction of cheap postage, the privilege has degenerated to a superfluity and latterly to a positive abuse, and although repeated attempts have been made, in previous sessions of Congress, to pass an act for its abolition, the strong opposition which the measure always encountered rendered such efforts fruitless. The evil has gone on increasing; hundreds of tons of letters and documents, together with bundles of dirty clothing for the wash, boots and shoes and all kinds of stuff belonging to members of Congress and their friends have burdened the mails, being sent in evasion and often in defiance of the laws governing their transmission, and causing, according to the estimate of the Postmaster General, a loss to the country of over three million dollars a year. Even this large sum, at periods, has been greatly exceeded. It is stated that, for the presidential canvass of 1872, if all the franked letters and campaign documents sent out from Washington and other points had paid the usual charges, fully four million dollars would have been saved.

It is a matter of no small moment, therefore, to the nation that the act abolishing the franking privilege has at length passed both Houses of Congress and only awaits the President's signature to become a law. The bill reads as follows:

*Be it enacted, etc.*, That the franking privilege be, and the same is hereby, abolished, from and after the 1st day of July, A. D. 1873, and that thenceforth all official correspondence of whatever nature, and other mailable matter sent from or addressed to any officer of the Government or person now authorized to frank such matter, shall be chargeable with the same rates of postage as may be lawfully imposed upon like matter sent by or addressed to other persons: *Provided*, That no compensation or allowance shall now or hereafter be made to senators, or members and delegates of the House of Representatives on account of postage.

The direct result of the abolition of the frank will be to increase the receipts of the Post Office Department, and thus to warrant the reduction of the rates of letter postage to two cents, a change which the people will everywhere welcome.

### THE BOSTON FIRE COMMISSIONERS' REPORT.

The Commissioners appointed by the city authorities of Boston to make investigations into the cause, effects, etc., of the great fire have recently published quite a voluminous report. Seven hundred and seventy-six buildings, covering a space of sixty-five acres and assessed at the value of $13,500,000, were destroyed, together with more than sixty millions of dollars worth of merchandise and other personal property. How the fire first broke out is not definitely stated, but its rapid spread in the building first consumed is considered to be chiefly owing to the faulty construction of the elevator which, like most elevators in Boston, was sheathed with wood and destitute of self-closing hatchways. The committee state that, if the last mentioned appliances had been in the edifice, the flames would not have reached the roof before the engines a rived, and the calamity might have been averted.

There seems to have been considerable delay for want of horses and a lack of water. The fire, it is also stated, was greatly aggravated by the escape of gas from the burning buildings, the water valves, which were believed to be sufficiently powerful to cut off the supply, proving of little value. Sliding valves should always be so arranged that the risk arising from the impossibility of isolating a burning district should never be incurred. The report strongly condemns the action of the authorities in allowing the use of gunpowder for blowing up buildings by citizens or others, not regular officials of the Fire Department. Recommendation is made that a system be arranged, for the future, for using a far more powerful and less dangerous explosive, and for training a number of men to use it skillfully. Dynamite is considered as the best material for the purpose, as its force is so directed as to bring the building down rather than scatter it in fragments. It may be dropped or jarred in any way without danger, and cartridges containing it may be safely cut or broken. A quantity of this substance should be kept constantly in proper places.

The Lowry hydrant is recommended for use throughout the city as giving a better distribution of water. Fire escapes should be attached to all warehouses, and every high building should have a permanent stand pipe of iron capable of having a hose attached to it. Finally, the general use of the most approved forms of fire extinguishers and hand pumps in every house is strongly urged. These would prevent many conflagrations from becoming serious, and they would inspire confidence in cases of alarm of fire.

### THE SYSTEM OF SNOW PROTECTION ON THE UNION PACIFIC RAILROAD.

The Chicago *Railway Times* gives a graphic pen sketch of the great obstacle presented by snow drifts to the passage of trains on the Pacific Railroad. During the great storm which occurred in the early part of last winter, it is said that drifts thirty feet deep packed full the heaviest cuts as fast as the largest force that could work dug or plowed it out. The snow at other points covered the low bed for miles in a solid mass which had to be cut transversely with trenches, eight feet apart, so that the snow plows could remove it block by block. It packed with such density that locomotives left the rails and ran upon the bed covering the track. Fences, however high, were found of little protection, and cases are cited in which bushes beside the road intercepted the snow, causing it to pile into drifts often completely covering the cars on side tracks.

From the experience gained during last winter, a new system was put in force during the present season which has thus far proved successful. Observations, along the extended portions on which the bed lay from a few inches to three feet above the natural surface, showed the latter hight to be the minimum requisite to give sufficient freedom and space for the wind to keep the bed clear of snow. The track was therefore raised and the cuts also widened at the bottom sufficiently to give freedom and space to the snow on either hand. The sides were sloped 7 in 125, that being the slope which the drifts were noticed to assume naturally. For cuts of moderate depth, this plan has been found to answer without the use of sheds; in the case of deep cuts, however, the widening and sloping of which would be very expensive, snow sheds have been retained or supplied.

In carrying out the plan the locomotive was utilized to draw both plows and scrapers. A massive beam extending across the bed from ditch to ditch was fitted with two heavy plows on each end; and this gang plow, attached to a locomotive, was drawn at a maximum rate of two miles per hour; the locomotive scraper followed, excavating the furrows thus made on both sides and throwing the dirt up against the bed. Each set of these equipments was equal to a force of 200 men; and by this means an aggregate of about 100 miles of the bed of the snow region across and beyond Laramie Plains was raised from three to seven feet. Cuts were also widened—largely by the use of the steam shovel, operated by the locomotive—where their great depth did not preclude widening. To protect the deep cuts, where fencing was deemed inadequate, miles of new and substantial sheds have been built on a plan fully obviating the defects of the old fences; and the latter have been thoroughly repaired, lengthened, or rebuilt of better material. On this work exclusively, a force of 300 men was employed during the entire season. At the shops of the road, the already large equipment of snow plows has been increased and greatly improved. Seventeen plows have been remodeled, and four mammoth ones constructed, weighing from 35 to 50 tuns, and costing an average of $3,000 each.

### Improvement in Spring Mattresses.

Among the recent patents is that of W. B. Judson, for improvements whereby the frames, slats, and straps, heretofore required on beds of this description, are done away with, and a light, elastic, durable and comfortable bed is produced, at a comparatively low cost. The inventor uses the ordinary standard upholstery steel springs, so well known in the trade. These are united by ingenious little couplings in such a manner as to produce a maximum of strength and elasticity' with a minimum of weight. A double bed, 4 feet 6 inches by 6 feet in size, weighs only 25 lbs., although it contains one hundred and ninety-two steel springs. Of course the real value of such beds depends upon the quantity of springs that they contain, and in this respect the Champion Mattress is ahead, as the purchaser gets from two to six times more springs for the same money than most other beds supply. This new bed is known as the Champion Spring Mattress, and the advertisement of the manufacturers will be found on another page.

### Six Inches of Snow in London.

A fearful storm, accompanied by a heavy fall of snow, occurred in England on the 1st inst. Much damage was done to the shipping on the coasts, while in the interior the roads and railways were extensively blocked up by snow drifts. In London six inches of snow fell, which was an astonishing thing for the cockneys to behold. An inch of snow is as much as they generally see there in a generation. The omnibuses, cabs, and street cars were all obliged to suspend travel, and the only available means of local communication was the Underground Railway, the cars whereof were of course densely crowded.

Last year the London Underground Railways carried between fifty and sixty millions of passengers. It is to be hoped that the New York Legislature, now in session, will authorize the construction of a similar work in this city. It is urgently needed.

### Luther Tucker.

Mr. Luther Tucker, the editor and proprietor of the *Cultivator and Country Gentleman* recently died in Albany, N. Y. Mr. Tucker was born in 1802, and at an early age was apprenticed to a printer, serving his time and learning that trade. In 1825 he embarked in the publishing business, and in the following year established the *Rochester Daily Advertiser*, the first daily newspaper ever issued west of Albany. Having a strong taste for agriculture, in 1831 he projected the *Genesee Farmer*, which was subsequently merged in the *Albany Cultivator*. At the time of his decease Mr. Tucker was treasurer of the New York State Agricultural Society. He was an able and thorough writer, and an acknowledged authority on all matters pertaining to the farm.

Severe Cold at the West.—During a recent cold snap at Sparta, Wis., the mercurial thermometer became useless by freezing, while the spirit thermometer indicated 45° below zero. Mercury freezes at —39°, but alcohol has never been frozen. The alcoholic thermometer is not, however, to be depended upon for accuracy. In Minnesota, by a sudden change in the weather the thermometer rapidly fell below zero in the course of an afternoon, and a blinding snow storm came on. So sudden, so violent, and so cold was it, that many persons, having but short distances to travel in order to reach their homes, were frozen to death in making the attempt.

Action of Gas in Rubber Tubing.—In determining the illuminating power of street gas, it should not be conducted through an india rubber tube, since this diminishes its illuminating power. A series of experiments, made by Zulkowsky, show that the weight of the tube increases. This phenomenon is probably due to the absorption of the heavy hydrocarbons by the tubing.

The horse disease has reached Omaha, Nebraska.

## THE CHEMICAL DISCOVERIES BY THE SPECTROSCOPE.

Professor G. F. Barker, of Yale College, recently opened the fifth annual course of lectures before the American Institute in this city, by an able discourse on the above interesting subject. He explained the spectroscope and its uses, illustrating his remarks by pictures of the instrument thrown upon the screen, and described how different substances may be recognized by the autographs written in bands of color on the spectrum. Various experiments were performed showing the spectra of different metals by the aid of the electric light, and a lucid description was given of the method by which new elements have been discovered. The more important portion of the lecture related to the application of the spectroscope to the determination of subjects of general interest. After giving a brief explanation of the

BESSEMER STEEL PROCESS,

the lecturer stated that a flame issues from the mouth of the converter which is exceedingly characteristic, and, by applying the spectroscope to which, we may learn something by which a method may be obtained to stop the decarbonizing blast of air at the proper instant. Dr. Roscoe appreciated this, and accordingly made investigations at the Bessemer steel works of Brown and Brothers at Sheffield. It was found that when the blow begins, the flame is scarcely luminous, a mere glare of red giving a very faint spectrum, if any. In about four minutes from the time the blast is let on, a flashing through the spectrum of the sodium line may be noticed. In about a minute and a half after this change, we discover lithium and then potassium. As the process continues, the flame becomes intensely luminous, owing to the silicon becoming incandescent. Then it gradually changes, and becomes slightly purplish, and, in a few seconds, passes to nearly the same color as at first. The first spectrum is an exceedingly simple one, but the last is complex, containing as many as 33 lines. The lines disappear in the inverse order of their appearance, and when the last green band becomes invisible, the blast should be shut off and the metal cooled.

ABSORPTION SPECTRA.

It is a singular fact that, if we take various colored substances, such as a set of dyestuffs, no two of them exert the same action upon light. The absorption spectrum is as distinct as the autograph of a metal. We may therefore distinguish one dyestuff from another, and thus we have an infallible means for the

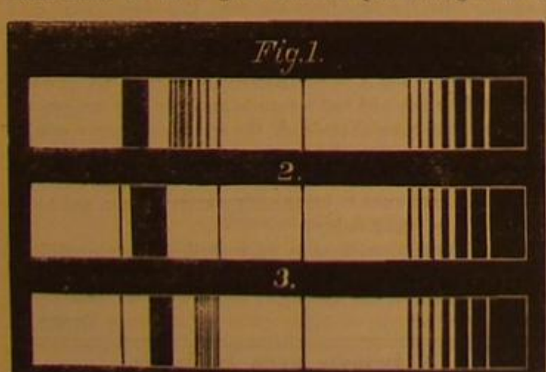
DETECTION OF ADULTERATIONS.

Mr. Sorby got a coloring matter from grape juice, which he called "Vitis purple." If this be suitably treated with citric acid, we have a solution the color of which cannot be distinguished from that of fresh port. If more acid be added a further oxidation is noticeable, and then it resembles the spectrum of port about ten years old. By adding more the spectrum becomes like that of port which is still older, there being a certain coloring matter which changes in its character by oxidation. In regard to adulteration of wines, Mr. Sorby believes that, as a general rule, such is not the case with colored wines. The lecturer stated that, in his own investigations, he had clearly seen the spectrum of logwood in a sample of port, and that he considered the popular belief, as to the use of Brazil wood and the common Virginian poke, to be not without reason.

Mustard, it is found, is almost uniformly adulterated with turmeric. Inferior rhubarb is also caused to imitate superior qualities. There is a kind of cheese bought in the English markets which has a curious yellow color which has been proved to be due to annatto. Professor Barker added that he once tested a suspiciously yellow sample of butter, and that the spectrum obtained was plainly that of carrots, but whether the coloring matter was introduced by the manufacturer or the cow, he was unable to determine.

COLORING MATTER OF HUMAN BLOOD.

Professor Stokes was the first to apply the spectroscope in the investigation of the spectrum of human blood. The various kinds of blood give different spectra; Fig. 1 is the




spectrum of arterial blood, Fig. 2, that of venous blood, and Fig. 3, of the dried coloring matter in blood. To show the utility of the spectroscope as a means of determining the presence of blood, Professor Barker mentioned the following instance

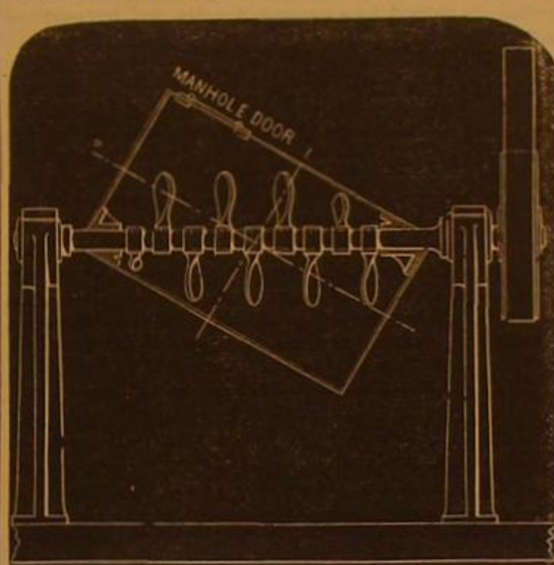
A case of suspected murder by means of some dull instrument was once given to Dr. Herapath to investigate. At some distance from the place where the crime was supposed to have been committed, a hatchet was found several weeks after, lying in the woods. It was stained with a drop of some dark substance. The Doctor, obtaining the implement, drove out the handle, and, slicing off a small portion of the stained wood and adding water to the shavings, obtained a few drops of a brown dirty solution, which coagulated by heat. He then cut off another very small portion of the wood and obtained a single drop of dirty liquid, which he placed in a tube, and light through this, being examined with a prism, gave the characteristic absorption spectrum of pematine—the coloring matter of the blood. He estimated the whole quantity of matter examined as weighing 1¼ grains. Yet this was sufficient to enable him to detect the substance and bring the guilt home to its perpetrator. Now blood varies in character with the different gases which may have been added to it. This happens in many cases; for instance, when people are suffocated by going down into vats or wells. In these cases the blood contains a certain amount of carbonic acid. The spectrum given by blood in this state is perfectly distinct from that given by blood in its normal condition. In like manner, when blood is compounded with sulphuretted hydrogen, prussic acid or other foreign substances, the spectrum is in each case distinct and peculiar. Knowing these facts, the cause of death may be determined in many cases where it is impossible to detect it by any other means

Blood corpuscles are so extremely small that 3,200 of them only measure one inch, yet the presence of even a portion of one may be tested by the spectroscope. Dr. Herapath says that it is perfectly easy to detect and ocularly examine the human blood in the stomach of a flea. We may even dilute this blood with a teaspoonful of water without its losing its property, if the insect has been dining off a sanguineous individual.

Professor Barker concluded with a review of the field passed over, and an eloquent tribute to Professor Tyndall for his efforts in behalf of original investigation.

## MIXING CYLINDER FOR CONCRETE.

We are indebted to Mr. G. C. Reitheimer, the superintendent of the Government submarine works at Hell Gate, N. Y., for the accompanying excellent design, of his own invention, for a concrete mixing cylinder. The apparatus




was used with every success, by Mr. Reitheimer, in the construction of the great breakwater at Holyhead, England. The revolving cylinder, of boiler iron, is immovably attached, as shown, to the axle which passes diagonally through it. Also, firmly fastened to the axle, are a number of knives or cutting blades arranged in spiral form. Motion is communicated by means of the belt wheel on the right of the engraving. The components of the concrete are introduced into the apparatus through the hinged manhole door. The machine is then set in motion, making some twenty-five revolutions per minute, causing the material to fall alternately from end to end of the cylinder, meeting in its progress the sharp edges of the knives. At the above speed, no effects of centrifugal force which would tend to keep the material in a single position are encountered. After the concrete is thoroughly incorporated, the cylinder is rotated so that the door is at the lowest point, when it is only necessary to open the manhole to allow the mixture to fall into a receptacle placed underneath.

## Underground Telegraph Wires.

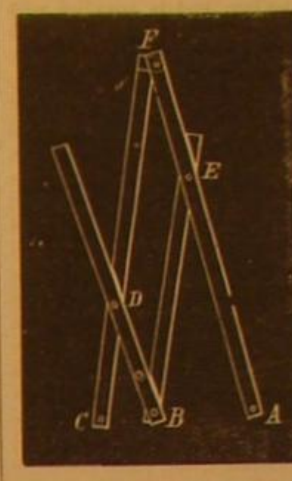
A recent heavy rain followed by a severe frost in this city played great havoc with the telegraph wires. The weight of ice was so great as to cause innumerable breaks, so that the elaborate fire alarm system became useless, and for a time it appeared as if communication with other cities was to be seriously interrupted. This has caused a re-agitation of the subject of underground wires, which, it is justly believed, would prove of great advantage as compared with those now in use. Not only would the unsightly telegraph poles be removed from our streets, but such casualties as the above, due to the weather, would be permanently averted.

Professor Silliman, in a recent letter, points out some of the difficulties incident to the underground plan. He says that gutta percha covering will not answer for insulation where it is exposed to the action of moist earth and vegetable processes. An element also, that is to be carefully considered in carrying out a general system for underground telegraphs in cities, is the facility that must be given for relaying in case of accident or of excavations in the streets for constructive purposes. If, however, says the Professor, the wire is once properly laid underground in insulatory material proof against natural agencies of destruction, the "electrical leakage" is very small, so much smaller than is possible with wires in the air as to be a great saving to the telegraph company.

## THE PANTAGRAPH.

The pantagraph is an instrument for copying drawings, producing the copy on an accurately enlarged or reduced scale. It is much used by engravers and designers, and, to some extent, by mechanical draftsmen. It was invented in 1803, by Christopher Scheiner,* a Jesuit, and has been improved and modified by Professor Wallace, of Edinburgh, who rechristened it "eidograph," and by M. Gavard and others. As now made, it is a very neat and quite useful instrument.

The principle involved is that of the proportional compass, and, although, for nice work, it should be made of metal and with great accuracy, any good mechanic can construct it in hard wood, and with sufficient exactness for ordinary purposes.




The four rulers, jointed together by pins at their intersections, as shown in the figure, are supported on, light, smoothly running casters, and carry a pen or pencil at A, and a tracer at B, or *vice versâ*, and the point, C, is held fast to the paper by a weight on which it is pivoted, and around which the whole instrument swings. A, B, and C are all interchangeable. The arms are graduated to indicate where the movable points of junction, D and E, must be arranged for any desired degree of reduction or enlargement of the scale. If the reduction is to be to one half its linear, or to one quarter its superficial dimensions, place the original drawing under the tracing point at A, the pencil at B, and let C remain unmoved. The joints, D and E, must each be made at the middle of the length of the long arms A F and C F, making the distances B B and B E equal to the half length of A F. The tracing point at A being now moved over the lines of the drawing, the pencil at B will describe precisely similar lines, and will make an exact copy, of half size. For the system is a kind of parallel motion, which compels the tracing point to remain, at all times, in the vertex of the angle, D B E, of a parallelogram whose sides are B D, D F, F E, and E B, no matter to what extent the angles may be altered. Then, if the three points move in the direction of the line containing them all, B will move but one half as far as A; and, if the instrument swings about C, B will again move but one half as far as A; and any combination of the two movements, by which any other line may be described, will give B a motion having the same relation to that of A. The point, C, always remains at rest. By putting the pencil at A and the tracing point at B, it is evident that the drawing will be copied on a double scale.

Placing the rods so that their junctions, D and E, shall occur at one fourth the lengths of C F and A F from C and from F respectively, and constructing thus a new parallelogram, D B E F, the original drawing may be reduced or enlarged four times. And, generally, the two triangles C D B and B E A, being similar in consequence of the parallelism of their sides, the distance BC : BA :: DC : EA and CC : CF :: E F : EA. So long as this proportionality is preserved, the instrument will be accurate, and the scales of the two drawings will be to each other as the distances of the pencil and of the tracing point, from the fulcrum or pivot of the pantagraph.

In our sketch, we have represented the simplest form of this instrument, and such as will be found easy to make and yet very convenient and useful. It can be purchased of the dealers in drawing instruments in a variety of improved forms and at correspondingly high prices. We have no doubt that many an apprentice, who reads our paper, will find this little "bundle of sticks" a most useful addition to his collection of drawing instruments.

## Gas Burners.

In batswing burners it is found that, though the size of the flame diminishes with the amount of gas consumed, it is not in equal ratio. The cost of a large flame for each candle power per hour may be, for instance, 0·42 centimes, while, with a small one, it will be 0·897 centimes. Or, again, the light of a large flame may be equivalent to 15 candles, while that of two small ones together will be 7·4 candles. The cause of this is attributed to the complete combustion of the gas in the blue zone of the gas flame, which gives little or no light in either case, and has more favorable circumstances for its occurrence relatively to the size of the flame in the small than in the large flame. Another more inexplicable phenomenon is that with a flat flame the intensity of the light is the same, whether the edge or the flat of the flame is tested. This points to the absolute transparency of the flame. The use of cylindrical glass chimneys with round jets (argand, etc.) is concluded to be, on the whole, somewhat more economical than with flattened chimneys, after a series of experiments to settle this point.—*M. Offret.*

MANUFACTURE OF CHLORATE OF POTASH.—To manufacture chlorate of potash on a large scale, it has been recommended by W. Hunt to adopt the following method: Milk of lime is made to trickle down over bricks placed in a tower where it comes in contact with a continuous current of chlorine gas. Chlorate of lime is the chief product, and, by treating this with chloride of potassium, chlorate of potash is formed, which can be purified by crystallization.

*Pantographica, sive Ars Delineandi, etc., Rome, 1623

## Correspondence.

### A Boiler Difficulty.

*To the Editor of the Scientific American:*

I am running a cotton seed oil mill with an 18x30 engine, supplied by two boilers, with five 10 inch flues each. Said boilers are 52 inches diameter by 20 feet long, and are set up with the regular western steamboat casing of sheet iron lined with fire brick. They are connected on top with a 30 inch steam drum, 10 feet long, with 10 inch legs, set on the second sheet from front. The mud drum is on the second sheet from back end, and is 20 inches in diameter by 10 feet long, with 10 inch legs connecting both boilers, and is supplied with necessary pipes, checks, and mud valve. The boilers are made of Lilman Son & Co.'s best Tennessee C. H. iron, $\frac{5}{16}$ thick, with $\frac{3}{8}$ heads. The trouble is that on increasing my machinery, I was forced to run up to 90 lbs. pressure, and as soon as I did so, the boilers began to leak on the first sheet over the fire. I had them caulked and re-riveted a dozen times, until the first and second sheets bagged on each side of the lap. The makers finally concluded to cut out one half of each sheet and patch across the lap. It looked like a good job when tested by hydrant pressure of 50 lbs.; but on raising steam, both patches gave way in 19 hours. After taking the advice of all our experts, they finally moved the steam drum back over the mud drum, put in an extra mud drum just back of the bridge wall, on third sheet, and put on new patches, but changed their laps so that they run with the boiler sheets. I have been running now two weeks and the boilers seem to hold tight and work well. They were also tested by the United States Inspector of this part at 160 lbs., and stood the test. Now the question arises, was it necessary to go outside of established custom to move steam drum back, when my engine sets front, and to put in two mud drums under a 20 feet boiler? I am using a Stilwell & Bierce superheater, and am well supplied with water. I clean out once a week and show no scale or sediment. The boilers, they admit, are perfectly clean, and the iron shows no signs of being burnt. The boiler sheets are 3½ feet wide, and the flue sheets 26 inches; this, some claim, is unequal expansion and caused the buckle or bag, but my theory is that it is all in the furnace. I use no fuel but cotton seed hulls, which make a quick fierce flame. My grate bars are 22 inches from boilers, while the bridge wall or throat is only 5 inches from boilers; and from that, the bed drops back to 10 inches at back of boiler. Now I claim that in my fuel, which burns somewhat like anthracite, the back flame curls up from the shape of bridge wall; and the draft flame in front, which is very fierce, is checked or forced up hard against the first lap to get over the rolling flame from bridge wall, and that it does not extend to rear of boilers, and shows here through flues, thereby making very intense heat causing unequal expansion. The boilers are caulked only on outside; is this customary? Some experts claim unequal expansion from difference in sheets of boiler and flues, some from not being caulked inside; others that the sheets ought to be connected with cheeks, while others were in favor of the change that was made. My gage cocks show water level in both boilers and do not vary; but I have been stopped about two months in repairs of boilers, at a loss of about $15,000 and a bill of repairs of $1,200. If you will please give me your opinion of my difficulty, I will be under many obligations.

GEO. W. HATFIELD,
Superintendent of Dixie Oil Company.
Nashville, Tenn.

REMARKS BY THE EDITOR:—We should judge that the boilers were of good material, well put together, for only excellent iron and well riveted joints would be likely to exhibit the behavior described by our correspondent. It is not unusual to leave the interior of boilers uncaulked, although it is generally considered better practice to caulk inside and out. We do not think that the caulking can have had any important influence in the matter. Some engineers of large experience and admittedly good judgment believe that, under the action of a very heavy fire, with defective circulation, the water may be driven off of the heating surface immediately adjacent to such an extent that the metal may be so highly heated as to yield under ordinary pressure, or even to become burnt. There is strong evidence that such cases have occurred, and it seems very probable that we find here described another example. We should have supposed the trouble to have been caused by sediment or scale over the fire, had we not been assured that none was found at the weekly cleaning. Wonderfully little incrustation over a heavy fire will make trouble. We should not suppose that the change of position of the steam drum could make any essential improvement, and the changes of mud drums could hardly effect anything unless the trouble arose from incrustation. We presume that the new work prevents the recurrence of the bagging, simply by stiffening that part. It is evident that the boiler was strong enough to bear the pressure, simply. We should feel uneasy still, and should not be surprised were further trouble to occur. In any event, we should first endeavor to diffuse the heat from the fire more generally over the heating surface, and, if unsuccessful in this, should put in more boiler and drive the fires less. We rarely meet with a case in which too much boiler power has been given. It might be found advisable to construct new furnaces, from which no radiant heat could reach the boiler.

### Steam Pressure in Boilers.

*To the Editor of the Scientific American:*

If the true way to estimate the strain in a cylindrical steam boiler is to multiply the pressure by the radius, a boiler 100 inches in circumference, having within it a pressure of 100 pounds upon each square inch, will of course have a strain of 1,600 pounds upon every circle of the boiler one inch wide, will it not?

Has it not been proved by careful test that the breaking point of good boiler iron is about 13,000 pounds to each one quarter inch of sectional area? If this be so, the bursting pressure for a boiler 100 inches in circumference and one quarter inch thick is, of course, 13,000 pounds upon each circle of the boiler one inch wide. According to your method of estimating strain in boilers, 100 pounds to a square inch on the boiler just named is less than one eighth of its bursting strain. Will a boiler thirty-two inches diameter and one quarter inch thick sustain any such pressure as 800 pounds to a square inch?

By using half of the circumference instead of the radius for one of the factors, we obtain a little less than 300 pounds per square inch as the maximum pressure, which I hold agrees best with actual test and practice.

F. G. WOODWARD.

REMARKS BY THE EDITOR.—A boiler of 32 inches diameter, of quarter inch plate capable of resisting a tensile force of 50,000 pounds per square inch, would resist an internal pressure of 781 pounds per square inch could it be made without seams. Experiment shows a single riveted boiler, however, to have but *fifty-six one hundredths* this strength at the seams. Such a boiler as is mentioned would therefore yield at about 437 pounds. We regret that we are compelled to differ with our correspondent.

### Aero-Steam Engines.

*To the Editor of the Scientific American:*

In No. 1 of the present volume of the SCIENTIFIC AMERICAN, you advocate further experiments in aero-steam engineering. You probably remember obtaining a patent for me in 1866 on the aero-steam generator, with which Warsop afterward (1868) created quite a flurry in England. I have studied the subject for a number of years, and have arrived at the following conclusions:

First, that it is impossible to construct a successful air engine of any great power, for the following reasons: Air, like all gases, expands but one volume for each 493° Fahr. of temperature through which it is raised; and it also becomes highly heated by compression; so that, if we force it into a heater under a pressure of seven atmospheres, the temperature before compression being 60°, we will then have it at a temperature of 435°; then, in order to double its volume, we must raise it 493° more, which will bring it to a temperature of 928° which is entirely too high for practical purposes. And even if we could work it at this degree of heat, we would then be compelled to have a feed pump of half the capacity of the engine, which would be very cumbrous, to say nothing of the cost; and more, our engine would have to be twice the size of a steam engine of the same power. If we work the air at a less pressure, we may reduce the temperature, but we must increase the size of the engine to obtain an equal power.

Second, that the only way in which we can obtain the advantages of air as a motor is to combine it with steam. In this way we can control the temperature of the air, as it is well known that the degree of heat of steam is regulated by the pressure. The air must take the same temperature as that of the steam with which it is mingled, consequently we can have no over heating of the air. But right here comes the difficulty in using air and steam together. As air becomes heated to a high degree by compression, we cannot force it into a boiler under a pressure of seven atmospheres without its becoming heated to a much higher degree than the steam, the temperature of the air being 435° while that of the steam is only 332°, a difference of 103°. The air, in taking the temperature of the steam, contracts; the steam at the same time expands. But the volume of contraction and expansion must be in proportion to the specific heat of air and steam. Air, having a specific heat of only one third that of steam, must contract three volumes, while the steam expands only one volume. The expansion of the air having been produced by mechanical energy applied to the pump, we have here a direct loss of power. This difficulty may be overcome; and in overcoming it, several advantages are gained. What is necessary is to prevent the air from becoming heated by compression. This, I believe, I can do with a pump of peculiar construction of my invention, and without the loss of power, as the heat is extracted from the air as soon as it begins to develop, consequently it will not expand until it reaches the boiler where it will take its heat from the steam, and we will have the former operation reversed, the air expanding three volumes and the steam contracting one volume. This, in my opinion, is the only way in which air and steam can be worked together successfully.

D. B. TANGER.
Bellefontaine, O.

### Ignition of Wood by Steam Heat.

*To the Editor of the Scientific American:*

On page 32 of the SCIENTIFIC AMERICAN of January 18, you make the following statement, editorially: "We maintain that any man of science who has studied the subject of steam, or any practical engineer of common sense, knows that all that steam can do, even when superheated, is to make woodwork hot and dry and to predispose it to catch fire. The spark must be supplied from another source; the steam tubes can never attain, outside the heating apparatus, the high temperature of 900° or 1,000° Fahr. required for the red heat which is necessary to set woodwork on fire." *Per contra*, a no less respectable authority than the *Journal of Commerce* has asserted, within the week, that, when wood has been charred by steam pipes, "engineers say that the least draft between the pipe and the charred wood will then cause the wood to form a coal, which will readily burst into flame."

Turning to page 41 of Wyatt "On Spontaneous Combustion," republished in this country and annotated by the editor of the *Insurance Monitor*, the following statements will be found: "The Institute of Technology, in Boston, long ago decided upon the danger of steam pipes passing through and in contact with wood." And here is an instance which occurred in a Pittsburgh oil refinery: "Steam was generated in an ordinary boiler and was conveyed therefrom in pipes which passed through a furnace and thence into retorts for the purpose of distilling petroleum. Here the pipes formed extensive coils and then passed out, terminating at a valve outside the building. To prevent the steam, when blown off, from disintegrating the mortar on an opposite wall, some boards were set up to receive the force of the discharge, and, as often as the superheated steam was blown against them, the boards were set on fire." And here is another case in point: "Steam was taken from an ordinary boiler through a pipe forty feet long. Ten feet from the farther end, a collar of wood was fitted closely to the pipe; ten feet nearer the boiler a lighted kerosene lamp was placed under the pipe. In ten minutes the wooden collar was on fire." When superheated steam was turned against a bale of cotton, "the cotton was in flames as quick as a flash." In the report of Mr. Braidwood to the Committee of the Fire Brigade of the city of London (I quote from a newspaper article, embodying the chief points), it is asserted that "Iron pipes, often heated up to 400°, are placed in close contact with floors and skirting boards, supported by slight diagonal props of wood, which a much lower heat will suffice to ignite." "Mr. Braidwood, in his evidence before a Committee of the House of Lords, in 1846, stated that it was his belief that by long exposure to heat not much exceeding that of boiling water, or 212°, timber is brought into a condition that it will fire without the application of a light."

I do not make these questions by way of attempting to controvert the extremely direct and flatfooted position which you have taken, but merely to show that there is another side to the question, be its merits what they may the SCIENTIFIC AMERICAN is a thoroughly practical paper which is read by practical men, and its opinions are doubtless in the vast majority of cases accepted without question. Hence what seems to me the danger which may arise from the positive tone of the article referred to. For the past few years, underwriters, basing their opinions upon such statements as those to which I have asked your attention, have endeavored to impress upon the public that steam pipes in contact with woody fiber are eminently dangerous. And the writer confesses that, in the prosecution of his business, he does not care to have such an unqualified dictum of such an authority as the SCIENTIFIC AMERICAN thrown in his teeth, unless that dictum has been based upon facts as absolute as itself. If steam pipes are not dangerous, it is to the interest of all that the truth should be known. But if the question is still an open one, if a positive answer to the question is as yet impossible, should not so cautious an authority give us the benefit of the doubt, and stimulate discussion rather than check it by enunciating an opinion which nine out of ten of your readers will accept at once as *ex cathedrâ* and final?

I am sure that the public would thank you greatly if you would give a thorough review of the *pro* and *con* of the matter, whatever your ultimate judgment upon them may be.

New York city. W. S. N.

### Influence of the Earth's Central Fires on its Surface

*To the Editor of the Scientific American:*

It is generally conceded that our earth is still a liquid fire, surrounded by a crust caused by congelation, through the elements, in its revolutions through space. Let us examine what influence this liquid fire has on the earth in its different positions, and on its affinity with the rays of light from the sun.

At the period when the rays from the sun begin to be oblique, the earth is turning in position to cause the liquid portion to settle, thereby losing its heating power on the surface and its affinity with the rays from the sun; this change continues to increase, bringing on the coldness of winter according to position in the change. Water freezes, and the frost enters the earth at times when it is comparatively warm; but as soon as the limit is reached and a turn is made in our sphere toward a more congenial position, the atmosphere may still be cold, and the ice on our lakes and streams melt away gradually from the source of heat generated by the internal fires. This change continues to bring spring and summer, and more heat than man really enjoys.

I make these suggestions to draw forth further investigation, for man, from the days of Adam to the present, has attributed much to the Author of Light without considering his own footstool.

EGBUD.

### A Swindle upon Inventors.

We have frequently received letters from various parts of the country calling our attention to the swindling transactions of individuals who represent themselves to be agents for the disposal of patent rights. These parties send neatly printed circulars through the mails to inventors, setting forth their advantages for effecting sales, etc., and requesting the forwarding to their address of models and a fee of five dollars or thereabouts. The money is of course taken and the model usually left in the express office.

Our latest advices regarding these scamps state that they have operated in Albion, Mich., at which place they collected some two thousand models, and more recently they have taken up their quarters in Galesburg, Illinois. We would caution inventors generally against any dealing with firms, or individuals regarding whose standing they have not full and satisfactory information.

## THE LOST ARTS.

Mr. Wendell Phillips, the distinguished orator, has delivered no more brilliant discourse than that of which the following is an abstract. The "Lost Arts" is a subject of surpassing interest, not only as treating of knowledge long since dead to the world, but as affording evidence that many of our newest discoveries were known and practiced in ages of which history furnishes but meager record. Mr. Phillips began by stating that he had been charged with repeating useless fables with no foundation. Take the subject of

### GLASS.

This material, Pliny says, was discovered by accident; some sailors landing on the eastern coast of Spain took their cooking utensils and supported them on the sand by the stones that they found in the neighborhood; they kindled the fire, cooked their fish, finished the meal, and removed the apparatus; and glass was found to have resulted from the niter and sea sand, vitrified by the heat. The story was rejected by scientific men as improbable, on the ground that no mere bundle of sticks could produce sufficient heat to cause vitrification. But Professor Shepherd, continued the lecturer, states that when he was in Mexico his party stopped on the road one day to cook some venison. They made their fire, on stones, of a wood resembling ebony. When the cooking apparatus was removed, there was pure silver got out of the embers from the intense heat of that almost iron wood, a heat more than sufficient to vitrify the materials for glass. Why then, can it not be supposed that Pliny's sailors used some such wood? It is stated that nothing has been observed in ancient times which could be called glass. In Pompeii, a dozen miles south of Naples, which was covered with ashes by Vesuvius 1,800 years ago, they broke into a room full of glass; there was ground glass, window glass, cut glass and colored glass of every description, and the house was evidently a glass maker's factory.

The chemistry of the most ancient period had reached a point which we have never even approached, and which we in vain struggle to reach to-day. Indeed the whole management of the effect of light in glass is a profound study. The Catholic priests, who penetrated into China two hundred years ago, say in their letters that they were shown a glass, transparent and colorless, which was filled with a liquor made by the Chinese, that was shown to the observers and appeared to be colorless like water. This liquor was poured into the glass, and then, looking through it, it seemed to be filled with fishes. They turned this out and repeated the experiment, and again it was filled with fish. The Chinese confessed that they did not make them; that they were the plunder of some foreign conquest. Another story relates to the age of Tiberius, the time of St. Paul, and tells of a Roman who had been banished and who returned to Rome, bringing a wonderful cup. This cup he dashed upon the marble pavement, and it was crushed, not broken, by the fall. It was dented some, and with a hammer he easily brought it into shape again. It was brilliant, transparent, but not brittle. The possibility of glass being thus made is strenuously denied by learned and scientific men. The Romans got their chemistry from the Arabians; they brought it into Spain eight centuries ago, and in their books of that age they claim that they got from the Arabians malleable glass. There is a kind of glass spoken of there that, if supported by one end, by its own weight in twenty hours would dwindle down to a fine line, and that you could curve around your wrist. Von Beust—the Chancellor of Austria—has ordered secrecy in Hungary in regard to a recently discovered process by which glass can be used exactly like wool, and manufactured into cloth. In Rome, there is exhibited a bit of transparent glass, which is lifted up to show that there is nothing concealed, but in the center of the glass is a drop of colored glass, perhaps as large as a pea, mottled like a duck, finely mottled with the shifting colored hues of the neck, and which even a miniature pencil could not do more perfectly. It is manifest that this drop of liquid glass must have been poured, because there is no joint. This must have been done by a greater heat than the annealing process, because that process shows breaks.

The ancient imitations of gems have deceived the most experienced connoisseurs. The celebrated base of the Geneva cathedral was considered a solid emerald, but when Napoleon, after taking it to France, presented it to the Institute, the scholars, though asserting it not to be a stone, were unable to tell of what material it was.

### ANCIENT AIDS TO VISION.

Cicero said that he had seen the entire Iliad, which is a poem as large as the New Testament, written on skin so that it could be rolled up in the compass of a nut shell. Now, this is imperceptible to the ordinary eye. Very recently the whole contents of a London newspaper were photographed on a paper half as long as the hand. It was put under a dove's wing and sent into Paris, where they enlarged it and read the news. This copy of the Iliad must have been made by some such process. Pliny says that Nero, the tyrant, had a ring with a gem in it which he looked through and watched the sword play of the gladiators, more clearly than with the naked eye. So Nero had an opera glass. Mauritius, the Italian, stood on the promontory of his island and could sweep over the entire sea to the coast of Africa with his *nauscopite*, which is a word derived from two Greek words meaning to see a ship. Evidently Mauritius, who was a pirate, had a marine telescope. The signet of a ring in Dr. Abbot's museum, said to belong to Cheops, who lived five hundred years before Christ, is about the size of a quarter of a dollar and the engraving is invisible without the aid of glasses. In Parma is shown a gem once worn on the finger of Michael Angelo, of which the engraving is two thousand years old, in which there are the figures of seven women. A glass is needed to distinguish the forms at all. Layard says he would be unable to read the engravings on Nineveh without strong spectacles, they are so extremely small. Rawlinson brought home a stone about twenty inches long and ten wide, containing an entire treatise on mathematics. It would be perfectly illegible without glasses. Now, if we are unable to read it without the aid of glasses, you may suppose that the man who engraved it had pretty strong spectacles. So, the microscope, instead of dating from our time, finds its brothers in the Books of Moses—and these are infant brothers.

### THE OLD DYES.

For the Egyptians, color was a means of recording history. We find upon the stucco of their walls their kings holding court, their armies marching out, their craftsmen in the ship yard with the ships floating in the dock, and in fact we trace all their rites and customs painted in undying colors. The French, who went to Egypt with Napoleon, said that all the colors were perfect except the greenish white, which is the hardest for us. They had no difficulty with the Tyrian purple. The burned city of Pompeii was a city of stucco. All the houses are stucco outside, and it is stained with Tyrian purple—the royal color of antiquity; and the flaming hues are as bright as if painted but yesterday. Come down from Titian, whose colors are wonderfully and perfectly fresh, to Sir Joshua Reynolds, and although his colors are not yet a hundred years old, they are fading; the colors on his lips are dying out, and the cheeks are losing their tints. He did not know how to mix well. The French have a theory that there is a certain delicate shade of blue that Europeans cannot see. Ruskin says that we cannot imitate in colors that would last for twenty years the magnificent scarlet in old illuminated missals, now five centuries old. The Frenchman says: "I am the best dyer in Europe; nobody can equal me, and nobody can surpass Lyons." Yet in Cashmere, where the girls make shawls worth thirty thousand dollars, they will show him three hundred distinct colors, which he not only cannot make, but cannot even distinguish.

### ANCIENT MASTER ARTISANS.

Taking the metals, the Bible in its first chapters shows that man first conquered metals there in Asia, and on that spot to-day he can work more wonders with those metals than we can. One of the surprises, that the European artists received when the English plundered the summer palace of the King of China, was the curiously wrought metal vessels of every kind, far exceeding all the boasted skill of the workmen of Europe. English surgeons going to India are advised to have their instruments gilded because English steel cannot bear the atmosphere. Yet the Damascus blades of the Crusades were not gilded and they are as perfect as they were eight centuries ago. There was one at the London Exhibition, the point of which could be made to touch the hilt, and could be put into a scabbard like a corkscrew, and bent every way without breaking. If a London chronometer maker wants the best steel to use in his chronometer, he does not send to Sheffield, the center of all science, but to the Punjaub, the empire of the seven rivers, where there is no science at all. The first needle ever made in Europe was made in the time of Henry the VIIIth, and made by a negro; and when he died, the art died with him. Some of the first travelers in Africa stated that they found a tribe in the interior who gave them better razors than they had. Scott, in "Tales of the Crusaders," describes a meeting between Richard Cœur de Lion and Saladin. Saladin asks Richard to show him the wonderful strength for which he is famous, and the Norman monarch responds by severing a bar of iron which lies on the floor of his tent. Saladin says, "I cannot do that," but he takes an eider down pillow from the sofa, and, drawing his keen blade across it, it falls in two pieces. Richard says: "This is the black art; it is magic; it is the devil; you cannot cut that which has no resistance;" and Saladin, to show him that such is not the case, takes from his shoulders a scarf which is so light that it almost floats in the air, and, tossing it up, severs it before it can descend. George Thompson states that he saw a man in Calcutta throw a handful of floss silk into the air, and a Hindoo sever it into pieces with his saber. We can produce nothing like this.

### EGYPT'S MECHANICAL MARVELS.

Taking their employment of the mechanical forces and their movement of large masses from the earth, we know that the Egyptians had the five, seven, or three mechanical powers, but we cannot account for the multiplication and increase necessary to perform the wonders they accomplished.

In Boston, lately, we have moved the Pelham Hotel, weighing fifty thousand tuns, fourteen feet, and are very proud of it, and since then we have moved a whole block of houses twenty three feet, and I have no doubt we will write a book about it; but there is a book telling how Domenico Fontana, of the sixteenth century, set up the Egyptian obelisk at Rome on end, in the Papacy of Sixtus V. Wonderful! Yet the Egyptians quarried that stone and carried it one hundred and fifty miles, and the Romans brought it seven hundred and fifty miles, and never said a word about it. Mr. Batterson, of Hartford, walking with Brunel, the architect of the Thames tunnel, in Egypt, asked him what he thought of the mechanical power of the Egyptians, and he said: There is Pompey's Pillar, it is one hundred feet high, and the capital weighs two thousand pounds. It is something of a feat to hang two thousand pounds at that hight in the air, and the few men that can do it would better discuss Egyptian mechanics.

### CANALS.

The Suez Canal absorbs half its receipts in cleaning out the sand which fills it annually, and it is not yet known whether it is a pecuniary success. The ancients built a canal at right angles to ours, because they knew it would not fill up if built in that direction, and they knew such a one as ours would. There were magnificent canals in the land of the Jews, with perfectly arranged gates and sluices. We have only just begun to understand ventilation properly for our houses; yet late experiments at the Pyramids in Egypt show that those Egyptian tombs were ventilated in the most perfect and scientific manner.

Again, cement is modern, for the ancients dressed and joined their stones so closely that, in buildings thousands of years old, the thin blade of a penknife cannot be forced between them. The railroad dates back to Egypt. Arago has claimed that they had a knowledge of steam. A painting has been discovered of a ship full of machinery, and a French engineer said that the arrangement of this machinery could only be accounted for by supposing the motive power to have been steam. Bramah acknowledges that he took the idea of his celebrated lock from an ancient Egyptian pattern. De Tocqueville says there was no social question that was not discussed to rags in Egypt.

### OLD HINTS OF NEW THINGS.

Years before Franklin's invention of the lightning rod, and before muskets were thought of, the old soldiers on guard on the towers, if a spark passed between them and the spear head, ran and bore warning of the state and condition of affairs. Solomon's Temple, lofty and situated on an exposed part of a hill, was guarded by a system exactly like Franklin's. The Duchess of Burgundy took a necklace from the neck of a mummy and wore it to a ball given at the Tuileries, and everybody said they thought it was the newest thing there. A Hindoo princess came into court, and her father seeing her said: "Go home, you are not decently covered—go home;" and she said, "Father, I have seven suits on;" but the suits were of muslin, so thin that the king could see through them. Four hundred and fifty years ago the spinning machine was first introduced into Europe. Yet we have evidence to show that it made its appearance two thousand years before.

We have not an astrology in the stars serving only the kings and priests; we have an astrology serving all those around us. We have not a chemistry hidden in underground cells, striving for wealth, striving to change everything into gold. No; we have a chemistry laboring with the farmer, and digging gold out of the earth with the miner. Ah! this is the nineteenth century, and of the hundreds of things we know, I can show you ninety-nine of them which have been anticipated. It is the liberty of intellect and a diffusion of knowledge that has caused this anticipation.

## Ocean Weather Signals.

The suggestion is made that a vessel, connected by telegraph cable with the shore, be stationed three hundred miles out at sea off the port of New York, to warn approaching ships of storms on the coast. This a pretty idea but not of much practical value. In fair weather no skipper would go out of his way to find the telegraph boat; and in a storm he couldn't find her if he would.

Equally valueless is the proposition to have signal buoys anchored at intervals in the ocean between Europe and America, to indicate wind currents, latitude and longitude, afford refuge to distressed mariners, etc., The majority of marine disasters occur directly upon the coasts. Few vessels, comparatively, are lost in mid ocean. The rotary motion of storms is well understood by sea captains, who know how to steer in order to avoid the most violent portions, while the barometer gives notice in advance of approaching storms and change of winds. The proposed signal buoys could add little or nothing to the safety of ships.

## A Locomotive Explosion.

A few days ago a locomotive, while standing at the head of a freight train at Lewisville, S. C., exploded with a deafening detonation, producing a concussion which was heard and felt for miles.

The scene around the engine was appalling. Every portion of it except the tender was a complete wreck. One of the large driving wheels on the right side was torn from the axle and buried deep in the embankment. One of the heavy driving shafts was hurled over the embankment of the cut and, in its career, struck the top of a telegraph pole, which it snapped of like a stick of glass. The dome of the engine was thrown far above the cut and fell about three hundred yards distant. The bell crushed in the gable end of a negro preacher's house, about the same distance away, causing the sable clergyman to tremble with fright. The cause of the explosion is inexplicable; the engine was quite an old one. No person injured.

## Quantities of Materials used by Photographers.

Dr. Vogel says: From my own experience, I give the following rules: For every square foot of plate, about half an ounce of collodion is necessary; a square foot of plate will consume also very nearly half an ounce of bath solution; and, when we use a developer of a strength of five per cent, with two and a half per cent glacial acetic acid, we will require, for every square foot of plate, nearly half an ounce of sulphate of iron and a quarter of an ounce of glacial acetic acid. Of varnish, about three quarters as much as of collodion is necessary. The consistence of the collodions and the varnishes differs, of course; but we can hardly go amiss if we provide ourselves with one and a half times to double the abovementioned quantities for each square foot of plate.

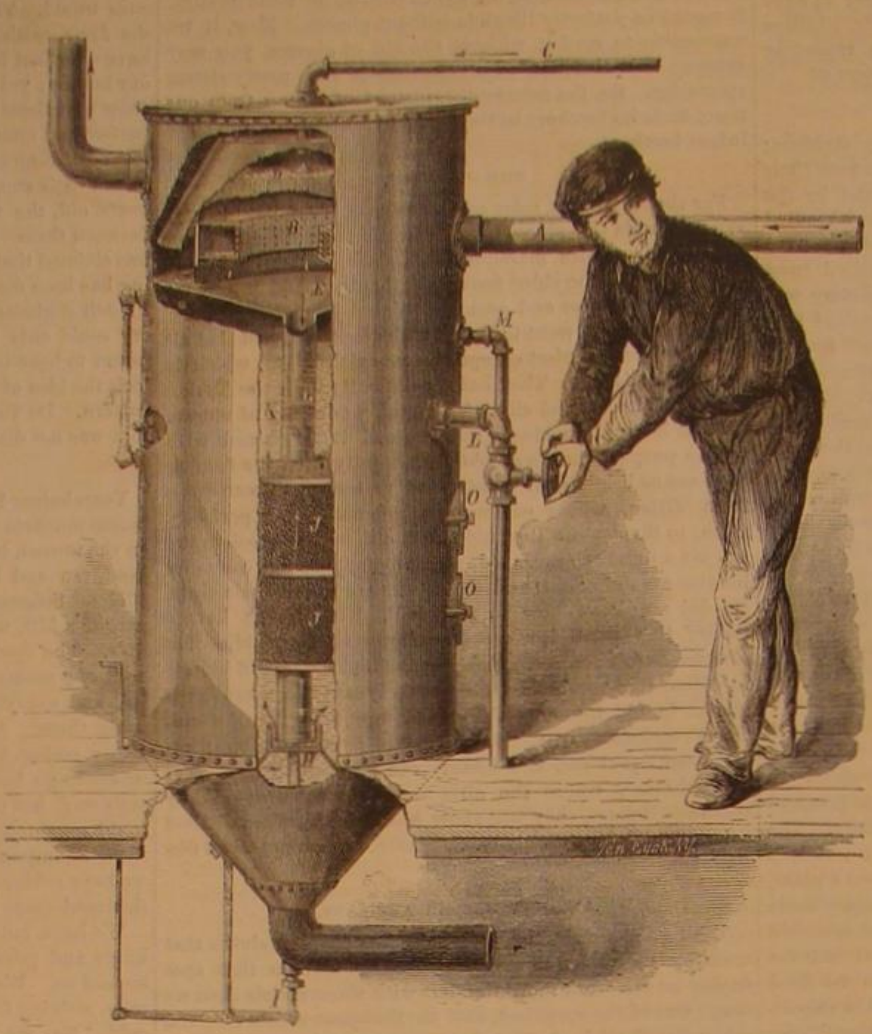
## STEAM FILTER AND CONDENSER.

Our engraving represents an improved form of steam filter and condenser, adapted to the purification of water for boiler feeding or other purposes. Steam enters through the pipe, A, into the annular perforated chamber, B. There it escapes through the numerous small orifices and is met by a copious shower of water which, supplied by the pipe, C, from above, is spread out over and percolates through the perforated distributor, D. The steam is thereby nearly all condensed and falls to the conical diaphragm, E, the residue escaping through the exhaust, F, on the left of the engraving. The water now descends the vertical pipe, G, to the lower section of the apparatus. At the bottom of the pipe it encounters the cup, H, over the sides of which it flows into the mud well, where it deposits such foreign matter as it may hold in suspension, the accumulated sediment being afterwards drawn off through the valve, I. The water next rises through the filters, J J, to the upper chamber, K, whence it emerges in a clear and pure condition through the pipe pipe, L. At M is shown the overflow pipe, at N the glass water gage, and at O the man holes.

It is hardly necessary to dwell upon the advantage of using the purest attainable fluid for the feeding of steam boilers, or the general benefits of filtering water that is in anywise turbid, previous to employing it for the ordinary purposes of life.

The apparatus above described seems, so far as its principle and construction are concerned, an efficient and useful device. The inventors state that careful analysis has proved that it removes from water over three quarters of the lime which forms boiler scale, and probably five sixths of the suspended impurities.

Patented through the Scientific American Patent Agency, February 27, 1872. Further information may be obtained by addressing Messrs. Kennedy, Berkshire & Co., Muscatine, Iowa.



STEAM FILTER AND CONDENSER.

### The Million Dollar Telescope.

"An Old Mechanic" writes to suggest the formation of a stock company, with shares of ten dollars each, to construct the proposed large telescope, and states that he, for one, would gladly pay $25 for a peep at Mars or the moon through such an instrument, and would go to any part of the United States for such a privilege. He points out that it is of no use to look to Government for such a telescope, as it has no money for such a purpose, although plenty is forthcoming for European shows and big guns; and he asserts that the money, according to his plan, would be easily obtained; and, if such a telescope were placed in Philadelphia in 1876, that it would pay the stockholders 200 per cent, besides benefitting science.

## LYNN'S ANTI-FREEZING RAILROAD TANK VALVE AND FEEDER.

The invention herewith illustrated is an arrangement of the parts of a railroad tank whereby water may be delivered to an engine without requiring the latter to be located at any precise spot near the reservoir, and also an ingenious combination of devices which prevent the flow of the liquid being stopped by freezing.

The outer portion of the spout, Fig. 1, is connected to the part, A, attached to the tank by means of the horizontal hinge, as shown, which allows of its motion in a vertical plane. This outer portion is in two parts, B and C, which are connected by the india rubber bellows, D. Within the flexible joint, and shown through its cut away portion, is a vertical hinge, E, which attaches a double rod, represented in dotted lines in the spout, to the part, C. On this rod the outer section, B, of the spout moves, this motion being allowed by the inner extremity of the latter being attached to the rubber connection. A clearer idea of this arrangement may be obtained from the similarly lettered portions in the horizontal section, Fig. 2. By means of the two hinges and the bellows attachment, it will be seen that the spout may be placed at any angle to suit the location of the engine. The special advantage of the flexible connection and double interior rods is that the portion, B, of the spout may be slightly drawn out, sliding on the rods, in order to adapt it to whatever distance the locomotive may be from the tank.

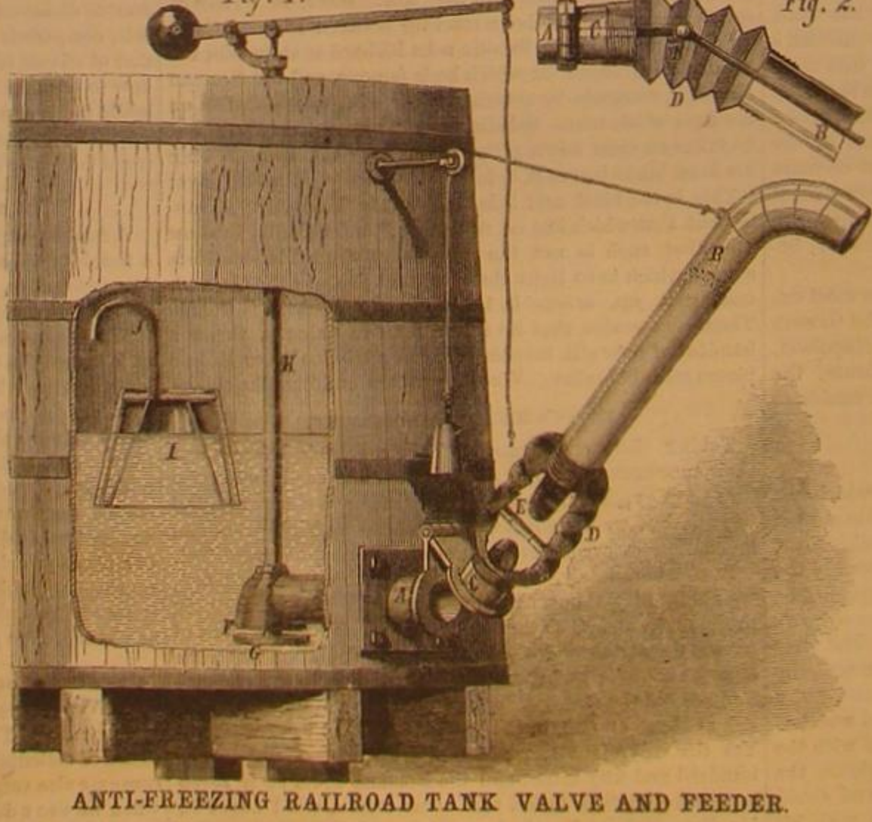


Fig. 1. Fig. 2.

ANTI-FREEZING RAILROAD TANK VALVE AND FEEDER.

F is the valve seat on the lower side of the inner end of the pipe, A, which extends into the tank; G is the valve, the rod of which continues up through the tube, H, to the top of the reservoir where it is connected with the lever, as shown. By pushing the valve downwards the water passes with force nto the spout, and the latter, acting as a siphon, does not ascend the tube, H. This device, it is claimed, effectually prevents the valve from becoming clogged or inoperative from freezing, its rod being always free to act. When the valve is closed, whatever may be contained in the box and spout, A, escapes from the exterior open end of the latter.

In order to avoid the stoppage of the flow from a freezing over of the surface of the water, and a consequent shutting off of access of the air, a float, I, is arranged. The liquid inclosed within the inverted tub is thereby protected and kept from solidifying while air is supplied through the bent tube, J. Further particulars may be obtained of Messrs. M. N. Lynn & Co., New Albany, Ind.

### Medical Phosphorus Oils.

According to M. Méhu, sweet almond, olive or poppy seed oils will dissolve easily one eightieth of their weight of phosphorus. He therefore proposes that only one part of phosphorus to 100 parts of oil, instead of two parts as in the French Codex, should be used. Phosphorated oil of this strength is strongly luminous in the dark; but this luminosity may be entirely destroyed by the addition of a small quantity of ether, or of any of the essential oils not containing oxygen, such as bergamot, citron, copaiba, lavender, mace, mustard, rosemary, turpentine, etc. Colza, rape, beechnut, linseed, and brown cod liver oils each dissolve one seventieth of their weight of phosphorus. Castor oil dissolves one part in one hundred and five. Cacao butter dissolves one per cent; but if a colorless product be required, it should be treated as recommended for the oil of sweet almonds.

### Recognition of Vegetable Fibers in Mixed Fabrics

Silk and wool are dissolved by boiling in a 10 per cent solution of caustic soda, while vegetable fibers remain unattacked. When wool is dissolved in caustic alkali, the solution blackens on adding sugar of lead, sulphide of lead being thrown down. The undissolved vegetable fiber is bleached, if colored, with hydrochloric acid and a little chlorine water. It then shows the characteristic property of dissolving in an ammoniacal solution of oxide of copper. If the fabric contains a large quantity of dye stuff, it is better to put it into a mixture of 2 volumes strong sulphuric acid and 1 volume nitric acid, whereby the wool, silk, and dye are all dissolved, and the vegetable fiber converted into gun cotton, which after washing and drying is recognized by its explosive character.

In testing white fabrics, a solution of fuchsin can be employed, which will dye the silk and wool but not the vegetable fiber. Before this test is used, the dressing must be removed by boiling in a dilute solution of sal soda and soap. Enough caustic soda must be added to the boiling fuchsin solution to partially destroy its color and leave it of a light rose red.

To detect wool in silk, a solution of oxide of lead in caustic soda is used, as this will blacken the wool but not the silk. If, on the contrary, you wish to detect an admixture of silk in a woolen fabric, you employ a cold ammoniacal solution of oxide of copper, which dissolves the silk but not the wool. Acids precipitate white flakes from this solution. Wool is also soluble in this solvent when warm, hence the necessity of using the solution cold when separating wool and silk.

Concentrated acids can also be employed, hydrochloric being the best; for they too dissolve the silk while cold, but do not act perceptibly on the wool. The vegetable fibers also remain undissolved. The insoluble fibers are bleached and tested as above given.

### The Premature Decay of Timber.

Mr. Hector Orr, in a paper on the above opic, communicated to the *Journal of the Franklin Institute*, gives conclusions drawn from an examination of the timbers of the U. S. ship Chattanooga. This vessel was built in Philadelphia, but never left the Delaware. Last winter she was injured by the ice and partially sunk off League Island. Her keel was laid less than eight years ago, but at the present day her timbers are so rotten that they fairly crumble under the touch. Near the forward bends the timbers were doubled. The writer noted one or more instances in which a pine log and a oak log were thus coupled, and the decay had evidently begun at the inner surfaces, which were in direct contact with each other; but even where both logs were of the same wood, the same inward decay appeared. Whether in the undisturbed mass or where pierced with iron or copper fastenings or even with the treenail, the fiber was completely broken up.

The fleet of Commodore Perry, which was built in haste from timber cut on the lake shore for service in the war of 1812, suffered from early rot, so that the vessels were pronounced unseaworthy soon after the peace of 1815. In some vessels a strange tendency to decay has been noticed, indicating a sort of triennial crisis in their early life, which, if passed without injury to the wood, predicted some twenty-five years of wear. Marked instances have been observed in large pieces of timber, such as pillars, girders, and even rafters, that were cased with light boards to improve the appearance of the room, the inner mass being found dangerously rotten. Another important fact is that in portions of the "lining" of vessels covered with zinc or tin, as in provision closets, etc., the decay followed exactly the surface covered by the metal, indicating the action of "dead" air in contrast with that of a free atmosphere on the surrounding parts which remain sound. The hygienic condition of a decaying structure is worthy of consideration. It has been determined that in all well ascertained centers of production and diffusion of yellow fever, three conditions were always present, namely, heat, moisture, and decayed wood. The danger in such a vessel as the Chattanooga is obvious. As to moisture, her mere bilge water would furnish this, even without the drippings from tanks and boilers; the heat is insured by her furnaces, which a cruise in the tropics would aggravate, and the rotten wood, as was evident, existed at once in profusion and perfection.

G. W. T. of Mason City, Ill., writes that he observed large numbers of meteors on the evening of November 27 In 55 minutes, 251 were counted.

### The Kallistochrome.

This is a new and ingenious form of chromatic top, to which the above name has been given, and is the invention of Mr. J. Beverley Fenby, of Birmingham, England, and although nominally a toy, it is worthy of notice on account of the brilliant chromatic effects it produces. The instrument consists of a well balanced top, which, when spun in the glass cup provided for the purpose, will run from six to eight minutes. On the top of this top can be dropped paper disks variously colored, these disks resembling those used with an ordinary chromatic top. Above the colored disk is placed what is termed a mask, this being a black disk having two triangular openings cut in it. The mask has an india rubber ring on its under side, which rests upon a collar on the spindle of the top while the mask itself is slightly "buckled," so that its surface is not flat. When the top revolves, the mask is carried round also, but the resistance of the air causes the mask to slip slightly on the collar, it thus revolving at a less speed than the top. The effect of this is to produce automatic changes in color of the top as seen through the openings in the rapidly revolving mask. These changes of color are very beautiful, the appearance of the top with some of the disks resembling a mass of brilliantly tinted vapor, which wells up at the center, and gradually changes color as it passes outwards towards the edge of the disk. Other disks produce brilliant rings, ever changing in their tints, and altogether the instrument is one which serves to illustrate some exceedingly interesting optical effects.

### Butter Making.

It requires both attention and experience to produce butter in the shortest time. If the cream be too warm, it froths a great deal and a thin liquid appears in the vessel, especially at high temperatures; when the cream is too cold, it froths too, but appears thick, like freshly fallen snow. In the latter case, the cream ought to be warmed, and in the former, cooled. The appearance of the butter globules also serves to indicate whether the cream is too warm or too cool. In the former case, the globules are soft and melting, in the latter, hard; in both cases a slower churning is advisable. Old cream produces butter sooner than fresh. A temperature between 70° and 80° is best in churning, and the cream should be skimmed off. Fresh air and strict cleanliness of the vessels are indispensable.

### Telegraphy in the United States.

An interesting report on the subject of telegraphing in the United States, and with special reference to the proposed Government telegraph system, has been lately made by the Hon. David A. Wells. According to the statistics given by him, there are at present $60,000,000 invested in the business, 80,000 miles of line, and 180,000 miles of wire. This valuable and increasing property it is now proposed to transfer to the National Government.

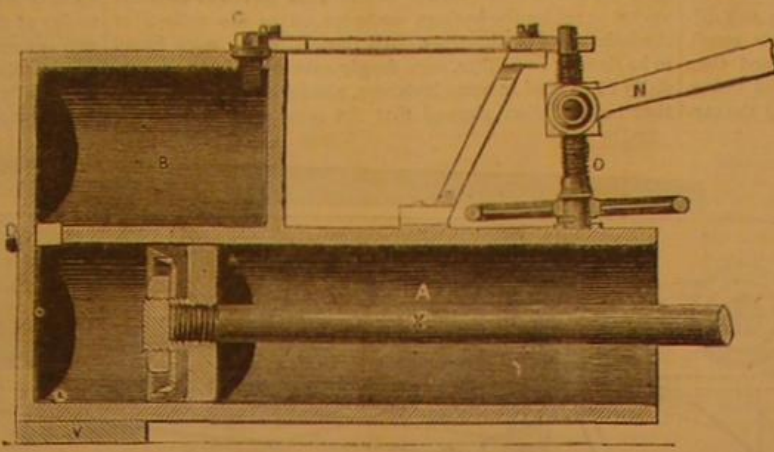
The cost of the British lines was $40,000,000, and to buy the lines in the United States, not less than $75,000,000 would be needed. To meet this expense a new national loan would have to be issued. The charge for transmission of messages, which is fixed at twenty-five cents for twenty words in the Washburn bill, and at one cent a word in the Hubbard proposition, would be entirely insufficient to meet expenses. Moreover, as the cheap telegraphing must be counterbalanced by an additional tax upon the people, it is difficult to see where the advantage lies.

In Europe, the government system has been unsuccessful. In 1870, North Germany, Bavaria, Denmark, Spain, and Austria, all had deficits, while the expenses in Great Britain were about $3,000,000 in excess of the receipts.

With regard to government efficiency, Mr. Wells calls attention to the fact that the post office of the United States is very much inferior to those of foreign nations. We have neither cheap postage nor a strictly honest service, and it is not supposable that any change would be made in these respects when the postal department was charged with the care of the telegraph. In addition, he repeats the arguments which have been so often advanced to show that all steps of this kind are inconsistent with the theory of republican institutions, because they tend toward imperialism.

### Statistics of Joint Stock Companies in England.

The "Joint Stock Companies Directory" for the year 1872 has just appeared, containing 1,500 pages, embracing the names of all the joint stock companies in England. From this we get some idea of the immense number of stock companies in that one kingdom. First, we find the different railroad companies, such as the Midland Railway Company, which has 15,000 stockholders. The same company has at least as many more employees, making 30,000 persons to whom the welfare of a single company is a vital question.




PNEUMATIC GUN CARRIAGE AND ELEVATOR.—Fig. 2.

After the railroads, follow long lists of insurance, banking, contracting, navigation, dock, hotel, mining, water, gas, and general companies. The *Echo* has counted the names of all the directors and finds them to number 10,500! If we suppose that each of these directors draws but $750, then the total sum paid them equals $7,500,000, which represents a capital of $150,000,000 at 5 per cent. Besides, as a rule, the directors draw $1,000 to $1,500, and railroad directors draw a salary of $2,500. In this way an idea may be formed of the immense extent of stock enterprises in England.

### A Gigantic Barometer.

A huge barometer, the face of which is four feet in diameter, is now being erected on the façade of the Paris Bourse. The instrument proper is an ordinary sized aneroid, the movements of which are transmitted, by ingenious mechanism, to a train of clockwork which is wound up monthly. The clockwork actuates the great needle on the exposed face. *Les Mondes* suggests that it would be an excellent idea to place such barometers at the entrances of harbors, so that masters of vessels leaving the port might be able to determine, with reasonable probability, the coming weather.

### PNEUMATIC GUN CARRIAGE AND ELEVATOR.

Captain James B. Eads, whose name is best known in connection with the great engineering work he is now successfully bringing to a conclusion—the railway and road bridge over the Mississippi at St. Louis—has recently designed a gun carriage for working guns *en barbette*, in which the force of recoil and the weight of the gun are employed to compress air in a suitably designed receiver, where it is stored up and used when the gun is to be elevated. Working models of this carriage have been tested at Washington with success, both as to their efficiency in rising and falling, and also as to their capacity for remaining depressed for prolonged periods without losing the power necessary again to raise the gun. The engravings, for which we are indebted to *Engineering*, are taken from a working model for a 15 inch United States army gun, and made one twelfth of the full size; the total fall of the gun in the model is 10 inches, representing a depression of 10 feet in the actual piece.

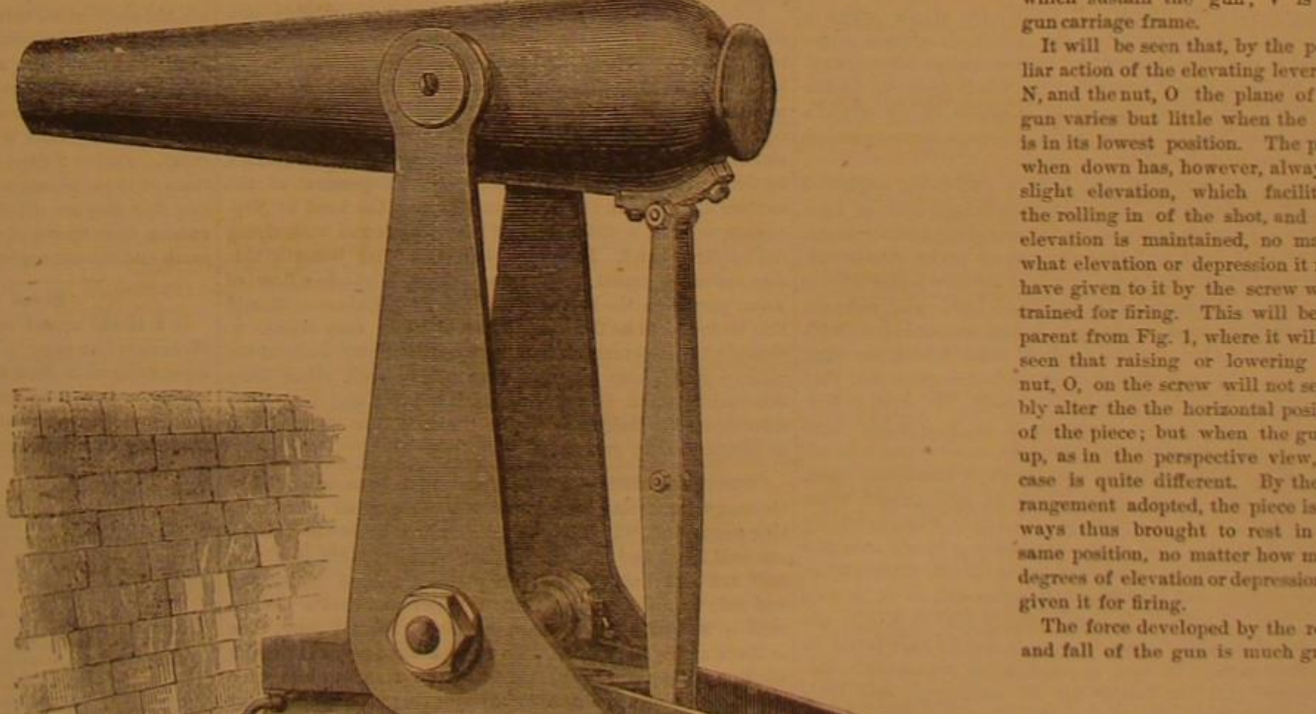
The action of the carriage is dependent simply upon the compression of air in a receiver, effected by the downward motion of the gun, transferred to a piston rod and leather-packed piston, which works to and fro in a cylinder open at one end. Water or glycerin is admitted behind the piston in order to maintain a tight joint, and in sufficient quantity to fill the space between the end of the cylinder and the piston when the gun is in its lowest position. The quantity of water would be varied with the powder charges employed; with heavy charges the quantity of water is increased, in order to produce a greater degree of compression in the air.

The chief features in the details of the carriage are the elevating and depressing gear for training the gun, the arrangement for locking and retaining the gun, when down, against the force of the air compressed in the reservoir, and the friction gear.

The engravings annexed will fully explain the construction of the carriage. Fig. 1 shows the gun above the parapet ready for discharging. Fig. 2 shows the air pump and cylinder for elevating the gun; and Fig. 3 shows the gun after recoil, in loading position beneath the parapet. A is the cylinder to receive water to assist in increasing the air pressure when necessary; B is the air chamber: C is an inlet closed with a screw plug for introducing water; K is a lever for working a ratchet arrangement or lock, by which the gun is locked in loading position when thrown down by the recoil; N N are connecting rods for elevating and depressing the gun before firing, and also for preserving its horizontal position when in the act of descent; O is a nut on the elevating screw, jointed to the rods, N N; P is a friction plug fitting into a wood-lined socket in the crosshead, which is attached to the piston rod and connecting straps, U; these straps are jointed to the lower ends of the levers which sustain the gun; V is the gun carriage frame.

It will be seen that, by the peculiar action of the elevating levers, N N, and the nut, O the plane of the gun varies but little when the gun is in its lowest position. The piece when down has, however, always a slight elevation, which facilitates the rolling in of the shot, and this elevation is maintained, no matter what elevation or depression it may have given to it by the screw when trained for firing. This will be apparent from Fig. 1, where it will be seen that raising or lowering the nut, O, on the screw will not sensibly alter the the horizontal position of the piece; but when the gun is up, as in the perspective view, the case is quite different. By the arrangement adopted, the piece is always thus brought to rest in the same position, no matter how many degrees of elevation or depression be given it for firing.

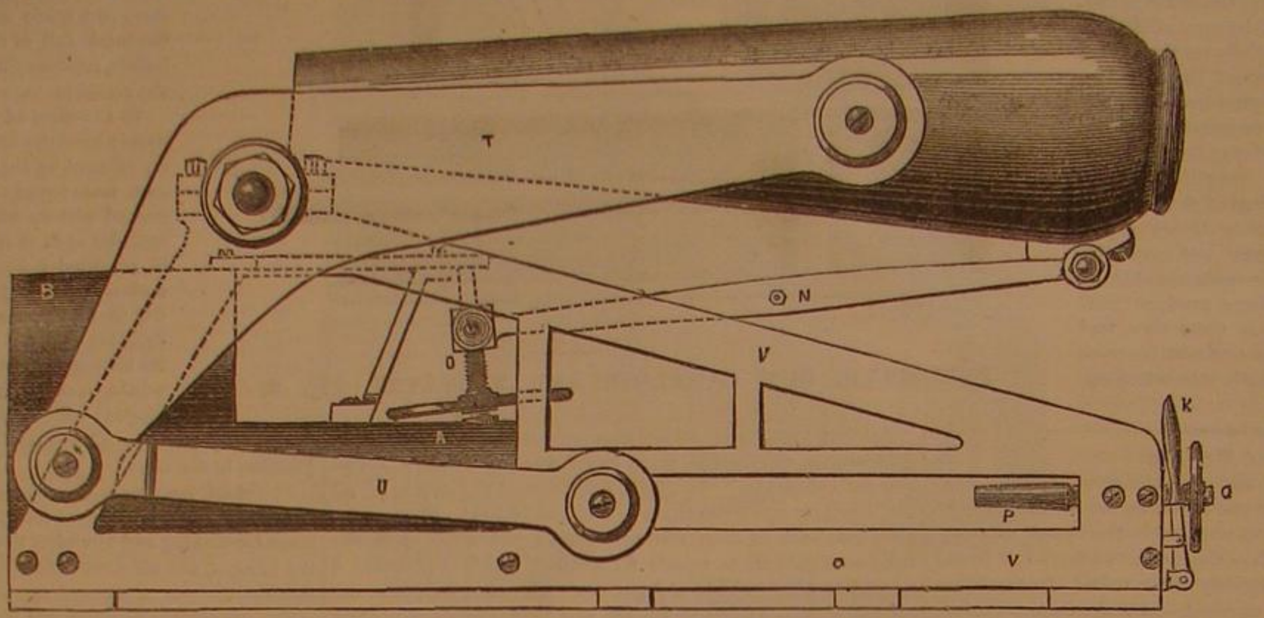
The force developed by the recoil and fall of the gun is much great



PNEUMATIC GUN CARRIAGE AND ELEVATOR.—Fig. 1.—[Designed by Captain James B. Eads, St. Louis, Mo.]

er than is required to bring it back to the elevation from which it falls. A part of this force is, however, given off by the cylinder and piston in the form of heat, otherwise the gun would be thrown up with great force; part of the force is also converted into heat in compressing the air in the cylinder, and as this heat is quickly absorbed, the latter is incapable of expanding to its original volume when the gun is thrown up. Hence the latter part of the stroke of the piston is made against an external atmospheric pressure, and tends to bring the gun gradually to rest as it rises above the parapet. If the gun is not down long enough for this heat to be lost, it comes up with greater energy. To equalize any differences of air pressure and also to prevent counter recoil, which would ensue if elastic buffers were used, and thus probably cause the gun to fall after it came up and before firing, the friction plug, P, is secured to the rear of the carriage, and enters a corresponding socket in the crosshead. This socket is lined with wood, and the plug can be advanced or withdrawn by the screw and wheel, Q, according to the amount of resistance found desirable to check the gun. When the plug enters the socket, the gun is securely retained until it is loaded and ready to be raised. This insures the cylinder being filled with air, and prevents the possibility of a vacuum after the gun is up.

The gun, when thrown down, is held against the reactive force of the air by a peculiarly arranged pawl and ratchet gear. The ratchet is fastened to the underside of the crosshead, with teeth inverted, and the pawl is retained in its upward position by a spring.




PNEUMATIC GUN CARRIAGE AND ELEVATOR.—Fig. 3.

### The Money Value of Intelligence.

Every thoughtful man recognizes the money value of intelligence in a community. It is for this, in part, says the *Country Gentleman*, that the State builds school houses and furnishes free education to the masses. "Knowledge is power;" even the ignorant respect it, and pay it many an involuntary compliment. The power consists in the ability to better one's condition more rapidly; and in doing that—such are the relations of men to each other—they usually benefit all around them. The improvements on a piece of real estate do not affect the owner alone, but indirectly extend to the neighborhood, and next find their way to the assessor's books and thus benefit the nation. It is like the ripple which a pebble starts when thrown into the water—it spreads wider and wider, and though after awhile the visible effect disappears, we know that it does affect the whole body, no matter how large. So when something is added to the world's wealth, it benefits the whole world, although we may not be able to trace its full effects.

When an enterprising man buys a run down, neglected farm, with ricketty and dilapidated buildings, and at once proceeds to improve it, clears up the unsightly fence corners, drains the wet land, pulls out stumps or rocks, moves the barn to the back of the house, and sets the new house a little distance back of the highway, lays out a lawn with pleasant walks and shade trees and hedges; brings blooded stock with him, and causes his acres to produce three fold more than ever before, what man so stupid as not to recognize that that is a pecuniary gain to the neighborhood? No matter how selfish the owner may be at heart, if he makes his farm more valuable, he does the same, to some extent, to all around him. The neighbors like to see a handsome farm near them even if they never think of selling, and when they do try to sell, the prospective buyer will invariably have his attention called to the handsome property over the way, or which adjoins, or at least is not far off. Speculators holding unimproved land like nothing so well as to be able to say (because nothing is more potent) that it lies in the very best of neighborhoods, is surrounded by rich farms in the highest state of culture, in a delightful region of walks and drives; that the people are all intelligent, and their tastes refined; that schools and churches abound; and that the value of the land has been proved by the extraordinary yield of crops on the adjacent farms. When these things can be said truthfully, sales are comparatively easy, and that at the highest prices.

Does not every enterprising farmer see then—as well as those who are not farmers—that there is a money value in intelligence, and that the rapidity of its spread concerns them very closely? Improvements on one's own place are well, wise and admirable; but so are improvements around you. There should be, then, no neglect of the means. Every agency which will promote farm intelligence should be employed and kept up.

### Submarine Water Supplies.

Yonkers is an enterprising city, just north of New York, on the Hudson river, and the municipal authorities have lately been exercised upon the question of a water supply. Through Yonkers runs a small river called the Nepperhan, which empties into the Hudson. Professor Newberry, of Columbia College, has been consulted in the matter, and in his report he gives the following interesting information:

Before any plan is adopted for supplying the city of Yonkers with water, I would strongly recommend that a thorough exploration be made of the materials which occupy the bottom of the rocky valley of the Nepperhan, and underlie, perhaps very deeply, the present stream. It is probably know to you that most of the draining streams of all the region between the Mississippi and the Atlantic are now running far above their ancient beds. This fact was first revealed to me by the borings made for oil in the valleys of the tributaries of the Ohio. All these streams were found to be flowing in valleys, once deeply excavated, but now partially filled, and in some instances, almost obliterated. Further investigation showed that the same was true of the draining streams of New York and the Atlantic slope. For example, the valley of the Mohawk, for a large part of its course, is filled with sand and gravel to the depth of over two hundred feet. In the Hudson the water surface stands now probably five hundred feet above its ancient level—the old mouth of the Hudson and the channel which leads to it being distinctly traceable on the bottom nearly eighty miles south and east of New York. The excavation of these deep channels could only have been effected when the continent was much higher than now. Subsequently it was depressed so far that the ocean waters stood on the Atlantic coast from one hundred to five hundred feet higher than they now do. During this period of submergence the blue clays in the valley of the Hudson—the Champlain clays—were deposited, and the valleys of all the streams were more or less filled.

Following the general rule, the Nepperhan probably once discharged itself into the Hudson at least one hundred feet below its present level, and the old valley in which it flowed is perhaps filled to this depth for some distance above its mouth. It is also probable that a portion of the material occupying the bottom of the old valley will be found to consist of sand and gravel, saturated with water and traversed by drainage currents which are quite independent of the surface stream. In the boring made near the head of Nepperhan avenue, a thick bed of clay was found underlying the surface gravel. It is almost certain that beneath this clay are sand, gravel, or boulders, through which a flow of water passes on the bed rock toward the Hudson. Should this be found to be the case, it would be an easy matter to construct a subterranean dam between the rocky walls of the valley—which here approach very near to each other—stop this underground flow and pump it out for city use, either directly by the Holly process, or throw it into reservoirs to be distributed by gravity.

Color Blindness.—An instrument has been invented in Germany for testing color blindness. It consists of a rotating apparatus, which moves a disk whose center is a circle, one half black and the other white; outside of this is a ring half red and half green, then another ring of violet and and red, then the outside ring of violet and green. When rapidly rotated, the center appears to be colored gray, then is black and white mixed. To a green blind person the middle line will appear gray, that being the result to him of a mixture of violet and red. The outer ring will appear gray to the red blind patient, and the inner, gray to the violet blind. By the use of this instrument, a large number of patients may be simultaneously examined for one or more kinds of color blindness.

A bill is before Congress to permit scientific institutions to import alcohol, free of duty, for use in preserving specimens. Professor Agassiz appeared before the Congressional Committee to advocate the measure, and stated that, last year, the institution with which he is connected, Harvard University, Cambridge, Mass., used five thousand dollars' worth of alcohol, and he thought that about as much more was annually used by other institutions.

Sir G. C. Cowell states that he witnessed the explosion of a fire ball, which seemed to be about twelve feet in diameter, near the Great Western railway at Slough, England, on November 30, 1872, at 2.30 P. M. The report made was similar to that of a heavy gun, and the ball burst, on reaching the ground, like a well timed shell.

### Meteorological Phenomena.

Father Sanna Solaro, in a communication to the French Academy of Sciences, takes an interesting and comprehensive view of meteorological phenomena. He says that if we consider the sun as the principal source of terrestrial and atmospheric electricity, we can consistently explain the most difficult phenomena of meteorology. The sun being the cause, we can account for the extreme violence of electrical phenomena in the tropics and especially at the time of the equinoxes. Hence the terrible cyclones, which mere differences of temperature cannot explain. The excess of electricity of those regions, striving to re-establish its equilibrium, causes the air to flow towards the temperate zones. The whole column of air over the tropical zone being more powerfully electric than the balance of our atmosphere, it is but natural that the electricity in the higher and more rarefied regions should flow off towards the poles and manifest itself under a luminous form. Hence auroras are most frequent too at the time of the equinoxes.

When electricity is developed in an electrical machine, it accumulates in the prime conductors and pushes away the air from them in order to escape. What then must be the effect of the immense oceans of electricity accumulated above our heads? It is here that we must look for the cause of barometric variations, and we will then understand why the barometer falls rapidly at the approach of the center of a cyclone, and why it sometimes rises suddenly after a clap of thunder. The daily and the yearly variations of the barometer, like those of the compass, are small at the equator, much more sensible at mean latitudes and almost zero in winter at high latitudes.

It has been known for some time that when the barometer rises considerably, the thermometer falls a few days after. On the supposition that the depression of the barometer is due to an accumulation of electricity, it will be easily understood that the electricity, escaping by puffs, cools the air in proportion to its own tension; the barometer will rise at once, while several days will be necessary to transmit the lower temperature to the thermometer.

Earthquakes are of two kinds; one of them originates in the interior of the earth, while the other, and by no means the less violent, is produced upon the surface. The latter are the more numerous. They are frequently preceded by noises in the air resembling rumblings of thunder or the unloading of pebbles on a stony road; they are often accompanied by luminous phenomena, and, for the most part, nothing can be heard below the surface of the earth. On one occasion, the shocks were not perceptible in the cellars and caves. Father Solaro states that frequent personal observations of these phenomena have forced upon him the conclusion that they are often due to atmospheric waves caused by sudden disturbance of the electrical equilibrium between the earth and the atmosphere.

### Fires and their Causes.

In a recent report of the Boston Manufacturers' Mutual Insurance Company, a list of the fires by which that corporation suffered in 1872 is given, from which we take the following. It will be found interesting as showing the many causes which may produce fires, and shows the great care necessary in all manufacturing establishments to prevent combustion.

1872.

January 1.—Lyman Mills, Holyoke, Mass., picker No. 1. Fire was discovered in a pocket or bin in cotton from a Kitson willow at about 9 o'clock A. M., attributed to foreign matter in the cotton. Loss $450.

January 8.—Glasgow Co., So. Hadley Falls, Mass. Fire in the gas house, from an escape of gas. It was caused by one of the workmen entering the gas house with a lighted lamp, there being no ventilator. Loss about $3,300.

January 9.—Woonsocket Co., Woonsocket, R. I. Fire in the office and store building, supposed to have been the result of thieving in the store, the thieves firing the store, accidentally or otherwise. Loss total.

January 9.—Utica Steam Cotton Company, Utica, N. Y. Fire in No. 2 picker room. On opening the room in the morning, fire was discovered running over two laps which were in contact with a steam pipe. There seems to be no doubt that we have here a clear case of ignition of what is usually clean cotton by the heat of ordinary steam pipes.

January 17.—Methuen Company, Methuen, Mass. Fire in jute card room, discovered on the apron of a picker, and as the stock had not entered the machine, it was attributed to matches. Extinguished by sprinklers. Loss moderate.

January 19.—Stevens Linen Works, Dudley, Mass. Fire in a jute card room, caused by a boy bringing some stock into a gas flame. Extinguished by steam. Loss $258.

January 31.—Salisbury Mills, Salisbury, Mass. Fire in a wool dry room, at about 7.40 P. M., attributed to spontaneous combustion. Loss about $21,000.

February 27.—Harmony Mills, Cohoes, N. Y. Fire in a store house; discovered by the watchman at 1.30 A. M., in the center of a pile of 2,000 rolls of jute cotton bagging. Caused by spontaneous combustion, probably from oil used in working the jute. Loss to the office, $1,900.

March 11.—Kearsarge Mills, Portsmouth, N. H. Fire in the picker room from foreign matter in cotton. No claim made.

March 13.—Whittenton Mills, Taunton, Mass. Fire in a Kitson compound opener in picker No. 2, at the 3d beater, and supposed to be caused by winding of cotton around feed rolls, the same being ignited by the beater. Sprinklers, steam, and extinguishers used in putting out the fire. Loss $328.

March 18.—Newton Mills, Newton U. Falls, Mass. Fire in a section of cards not at work, attributed to friction of loose pulleys. Extinguished by buckets and hose. Loss, chiefly on card clothing, $820.

March 22.—N. Andover Mills, N. Andover, Mass. Fire was discovered by the watchman, at about 4.30 A. M., in the attic, and about half an hour after he had been there and found all safe. After the fire was discovered, much delay in giving an alarm was caused by the burning off of the bell rope, and the alarm when given was mistaken for the first bell, and help was slow in coming. Result, the burning out of the three upper floors of the mill and much damage to the rest. Cause not known. It might have been from spontaneous combustion in wool, or the carelessness of the watchman Loss about $100,000.

March 29.—Steam Woolen Mill, Catskill, N. Y. Fire in picker room, originating in a wool picker, probably from foreign matter in the wool. Loss about $1,500.

April 22.—Amoskeag Mills, Manchester, N. H. Fire in No. 5 picker, discovered issuing from a Creighton opener, probably from foreign matter in cotton. Extinguished by the sprinklers. In pulling over the cotton the fire broke out anew, and the sprinklers were applied again. There were 24 bales of cotton in the room. Loss only $400.

April 29.—Souhegan Mill, Milford, N. H. Fire was discovered by the watchman, in the basement, at about 1.30 A. M. The watchmen changed at 12.30, and the fresh man says he passed through the basement about 1 o'clock when all was right; about 20 minutes later he saw the fire from the boiler house, and went for the agent. When the latter reached the mill, he found so much smoke in the next room above the basement that he could not get at the pump fixtures, and the fire was so located in the basement as to prevent reaching the pump in that room, and it was not started at all. At this time the fiercest of the fire was among about one hundred sets of nearly new harnesses hanging in the usual manner overhead in the basement. Whether the fire originated in these harnesses, or was kindled accidentally by the watchman, or was the work of incendiaries, may never be determined. Loss total, or $100,000.

May 2.—Fall River Print Works Mills, Fall River, Mass. Fire broke out in the center of a Sharp & Roberts mule carriage, about one hour after starting work in the morning, probably from a dry step on an upright shaft, and run both ways. After ineffectual efforts with buckets, the pumps were started and the mill pretty thoroughly drenched. The damage was considerable, both from fire and water, the latter chiefly on cards, etc., in the lower room; one pair of mules destroyed, all rollers uncovered, etc., besides the loss of most of the window glass and sash, and the whole amounted to $5,643.93.

May 6.—Chas. Wilds, Valatie, N. Y. Fire in an English opener at 6.15 A.M., supposed to have been from foreign matter in cotton. Loss small.

May 17.—Cocheco Mills, Dover, N. H. Fire in a mule carriage from friction. Put out by buckets of water. No claim.

May 18.—Greenwoods Company, New Hartford, Conn. Fire in a first picker at second beater, from foreign matter in cotton. Beater blade roughed up, but nothing found. Put out by pails of water. No claim.

June 23.—Stillwater Woolen Mill, Smithfield, R. I.—Fire was discovered at about 10.30 A. M. of Sunday. The mill was nominally watched on Sunday, but on this day the watchman was permitted to leave his charge to attend church, and the fire was seen from a dwelling (about half an hour after the man had reported all safe), and in the second story of the wing, and as the day was warm, the doors of the mill above the first story were all open, and the doors to the elevator open also, and the fire after getting headway rushed up and through the mill without hindrance. There was a good organization connected with the force pumps, and the fire fixtures were esteemed better than an average, but all the men who belonged to this organization were out of the village at the time of the discovery of the fire, as was the agent also. The efforts of the men not used to the pumps resulted in breaking the main gear of the wheel, and the mill was totally destroyed in about 45 minutes. Cause, spontaneous combustion in bags of shoddy stored in lower story of wing. Loss to Mutual Companies, $160,000.

June 29.—Slater's Mills, Jewett City, Conn. The superintendent reports two fires in the picker room on a Saturday in June, within an hour of each other. An examination of the cotton delivered from the opener resulted in finding matches, which they thought had passed through without ignition. Put out by "extinguishers" without loss.

July 30.—Stark Mills, Manchester, N. H. Fire in picker of No. 2 mill, in a bin which received the cotton from a willow, and attributed to foreign matter in the cotton. The alarm being given, an effort was made to let water into the sprinklers by turning the valve wheel the wrong way, and persisted in until the valve stem twisted off. The fire was subdued by streams from the hose after getting well advanced. Loss made up at $1,949.

August 21.—Dodgeville Mill, Attleborough, Mass. Fire was discovered about 5.30 A. M., in the gauze room of the picker house, supposed to have been caused by a spark from the chimney alighting on the ventilator of gauze room and working its way downwards into the cotton. Extinguished by steam. Loss moderate.

August 21.—Cocheco Print Works, Dover, N. H. Fire in dust house of singeing department, caused by a spark from the singeing machine. No claim made.

August 29.—Wamsutta Mills, New Bedford, Mass. Fire in the picker room of No. 2 mill, first seen on the floor under an opener apron, and was soon all over the room. Extinguished by steam, sprinklers, and hose. Cause not ascertained. Damage, $1,000 to $1,200.

September 11.—Stevens Linen Works, Dudley, Mass. Fire in jute card room, supposed to have been caused by matches. Extinguished by sprinklers and hose. Loss about $711.

September 11.—Lonsdale Mills, Lonsdale, R. I. Fire in No. 3 picker house, cause not known. Loss about $1,000.

October 17.—John S. Brown, Fisherville, N. H. Fire found in the gauze room of cast picker, attributed to foreign matter in cotton. Extinguished chiefly by "chemical fire engine;" sprinklers and hose were also used, but probably unnecessarily. Loss $585.

October 18.—Lancaster Mills, Clinton, Mass. Fire in opening machine, caused by matches. Extinguished in season to prevent loss.

October 24.—Washington Mills, Lawrence, Mass. Fire in cotton picker, caused by a piece of flint stone passing through the opener. Extinguished by sprinklers and hose. Loss $446.

October 24.—Bates Mills, Lewiston, Me. Fire in No. 2 picker in a Creighton opener, caused by winding up of roving waste which fired by friction. Extinguished by sprinklers. Loss $238.

November 4.—U. S. Flax Company, Lincoln, R. I. Fire in cotton picker room in stock passing through a Jillson whipper, and caused by matches. Extinguished by steam and sprinklers. Loss about $1,000.

November 4.—Cocheco Print Works, Dover, N. H. Fire in engraving shop by spontaneous combustion in a heap of dirty neglected rags. Put out by watchman with a pail of water. No claim made.

December 7.—Greenwoods Company, New Hartford, Conn. Fire in picker room of warp mill, caused by the friction of a belt on its enclosing box. The fire being out of sight, much water was thrown in and the stock damaged thereby. Loss not large.

It will be observed that the pickers still keep up their reputation as the most frequent originators of fires, 18 out of 85 having been in that department. There are also several cases of spontaneous combustion, and woolen manufacturers should be warned by the case at Stillwater. The attention of all is directed to the case of firing of cotton laps by steam pipes in the Utica mills, as one to which very many concerns are liable, from the practice of allowing combustible matters to remain in contact with steam pipes. The sprinklers alluded to consist of perforated pipes placed on the ceilings, through which water is sent in case of fire.

**Facts for the Ladies.**—Mrs. Rev. W. V. Milligan, Cambridge, Ohio, has saved with her Wheeler & Wilson Lock-Stitch Machine hundreds of dollars in the last ten years without a cent for repairs. See the new Improvements and Woods' Lock-Stitch Ripper.

## PATENT OFFICE DECISIONS.

IMPROVEMENT IN INDEX LAMPS.—HENRY H. BLAKE.—FORFEITED APPLICATION.

THACHER, *Acting Commissioner:*

The only date that can be regarded by the Office as entirely reliable is that of filing, as indicated by the official stamp upon the paper. As this was more than two years subsequent to the last official action on the application, and no explanation of the delay is offered, the Commissioner is left by the law without discretion in the matter. The application must be treated as abandoned under the provisions of section 32, act of 1870.

IMPROVEMENT IN HORSE RAKES, GRANTED TO HARVEY W. SABIN, DECEMBER 3, 1850.—CALISTA E. COX, EXECUTRIX.—PRACTICE UNDER RULE 44.—REISSUES.

THACHER, *Acting Commissioner:*

It has been urged that the practice should be relaxed in this instance, as the claims, or at least some of them, have been sustained by United States Courts. I do not think this position is tenable. The law makes no exception whatever in reissue applications. Section 54 of 1870, relating to reissues, provides that "the specification and claim in every such case shall be subject to revision and restriction in the same manner as original applications are." Now the claims have been sustained by construing them as claims for devices, and although under a former more lax practice they were granted without objection, now that they are before the Office again, in an application for reissue, they are undoubtedly subject to revision, and should be amended to conform to the decisions of the courts and the present practice of the Office. This objection of the Examiner is therefore sustained.

TOOL HANDLE OR HOLDER.—WM. W. DRAPER.—EXTENSION.

THACHER, *Acting Commissioner:*

This case, although very well presented before the Office, does not appear to be a strong one in the essential facts requisite to warrant the grant of an extension. The invention consists of a tool holder intended to center, clamp, and secure the tang of a file or other tool, and is adapted to apply to tools of varying sizes.

I am not favorably impressed with the contract by which it is proposed that the inventor is to obtain the adequate remuneration which it is alleged he has thus far failed to receive. The assignees or licensees engage to supply the market, but there is no evidence that there is any demand in the market for this particular tool holder. On the other hand, there is evidence that the main reliance for profit is upon suits for infringement of the "principle" of construction embraced in the first claim, which would avail the inventor nothing. Twenty-five per cent of the net profits of manufacture, after deducting the expenses of extension, do not, under the circumstances of this case, promise the inventor adequate compensation.

Altogether the case does not commend itself to my mind, upon the evidence adduced, as a proper one, having due regard to the intent of the law and the interests of the public, to warrant the grant of the extension sought and it is therefore refused.

## DECISIONS OF THE COURTS.

### United States Circuit Court---Southern District of New York.

METHOD OF PRESERVING FISH.—ENOCH PIPER *vs.* GEORGE T. MOON *et al.*

BLATCHFORD, *Judge:*

The patent to the plaintiff, granted March 19, 1861, is for an "Improvement in Method of Preserving Fish."

The claim is for "preserving" fish or other articles in a close chamber by means of a freezing mixture, having no contact with the atmosphere of the "preserving" chamber, substantially as set forth.

The specification of the patent, in describing the process claimed, describes the process previously used for preserving frozen ice cream. All that the patentee has done, according to his claim, is to take the frozen ice cream out of the vessel and put into it a fish or other article, frozen or unfrozen. That is no patentable invention. If the process of preserving the frozen ice cream had not existed previously, the use of such process, in the manner stated, would be within the *claim* of the patent, and would be an infringement of it. The prior use of such process must, *therefore*, be an anticipation of the claim of the patent at least in a case like this.

The patentee may be the first person who has practically succeeded in introducing into the market, at all seasons, salmon as fresh as when first caught, and may thus have supplied a great desideratum and have established a business that is commercially profitable. He may have invented something, in that connection, which is capable of being protected by a patent, and he may have described in this specification, or shown in the model or drawings accompanying it, something which may be claimed, and well claimed as an invention, and which may be secured to him by a reissue. But the difficulty with the present claim is that it is too broad, and that it covers nothing but a process, and that a process practiced before, substantially in the same manner set forth in the specification.

For these reasons the bill must be dismissed with costs.

*M. B. Andrus and Browne & Holmes*, for complainant.
*W. C. Witter and George Gifford*, for defendants.

## Recent American and Foreign Patents.

### Improved Vapor Stove for Heating Soldering Irons.

David Berkey, Huntington, Ind.—This invention has for its object to furnish an improved vapor stove or fire pot for tinners' use for heating their soldering irons. The body of the stove is made of any sheet metal in the form of an inverted frustrum of a cone. The body is provided with a conical cover, terminating in a neck to receive the smoke pipe. The reservoir to contain the kerosene or other light hydrocarbon is supported by rods. From the reservoir a pipe leads downward, and is then curved to enter the lower part of the stove. To the end of the pipe is attached a semicircular piece of pipe. To the other end of the semicircular pipe is attached a short piece of pipe, which is bent into such a shape that its other end, to which the burner is attached, may be directly beneath the center of the curved pipe so that the flame from the said burner may strike the said pipe and vaporize the liquid before it passes to the burner. The burner is made in the form of a short tube, and with a number of small holes in its closed upper end. A disk fits into the stove and has a slot with flanged side edges formed in it. It is so adjusted that the slot may be longitudinal with the semicircular pipe, the flanges of said disk overlapping the sides of the said pipe so as to collect the heat from the burner and guide it through the slot in the said disk so that it may come into direct contact with the copper tubes placed above and upon the disk; and its open ends communicate with holes in the side of the stove through which the irons are inserted to be heated.

### Improved Corn Husker.

John M. Carlisle, Sumter, S. C.—This invention has for its object to furnish an improved machine for separating ears of corn from their husks, enabling the work to be done faster than it can be by hand, saving the hands of the operator from injury, and leaving the husks in fine condition for being fed to stock. In using the machine the ear to be husked is laid upon the rest with its stem forward, and is pushed forward till stopped by the stop claw. The spring lever holder is then lowered to hold the ear, and the sash is forced downward. By the downward movement of the sash the stop claw is withdrawn, the knife cuts the ear from its stem, and the husks are slit longitudinally, by the points as they are drawn back along the ear by the rearward movement of the head block, and drop from the ear, which is then removed from the rest and placed in a basket or other receptacle. The sash is then raised and the machine is ready for another ear.

### Improved Spectacle Frame.

Julius King, Warren, O.—A difficulty has heretofore been experienced in joining the bow to the bridge, or nose piece, in manufacturing steel frame spectacles. By making the bridge of silver, gold or other non-oxidizing metal, the soldering of such metal to the steel is done at much lower temperature, and prevents burning, which renders ordinary steel frames very brittle. By the use of a combination of metals, greater strength is obtained, and the liability of the bridge to oxidization is prevented. Mr. King is a practical optician, and author of a chart by the use of which persons are enabled to determine the focus of their sight, and thus be readily fitted with glasses of the number they require.

### Improved Cartridge Loader.

Joel S. Warner, Ogdensburg, N. Y.—The object of this invention is to produce a portable device but little larger than the cartridge shell for placing the wads therein, and the invention consists in a tube counterbored to fit over cartridge shell and provided with a spring plunger very effectively applied.

### Improved Glove.

James F. Mason, Johnstown, N. Y.—This invention relates to that class of gloves which are made partly of leather and partly of cloth, and known as "combination gloves," and consists in the patterns and in the glove made therefrom.

### Improved Steam Boiler.

Atwood Wigzell, Halifax, England.—This invention relates to the construction and general arrangement of steam boilers, having particular reference to the class known as "sectional steam boilers," and consists in a series of conical tubes attached to or forming a part of horizontal parallel tubes upon the sides of the boiler, the said conical tubes being so arranged that the tubes of one part fit between the tubes of the other part, thus forming one or more horizontal tiers of these conical tubes, two or more such tiers being contained and operating in combination with a steam chamber.

### Improved Adjustable Pipe Tongs.

William Kearney, Belleville, N. J.—This invention relates to improvement in pipe tongs, of the class in which one jaw is made adjustable by means of a screw, but is more particularly a modification of a device described in the patent of H. N. Smade, dated August 29, 1871. The object of this invention is to provide an adjustable jaw which shall be capable of adapting itself, within moderate limits, to the object to be seized or held, and of being readily adjusted to various positions.

### Improved Awl.

Godfrey K. Mellor, Woonsocket, R. I.—The lower part of the awl is made with two or more sides, each side being grooved. The grooves extend to the pointed end. By being thus grooved, the awl forms several sharp edges at its sides which cut easily through the leather, and which, therefore, make it easier to use the improved awl than the awls in common use.

### Improved Slide Valve.

Peter Peartree, Lansingburg, N. Y.—This invention has for its object to furnish an improved device for operating the valve of a steam engine, which shall be so constructed as to enable the steam to be cut off at any desired part of the stroke, and which will operate the valve so as to give a lead, which may also be regulated at will.

### Improved Pruning Shears.

Oscar Chase, Rutland, Ohio.—This invention has for its object to furnish an improved pruning shears, so constructed as to cut the bows with a circular or drawing cut, so as to do its work easier than when the cut is made in the ordinary manner, and which may also be used with equal advantage for cutting bolts and other articles of iron or other metal; and it consists in the continuation of the handles, one of which is provided with a hook, guide arm, and stop, and the cutter and the link slotted in its inner end and provided with a finger or cam.

### Improved Boots and Shoes.

Robert Sommerville, Sandusky, O.—This invention consists in the use of wire gauze cloth for the uppers of boots and shoes. The principal advantage of this shoe is that it gives the foot free ventilation, and it is sufficiently pliable to allow free action to the foot.

### Improved Picket Fence.

Joseph Willhite, Pilot Point, Texas.—This invention has for its object to furnish an improved picket fence, which shall require a comparatively small amount of timber, can be easily repaired, and cannot be rubbed down by the stock, and it consists in the construction and combination of the various parts of the fence, so that all may incline laterally, and the timber may be made light, and at the same time the fence will be strong and substantial. With this construction, also, when any of the pickets rot off they may be driven down into the ground or replaced with new pickets, without disturbing the wire, rails, or posts, which cannot be done when the wire passes through the pickets.

### Improved Ore Crusher.

William P. Hammond, Napa city, Cal., assignor to himself and Henry Mygatt, same place.—This invention has for its object to furnish an improved device for operating the stamp of a stamp mill or ore crusher, enabling the stamp to be raised with a less expenditure of power than when the stamp is operated in the ordinary manner, and it consists in the tappet, in combination with the stamp shaft, cam, and driving shaft. By suitable construction and arrangement of the tappet the friction will be lessened, the cam will rotate the stamp more surely, and the power required to raise the stamp will be diminished, the point of contact being directly above the driving shaft.

### Apparatus for Filling, Polishing, and Varnishing Moldings.

Max Hamburger, Isaac J. Siskind, and Achille Klein, New York city.—This invention has for its object to furnish an improved machine for filling, French polishing, finishing, varnishing, and sand papering wood moldings, etc. In using the machine, the molding or other work to be operated upon is secured to the table, which table is then raised to bring the work against the brushes or rubbers with the necessary pressure. A lever is then operated to bring a clutch in contact with a wheel that will carry the brushes or rubbers in the proper direction. The motion of the brushes or rubbers may be reversed at any time, and as often as desired, so that a short strip of molding or a part of a long strip may be operated upon, as required.

### Improved Balanced Slide Valve.

Hubbard Hendrickson, Red Bank, N. J.—This invention relates to a new means of balancing the slide valves of steam engines with such exactness and regularity that the motion of the valve will be made easy, its wear prevented, and friction avoided. The invention consists, first, in connecting a pivoted yoke with the slide valve, said yoke having a vertical stem that swings at its upper end on a horizontal pivot. This pivot is supported in a tube or cylinder, which is held balanced by the steam, so that the actual support is supplied to the valve by the steam, but indirectly under said cylinder, and thence to the pivot at the upper end of the rod.

### Improved Pole Clamp.

Henry Haering, New York city, assignor to himself and Hermann Allis, of same place.—This invention consists of a U-shaped yoke with bearings in the bars near the open ends, an eccentric clamp with a hand lever, and journals for working in the aforesaid bearings, and a fastening chain or rope, all combined or arranged so that a couple of scaffold or other poles lapping each other may be embraced between the bottom of the yoke and the eccentric clamp by placing the yoke around them and then putting the clamp in its bearings, and thus be bound together very firmly and in a simple manner. The clamp is designed for splicing scaffold, tent, and other poles.

### Improved Plow.

Edwin Reese, Eutaw, Ala.—The invention consists in a self sharpening plow having the landside of such peculiar construction that the point and edge of share are allowed in a uniform and certain manner to wear upon both upper and lower side so as to retain the same edge until completely worn out.

### Improved Butt Hinge.

Isaac L. Thompson, Sardis, Ohio.—This invention relates to an improvement in the class of butt hinges provided with supporting arms or straps, and consists in constructing such arms or straps with lugs for taking into the wood and relieving the screws from strain.

### Improved Chair Seat and Back.

William T. Doremus, New York city.—This invention has for its object to furnish chairs, provided with elastic seats and backs, which shall be simp in construction, strong and durable, and at the same time convenient in application and comfortable in use; and it consists in the arrangement of alternate rigid and elastic blocks, having flexible connections.

### Improved Lubricator

John McLure Power, Port Discovery, Washington Territory.—The neck o the lubricator is screwed into the cylinder head. A pipe is connected with the branch from the neck of the lubricator and with the condenser, through which steam is admitted from the cylinder. This pipe enters the condenser and is closed at its end. It has a short vertical branch pipe screwed into it. A valve spindle is attached near the bottom of the reservoir, for drawing off the surplus water of condensation. A spindle valve is located in the cup or receiver, by which the flow of oil is controlled, and the condensing surface increased or diminished. A solid plug, made of any non-conducting material, closes the top of the neck tube. Steam will pass up through the branch and pipe from the cylinder into the condenser, which steam will be condensed in whole or in part, and the water of condensation will fall by its own gravity into the reservoir. The water, being of greater specific gravity than the oil, will settle at the bottom of the reservoir, and when it accumulates in too great quantity, it is drawn off through the valve. The lubricating oil flows over into the pipe, and reaches the cylinder by virtue of its own gravity. The flow of steam upward, as well as of oil, may be shut off by means of the valve spindle.

### Improved Tool Holder.

James S. Ettenborough, Easton, Pa.—This invention consists of a relief bar or plate pivoted to the end of the shank by which the tool is attached to the reciprocating bar of the machine at right angles to the line of motion, with a tool post similar to the tool post of a turning lathe, for holding the tool, the relief bar being arranged to swing and free the point of the tool from the work when it moves back, to prevent it from rubbing on the work and being worn thereby or broken when escaping from the end of the work, the said bar being provided with a spring to throw it back into the working position before beginning to cut, and the tool post being arranged to shift the tool sidewise for under cutting, slotting, and other purposes.

### Improved Door Check.

George Rohrbaker, Penn Station, Pa.—The object of this invention is to provide means for holding swinging doors in any desired position; and it consists in one or more circular plates forming part of a frame attached to the casing and arranged concentric with the door hinges, and in an elastic friction block connected with the door and working in contact with said circular plates, thereby causing friction, by means of which the door is held.

### Improved Farm Gate.

Cyrus E. Gillespie, Edwardville, Ill.—This invention relates to an improved mechanism for operating gates on roadways at a distance therefrom so as to make it convenient for persons on horseback or in carriages to open such gates before reaching them, and to reclose them after they are passed, all without dismounting. The invention consists mainly in connecting the latch of the gate with a crank on a pinion that hangs on its lower pivot, so that as said pivot is moved to one side or the other, the pinion will be turned and the latch opened to permit the opening of the gate.

### Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From January 3 to January 9, 1873, inclusive.

CAR SPRING.—P. G. Gardner, New York city.
DRYING PEAT, ETC.—L. W. Boynton, N. Y. city, J. E. Holmes, London, Eng.
ELECTRIC SIGNAL.—W. Robinson, Brooklyn, N. Y.
EXTRACTING NAILS.—G. J. Capewell, Cheshire, Conn.
HAT.—R. Eickemeyer, Yonkers, N. Y.
HOSPITAL BED.—I. Waller, Cleveland, O., H. Fowler, Detroit, Mich.
PRINTING TELEGRAPH.—G. L. Anders, E. B. Welch, Cambridge, Mass.
PUDDLING FURNACE.—L. S. Goodrich, Waverly, Tenn., I. H. Hillman, G. W. Goodrich, Trigg Furnace, Ky.
TOY.—W. W. Ross, New York city.

## Business and Personal.

*The Charge for Insertion under this head is $1 a Line.*

Water Front, also Stores or Lots to Rent, Delancy St., E. River. Andrews Bro., 414 Water St., N. Y.

Covering for Boilers and Pipes. The most economical and durable article in use. Took first prize at American Institute Fair. Van Tuyl Manufacturing Company, 328 Water Street, New York.

Indispensable to every Manufacturer and Machinists—Boston Journal of Commerce; send for a specimen copy. $2 per year.

Buy Iron Working Machinery of Gear, Boston, Mass.

Spur and Bevel Wheels and Spindles, of great durability, cast to order by Pittsburgh Steel Casting Co. All work warranted.

Carpenters—For Sale, a Sash Factory, run by water power, at a lumber landing, with a profitable run of trade. For particulars, address P. O. Box No. 2, Charlestown, Jefferson County, West Virginia.

Chucks—Fairman & Co., Baltimore, Md.

I have some capital and a practical knowledge of the manufacture of Tubs and Pails, and want to put them both to use. Address H. J. Howe, Pittsburgh, Pa.

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

Needle and Clock Machinery of every description of the most improved Styles. Hendey Bro's, Wolcottville, Ct.

Wanted—A lot of Second-hand Machinery for a Cotton Mill, consisting of Looms, Spinning Frame, Dressing Frame, Bobbin Winders, Beamer, Cards and Picker. Address P. O. Box 5393, New York.

For best Presses, Dies and Fruit Can Tools, Bliss & Williams, 118 to 120 Plymouth St., Brooklyn, N.Y.

E. P. Peacock, Patent article manufacturer in light metal work of all kinds, 143 S. Clinton St, Chicago.

Wanted—A situation by a first class Machinist and Toolmaker. Best reference given. Address T. Albertl, 192 E. 7th St., New York.

Send to H. Moore, 41 Centre St., New York, for Catalogue of "Broughtons" (the best) Lubricators, Oil Cups, Gauge Cocks, Oilers, Faucets, &c.

For Sale—Rights to a popular and recently patented Toy. Can be sold for 10 cents and leave a good margin. Address J. H. Layman, 223 Baymiller Street Cincinnati, Ohio.

Buy Gear's Improved Automatic Dovetailing Machine, Boston, Mass.

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

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1872, for "Best Telegraph Instrument for private use"—is offered for sale by the Merch't's M'f'g and Construction Co., 50 Broad St., New York. P. O. Box 6865.

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.

Patent Gearing—Great Strength, Durable, Noiseless, Cheap. J. Comly, 148 Ten Eyck St., Williamsburgh, N. Y.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th St., New York—1202 N. 2d St., St. Louis, Mo.

For Sale, Machine Shop and Foundry. Address, Wagoner & Matthews, Westminster, Md.

Sperm Oil—No lubricator like it. See Kellogg's advertisement on another page.

Iron Roofing. Scott & Co., Cincinnati, Ohio.

Shafting and Pulleys a specialty. Small orders filled on as good terms as large. D. Frisbie & Co., New Haven, Conn.

Wanted, a Machine to make a flat flour barrel hoop out of black ash timber; also, any Machinery that will decrease the cost of making Flour, Fruit, or Lime Barrels; also, a Machine to shave a flat hoop ready for the barrel. Address P. O. Box 2583, Buffalo, N. Y.

Hydraulic Presses and Jacks, new and second hand. E. Lyon, 470 Grand Street, New York.

Foot Lathe for $22. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

Wanted, reliable and responsible parties to Sell Engines, Saw Mills, and other machinery manufactured by the Mansfield Machine Works, Mansfield, Ohio.

For the Best Circular Saw Mills and Steam Engines, Stationary and Portable, of all Sizes, apply to the Mansfield Machine Works, Mansfield, Ohio.

For Wait's Improved Turbine Water Wheels, Improved Mulay, Gang, and Circular Saw Mills, Paper Engines, Rope Cutters, &c. &c., address Marihew & Van Wormer, Successors to P. H. Wait, Sandy Hill, N. Y.

Circular Saw Mills, with Lane's Patent Sets; more than 1200 in operation. Send for descriptive pamphlet and price list. Lane, Pitkin & Brock, Montpelier, Vermont.

Machinists—Price List of small Tools free; Gear Wheels for Models, Price List free; Chucks and Drills, Price List free. Goodnow & Wightman, 23 Cornhill, Boston, Mass.

All Fruit-can Tools, Ferracute, Bridgeton, N.J.

Nickel Salts and Ammonia, especially manufactured for Nickel Plating, also "Anodes," by L. & J. W. Feuchtwanger, 55 Cedar Street, New York.

English Patent—The Proprietors of the "Heald & Cisco Centrifugal Pump" (triumphant at the recent Fairs), having their hands full at home, will sell their Patent for Great Britain, just obtained. A great chance for business in England. Address Heald, Sisco & Co., Baldwinsville, N. Y.

Read the article on "The Machinists," now being published in the Boston Journal of Commerce. Send for Specimen Copy.

American Boiler Powder, for certainty, safety, and cheapness, "The Standard anti-incrustant." Am. B. P. Co., Box 797, Pittsburgh, Pa.

Scale in Boilers. I will Remove and prevent Scale in any Steam Boiler, or make no charge. Send for circular. Geo. W. Lord, Philadelphia, Pa.

Gauges, for Locomotives, Steam, Vacuum, Air, and Testing purposes—Time and Automatic Recording Gauges—Engine Counters, Rate Gauges, and Test Pumps. All kinds fine brass work done by The Recording Steam Gauge Company, 91 Liberty Street, New York.

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

The Berryman Manuf. Co. make a specialty of the economy and safety in working Steam Boilers. I. B. Davis & Co., Hartford, Conn.

Absolutely the best protection against Fire—Babcock Extinguisher. F. W. Farwell, Secretary, 407 Broadway, New York.

Steel Castings "To Pattern," from ten lbs. upward, can be forged and tempered. Address Collins & Co., No. 212 Water St., N. Y.

The Berryman Steam Trap excels all others. The best is always the cheapest. Address I. B. Davis & Co.

All Blacksmith Shops need a Holding Vise to upset bolts by hand. For such address J. R. Abbe, Manchester, N. H.

Co., Hartford, Conn.

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

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

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

Belting as is Belting—Best Philadelphia Oak Tanned. C. W. Arny, 301 and 303 Cherry Street, Philadelphia, Pa.

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

The Berryman Heater and Regulator for Steam Boilers—No one using Steam Boilers can afford to be without them. I. B. Davis & Co.

Always right side up—The Olmsted Oiler, enlarged and improved. Sold everywhere.

Gatling guns, that fire 400 shots per minute, with a range of over 1,000 yards, and which weigh only 125 pounds, are now being made at Colt's Armory, Hartford, Conn.

## Notes & Queries

1.—A. F. P. asks: How can I tan a sheeps' hide with the wool on it, and then color it pink?

2.—E. M. K. would like to have a recipe for tanning both sides of a deer skin.

3.—J. T. would like to know what is the easiest method to brighten cylinder heads, and other smooth cast iron?

4.—G. R. C. wants directions for making a spectroscope for stellar observations, with dimensions and other details.

5.—J. P. wishes to know how to color tanned deer, sheep, and dog skins the different shades of brown, purple, orange, black, etc. He has six or eight hundred to color.

6.—G. D. Y. says: I will wager G. B. D. one year's subscription to the Scientific American that he cannot make a box at an angle of 45° from the perpendicular, by his own rule as given on page 24 of this volume.

7.—A. B. asks if some one will explain the mathematical process of ascertaining the distance between two chords of a circle, the area of circle and the area of that portion of circle included between chords only being given.

8.—S. T. W. asks: Will S. L. D., who asked on page 214 of volume XXVII., for a simpler method of transferring prints to glass than removing the paper from the back of the picture, state his method, also what varnish is used and how it is made?

9.—E. M. H. asks: Will some one please inform me how to make a good emery wheel for finishing tools? I use sole leather for covering, but it is too hard. I want to make a grease, or finish wheel. What kind of leather shall I use? What number of emery is best to set with, to finish after a 90?

10.—P. E. F. asks: What is the best rule for making coffins? The one in use is not applicable to all sizes. 2. Is it true that there is a preparation made that will cause one's moustache to grow? If so, what are its ingredients? 3. How can I make hair oil that will cause the hair to curl, and not be injurious to hair or scalp? 4. Is there a dip for polished iron to keep it from rusting, and what is it that manufacturers of sewing machines use on their polished steel and iron to prevent rust?

## Answers to Correspondents

M. McD. asks for (1) a rule to find the distance from fulcrum to weight on a safety valve lever, to keep in a given pressure, when the size of valve, distance from fulcrum to valve, and weight are known; and also a rule, when the diameter of a valve is given, to find the area. 2. Which is to be taken, the inside diameter of valve seat, or the whole diameter of valve that rests on the seat? Answer: To find the total length of a safety valve lever for a required maximum pressure: Multiply the effective area of the valve by the distance from the center line of its stem to the pin on which the lever is hinged, and divide by the weight of the suspended weight. 2. Where the valve is well fitted, the inner diameter of its seat is to be taken. When leaky, the effective area is likely to be that whose diameter is the outside diameter of the seat.

J. M. G. asks: How long should two boilers (42 inch shell with 37 three inch flues) be for an engine 18¼ x 30 inches, running at 65 revolutions a minute with 65 to 70 lbs. of steam, using very hard water? Answer: If the engine is well built and well taken care of and is of good design, we should be inclined to make the boilers 16 feet long. Sixteen feet is long enough, in our opinion, for three inch tubes. Were it necessary to give more heating surface and to use longer boilers, we should put in larger tubes.

A. B. C. says: I wish to enquire in regard to lighting my house with manufactured portable gas. It is claimed by some that this portable arrangement is cheaper than any other mode. Answer: By portable gas we presume you mean the apparatus now so commonly used for lighting churches and dwellings in the country, which consists of a device for driving air through light coal oil and thence through gas pipes to the place of combustion. The air on passing through the oil absorbs some of the liquid, and the carbon thus taken up burns, just as oil carried up by a wick burns. The air serves the place of the wick. If properly made and carefully used, these portable gas machines are safe and afford a first rate light at a cheap cost. The oil used, termed here gasoline, is very explosive, and the utmost care should be taken to keep fire and lights far away from the machine.

A. B. says: The heating pipes of a greenhouse are common sewer tiles, composed of lime and gravel, the end of each joint slipping into the next one. I find the heat or cold expands and contracts them, breaking the cement that I put them together with, consequently permitting the smoke to escape and fill the greenhouse, to the no small detriment of the plants. How can I obviate this evil, and is there any kind of springy cement with which I could join them? 2. What is the force per square inch of freezing water? 3. The news dealer charges me 8 cents for the Scientific American, that is $4.16 per year. Does $3.00 sent to you include postage; if not, what would the postage be? Answers: 1. As an expedient, we suggest that you cover the joints with a band of thin sheet tin, the ends of which you can lap and bend over with your fingers with sufficient tightness. 2. The expansive force of water in freezing has been estimated at thirty thousand pounds per square inch. 3. The postage on the Scientific American is 5 cents a quarter or 20 cents a year, payable by the subscriber.

G. W. D. says: The water backs in the ranges and stoves in this city become clogged up with a deposit of lime, the hot circulating pipes stopping up first. I wish to know if, supposing I can get a preparation that can be put in the boiler and circulate through the pipes and back, it will cut the lime from the pipes or back and leave it in the form of sediment, so that it can be washed out. Answer: Try chloride of barium. It may do the work in time. It is always more difficult to remove scale once formed than to prevent its formation. For such situations, water backs should be constructed with special provision for cleaning out scale mechanically. There is a chance for some one in the trade to make a useful improvement.

N. B. J. asks: 1. How can I find out the law in regard to inspecting steam boilers, and who is the inspector? I know of several engines which have been running for years, which have never been inspected. 2. Will you inform me how I can find the rule for setting an eccentric? 3. Can an engine be built with the cylinder moving on guides in one direction, connected to a crank while the piston moves in the other direction, thus utilizing the power always exerted on the cylinder head, and also answering the purpose of the valve? Answer: 1. If the boilers are stationary, apply to the police department for information; if they are steamboat boilers, write to Supervising Inspector J. S. Devenny, Pittsburgh, Pa., or to Supervising Inspector General Nimmo, United States Treasury Department, Washington, D. C. 2. Consult back numbers of the Scientific American, or purchase a copy of Professor McCord's book on valve gearing, which may be had of any New York bookseller. 3. It has been thought of before and has been tried, but without success. You do not lose power in consequence of the pressure of steam acting against the stationary cylinder head, any more than from the engine itself pressing upon its stationary foundation. Motion is necessary to either the use or the loss of effective pressure developing power.

E. W., of R. I., asks: If I take an iron box containing 1 cubic foot of space, fill it with steam at 212° Fahr., raise the temperature to 500° Fahr., what pressure would an ordinary steam gage indicate on this box? 2. Fill the same box with air at the temperature of say 60° Fahr., and raise this temperature likewise to 500° Fahr.; what pressure would the gage indicate upon this? Answers: See reply to J. F. L. 1. $(500°+461°)\div(212°+461°)\times14{\cdot}7=20\frac{5}{16}$ pounds. 2. $(500°+461°)\div(60°+461°)\times14{\cdot}7=27\frac{1}{16}$ pounds.

D. F. W. writes for information as to repairing a church bell. The bell is split up 14 inches, a straight split; it is about 1,400 lbs. in weight, and is about 3½ inches thick along one portion of the split. My plan is to make a true circle of light Russia iron (such as is used for stoves and stove pipes), place it on a shaft and run it at about 5,000 revolutions per minute, moving the bell slowly up to the circle as it makes its way into the bell, which I think it will do. What is your idea? Will it do it, and, if so, would more than one day be required to do the cutting; and after the cutting was done, would the bell be likely to have a good tone? Answer: You have proposed the only practical method of getting out of your difficulty. We should expect your plan to succeed if properly carried out, but should be somewhat apprehensive that very thin iron might not work as well as iron of, say, No. 12 or No. 14 gage. "Soft iron saws without teeth are in use for cutting off iron beams, and even steel."—Scientific American.—The unpleasant sound of a cracked bell is due to the jarring against each other of the two sides of the rift, thus breaking up the regular vibrations producing musical tones. Cut the two sides clear of each other and the note will be again heard. We should try the experiment as proposed if a good steel saw could neither be found or made. Knowing nothing of your facilities for doing work, we cannot tell about the time required.

J. F. L asks: If a steam boiler of 1,711 cubic feet internal measurement have one cubic foot of water in it, which is heated to 212° Fahr., the gage indicating 14 lbs. pressure, and if then the heat be raised 20° what will be the additional pressure for each twenty degrees above the boiling point? Does steam expand or contract by being superheated? Which is the most dense, steam or superheated steam? What is the actual cohesion of best cast iron heated to 750° Fahr., also of cast steel, unwrought, in pounds, the materials being one inch square, two or three feet long? What is the effect of alloying iron or steel with copper, especially if it be used hot? Answer: Steam, *if perfectly dry* and not in contact with water, behaves precisely like any other gas, expanding $\frac{1}{461}$ of its volume at 32° Fahr. for each degree that its temperature rises, the pressure being proportional to the temperature, measured from the absolute zero of heat, 461° below Fahrenheit's zero. In the case given, the pressure will be $(232°+461°)\div(212°+461°)\times14=14{\cdot}4$ pounds per square inch. Steam, superheated, is five eighths as heavy as air. No reliable experiments have been made upon the other points of your inquiries.

H. D. says: I have seen in the Scientific American a statement in regard to using oxyhydrogen gas for illumination, and that the hydrogen gas was made very cheap. I would like to know how it is made so cheap, or the cheapest way to make it for balloon purposes. Answer: There is no really cheap way of making hydrogen gas. One of the methods that went the round of the journals a few years since, is to heat damp coals and slaked lime, absorb the carbonic acid by soda, and collect the hydrogen in gasometers. Where the resulting bicarbonate can be sold to advantage, and the alkaline earth can be obtained in quantity, it has been maintained by Du Motay that the above method is the cheapest yet proposed. The economy of the operation has not been fairly tested.

A. W. D. asks: Will it be necessary for me to make the entire model of a machine, or only the improvement to be patented? Answer: The model only needs to be complete enough to illustrate the working of your improvement

A correspondent asks: How can the work necessary to overcome the friction of a body on rollers be calculated? Take for example, a house weighing 100,000 pounds, moving on 20 oak rollers 8 inches in diameter the rollers running on oak planks. There is no lack of data concerning sliding friction, and that of axles, but apparently very little concerning the common expedient of moving heavy bodies, as guns, by mounting them on cradles and placing the rollers under in succession. Answer: The earliest experiments on rolling friction were made by Coulomb, and later experiments were made by Morin The laws deduced are the following: 1. Rolling resistance is nearly proportional to the pressure. 2. Such resistance is inversely proportional to the diameter of the rollers. Where the rollers are smooth and no crushing occurs, the rule for determining the resistance, with oak rollers running on hard wood, as determined by experiments on a small set of rollers, is: Multiply the pressure or load, in pounds, by seven, and divide by 1000 times the radius of the rollers used in feet, or $R=7P\div1000r$. Thus, for a load of 100,000 pounds and 20 rollers of 8 inches diameter, $R=(7\times5000)\div(1000\times\frac{1}{3})=105$ pounds for each roller, or $105\times20=2100$ pounds total. Results will vary greatly in different kinds of material for rollers and for different kinds of road bed.

J. R. asks: Will some one give me the solution of the following problem? What are the contents of a stick of timber, length 40 feet, diameter of larger end 24 inches, of smaller end 12 inches. 73½ feet, nearly, is the answer. Answer: The mathematical formula is as follows: $\frac{\pi h}{3}(R^2+Rr+r^2)=$ contents in cubic feet or inches. $\pi=3{\cdot}1415$ or $\frac{22}{7}$, a constant factor. R is the larger radius, r, the minor radius, and h the length of cone. This formula holds good for any truncated cone.

P. S. says: In your book "For Inventors and Mechanics," you give a receipt for making marine glue. I have tried your receipt and failed. I took sulphuric ether and put in pure rubber; it has now been standing some three weeks and there is no sign of its dissolving. Answer: Why do you try sulphuric ether? The recipe says "ether," simply.

J. T. writes as follows: Bourne's "Hand book of the Steam Engine" says that a cylinder 64 inches diameter and 8 feet stroke, working with 12 pounds pressure, should have the neck of its cast iron crank shaft 17·01 inches in diameter, and, by another rule, it should be 17·59 inches. Byrne's "Calculator" gives the latter figure. Again, Bourne says 396 pounds acting at a foot radius will twist off a cast iron bar one inch in diameter, and that 132 pounds will be safe. Byrne says 11,943 pounds is the ultimate strength of it, and that 3,981, or one third of it, will work with safety, but he does not say at what radius. Who is right? Byrne also says if you multiply the force applied in pounds by the length of lever in inches, and divide the product by one third of the ultimate strength of an inch bar, or 3,981, the cube root of the quotient will be the diameter of the shaft in inches; therefore, according to this rule, we have: force acting on the piston mentioned, 38603·9808 pounds, which, multiplied by 48 inches, the length of crank or lever, will give an 8 feet stroke, which equals 1852991·0784, which, divided by one third of the ultimate strength of an inch bar or 3981 = 465·4587 + of which the cube root is 7·74, the answer, or diameter, a big difference between 17·59 and 7·74. How comes this? Please give the name of a reliable work on the strength of shafts. I also notice in your last issue that 2·65 inches is the area of the steam ports of 9 horse power compound engine, which is not according to the the old theory of 4 square inches for every horse power. How is this? Answers: The strength of cast iron is somewhat variable. Some specimens twist off under the action of far less force than do others. The most reliable experiments thus far published are those of Major Wade of the United States Ordnance Corps. Using bars one inch in diameter and a leverage of one foot, he found some specimens that gave way with a force of less than 600 pounds, while others bore nearly 900. The average was 733, with American cast gun irons. Basing a rule on the mean result, we have the following: To determine the least force, in pounds, which will break a crank shaft of good cast iron: Multiply 733 by the cube of diameter, in inches, and divide by the radius, or length of crank in feet; that is, $P=733\times d^3\div L$. (1.) To determine the diameter required to resist torsion we have: d = the cube root of $(PL\div733)=\frac{1}{9}$ the cube root of (PL). (2.) and this is the algebraic expression of the following rule: Multiply the twisting force, in pounds, by its leverage or the length of crank in feet, and take one ninth the cube root of the product, for the diameter of a shaft which will just break under this torsional strain. The principal cause of variation among authorities treating on this subject is the fact that they use different factors of safety. One writer considers three sufficiently high, while another is unwilling to subject a shaft to a twisting force greater than one tenth of that which will break it. It thus happens that one writer recommends a size which would be utterly condemned by another. The best authorities, such as are accepted by our leading engineers, recommend that, in machinery, all important parts be made strong enough to bear six times the force to which it is proposed to subject them. Introducing a factor of safety of six, we construct, for shafts of cast iron, the following rules for safe working sizes: To determine the proper working torsional stress on a given shaft: Multiply 120 by the cube of the diameter, in inches, and divide by the length of crank, in feet, expressed algebraically, $P=120\times(d^3\div L)$. (3.) To determine the diameter required to be safe for a given working torsional stress: Multiply the twisting force, in pounds, by the length of crank, in feet, divide by 120, and the cube root of the product will be the diameter in inches, that is: d = the cube root of $(PL\div120)$. (4.) Using rule (1) we find the breaking strength of a shaft 17½ inches diameter, with crank 4 feet long, to be $733\times(17\frac{1}{2})^3\div4=982{,}087$ pounds. Using rule (2) to determine the size of shaft just capable of sustaining 38,600 pounds on an arm 4 feet long, we get, d = $\frac{1}{9}$ the cube root of $(38600\times4)=6$ inches. But determining the *safe* figures by rules (3) and (4), we get $P=120(17\frac{1}{2})^3\div4=160{,}770$ pounds, and d = the cube root of $(38600\times4\div120)=11$ inches. The rules given in Bourne are frequently very defective. Professor J. D. Van Buren's work on "Strength of Steam Machinery"* is the most concise and accurate yet published, on that subject, of which we have knowledge For more general purposes we use, often, the work of Professor D. V. Wood on "Resistance of Materials" and, for more obstruce investigation, consult Rankine, Mosely and Morin. The last named are too mathematical for the general reader, however. Barlow on "Strength of Timber," Hodkinson on "Cast Iron," Kirkaldy's "Experiments on Wrought Iron and Steel" and J. B. Francis on "Cast Iron Pillars" are valuable authorities for special cases. For ordinary every day use, we find the Pocket Books of Haswell, Trautwine, Molesworth and Nystrom extremely convenient, and always keep them by us. Question relating to size of steam ports is answered in a reply already given to an earlier applicant.

*Investigations of Formulas, etc. J. D. Van Buren, New York, 1869.

**J. A. S.** finds the alum and sulphur method of preserving eggs to be a failure, and enquires for some other means of keeping eggs fresh in hot weather. Answer: The theory of egg preservation is that the closing of the pores in the shells prevents the oxidation and consequent destruction of their contents, and so various substances for coating them have been recommended. Drying varnishes have been used, and collodion has been recommended; but the expense of these means would justify an experiment with the Chinese method, which is to coat the eggs with wet clay, and let it dry on.

**B.** asks how the number of yards of carpet required to cover a room is ascertained. Answer: Your room, 14x15 feet, contains 210 square feet, or 23⅓ square yards. Your carpet being 27 inches wide, you will need 1⅓ yards of it to make a square yard, or 31 yards 4 inches in all.

**W. N.** asks for a recipe for pasting paper to iron, so that it will not be affected by oil or water. Answer: Paint the iron first with oil paint and let it dry. Glue or paste will then adhere to the iron, but the paper will not be oil or water proof. Try a quick drying varnish.

**R. D. S.** wants elaborate details for making an Æolian harp. Answer: Make a long flat box (30 x 6 x 2 are very good dimensions) of very thin sound pine board, and make every joint perfectly air tight. Cut a round hole in the center of the lid, and stretch by screws several strings of fine catgut, lengthwise over the hole, strained over two bridges. Tune all the strings to the same note, and stand your box upright in the wind. E violin strings will do for the purpose.

**G. F., of Mo:** When there are two assignments of record covering the same interest, the Office does not regard the second assignment.

**J. D. M., of Texas:** Your remarks censuring the acts of the Patent Office are not well founded, although your sentiments accord with those of many others who have obtained patents which they could not sustain. If you will consider for a moment, you will see that it is not in the province of the Patent Office to determine matters of infringement: It is for the Courts only to adjudicate in such cases. The Patent Office examine your claims, and, if your invention possesses novelty, it is bound to give you a patent; should it go further and decide as to its conflicting with previous patents, it would exceed its jurisdiction.

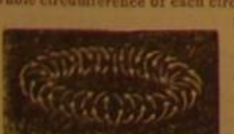
**N. B. H.** writes: I would say to your enquirer H. C. K., who asked for a rule for laying off wooden axles, that the old rule, one third off front, two thirds behind, one third off bottom and two thirds off top of the axle is not a bad one, but the only scientific way of making a wooden axle is to set the bottom of wheels 4 feet 10 inches apart from inside to inside. Set the tops 4 feet 11 inches, the front one inch nearer together than the back. Then take a straight edge and run through the hubs. Just what it lacks of touching the boxes, take that much off the axle at that point. Try the straight edge bottom and front, and work the back and top off to it; and no matter what the shape of the wheel may be, no matter about the length of hub or the size of boxes, the wheels will track and run precisely right. From shoulder to shoulder, between the hubs of course, is the length of the axle, which you get on the straight edge.

**D. M. S.** asks: How can I plate, with silver or nickel, small brass polished articles—telegraph instruments, for instance? How is the metal applied, and what is the best preparation to remove the coating or varnish on the articles to be plated, if it is necessary to remove it before plating or washing? Answer: Before plating with metal, it is necessary to remove all paint and varnish; this can be accomplished by a solution of bichromate of potash made acid by a little sulphuric acid. The surfaces of the metal must be thoroughly cleaned. To plate with nickel, use the double sulphate of nickel and ammonia, and make the positive electrode of a bar of nickel.

**W. C. W.** says: I was running a saw mill last summer and the water failed. I went to digging and struck a vein that rose to the top of the hole at once. My boiler was very badly scaled; but since using this water, the inside of my boiler is as clean as if new. Enclosed is a sample; please tell me what is in the water, and if it will injure my boiler. Answer: The water has been examined by an expert chemist. It contains considerable chlorine and organic matter, not much magnesia, but too much lime for good drinking water. It would be better to blow off the boiler more frequently when using such water.

**E. P. W.** says: In a recent number of the Scientific American there is an article on the metal vanadium, in which you speak of a Mr. Apjohn, who has been investigating the subject. Will you oblige me by giving me the address of this gentleman? Is the article in your paper a synopsis of a fuller article in some other, and if so, what? Answer: The article on vanadium was prepared expressly for this journal from the literature of the subject found floating through foreign periodicals, and was not the synopsis of a longer article from another journal. The latest information on the subject, accessible to American readers, is contained in the Supplement to Watt's "Dictionary of Chemistry."

**E. H. R.** says: I presume that most people have noticed the circles of smoke, frequently caused by the puffing of a locomotive. A few weeks since I noticed some uncommonly fine circles of the kind, one of which continued revolving rapidly for fully fifteen minutes, and until it had floated out of sight. If it is a centripetal force that keeps a revolving body or substance in its orbit, where is the centripetal force that held this circle of smoke from dissolution during the time referred to, or in fact for any appreciable time? Do not such phenomena indicate that there is a force inherent in matter, besides centripetal and centrifugal forces, that may be denominated circular force or a natural tendency to revolve in circles? Answer: Any force acting suddenly upon the air from a center, imparts to it a rotary motion. Smoke and steam render the motion visible. The whole circumference of each circle is in a state of rapid rotation, as is shown by the arrows in the figure.



The rapid rotation, in short, confines the smoke within the narrow limits of a circle and causes the rings to be well defined. Professor Tyndall, in one of his experiments, made wave motions visible by blowing tobacco smoke into the apparatus.

**C. F.** asks which would make the best table for a sewing machine, a plain black walnut, well seasoned, or 6 thin white wood boards, glued together diagonally and veneered with black walnut. Which would be the least liable to warp or split, and which would hold screws the best? Answer: We should prefer the black walnut made of thin boards, glued together diagonally as you propose. The white wood made in the way you describe would make a good table.

**O. N. McK.** asks (1) who it was who observed the lifting of the lid of a tea kettle by steam, and fastened the cover to the kettle; and was afterwards surprised to find the cover was thrown off violently? 2. Who first applied steam as a motor? Answers: 1. A somewhat similar story is told of James Watt, the legend stating that his attention was first called to the power of steam by the lifting of the lid of a kettle. 2. Heron, in his work on pneumatics (230 B. C.), mentions three simple contrivances for using steam as a motor; this is, we believe, the oldest record on the subject, but the power of steam was probably recognized, many centuries before the time of Heron, by the Egyptians.

**D. J. T.** says: Please let me know the effect of mixing creosote and nitro-glycerin. Answer: We give it up.

**A. L.** asks what will destroy or neutralize the narcotic effect of tobacco while being smoked in a pipe. Answer: Fill your pipe about one third full of pine chips, cut as you would cut your tobacco; put your tobacco on the top of the chips and draw the smoke through them, changing the wood two or three times a day, and use the best light navy tobacco.—J. A. S.

**S. H.** wants to know if a coil of pipe in his kitchen range will not be a good water back or heater. Yes, it will be, none better. I have used it for years in my stove, and never any other. At first I had an iron ¾ inch gas pipe, but the water became rusty; I then had a ¾ brass pipe put in, and the action is perfect. There ought not to be any steam generated, and will not be, if the circulation is good. An inch pipe is better than any smaller size. One end, projecting from the stove, should be ⅛ inch higher than the other, more would be better, to establish the circulation. My pipe comes in at the back of the stove, passes around the fire box, on the fire brick (touching it) and passes out again, the two legs being parallel. Two or three inches outside the stove, the lead pipe is connected by screw joints. At the angles of the brass pipe, brass elbows are used, the pipe being screwed in, like common gas pipe. My copper tank is in the bath room and water closet, in second story, directly over the kitchen, keeping it warm in winter.—N. D.

**E. E. S.** says that J. C. J., who enquired how to prepare canvas for painting on, will find little economy in preparing his own canvas. He can make a very cheap substitute for canvas by mounting a sheet of well dampened drawing paper on a pane of glass; when partially dry, paste over it four or five thicknesses of thin muslin, each piece being allowed to dry thoroughly before another is put on. All must be stretched very tight and rubbed smooth. Cover it with paint, spreading it with a knife, and using as little as possible; when dry, paint it and stipple it with a blender to give it a "tooth." It is better to use isinglass than flour paste, as it does not absorb moisture as soon as the latter; and old muslin or lawn is better than new. If before any paste is put on, it is saturated with drying oil and allowed to dry a year before it is used, it will not warp; if not, it should be left until the picture is dry enough to lay in a portfolio. Some painters make canvas by tacking cloth on a stretcher, sponging it with a strong solution of glue and spreading white lead on with a knife, but it lacks that roughness which is technically called "the tooth," and it is liable to crack if too much glue has been used. Should J. C. J. ever attempt to sell his painting on this material to a professional picture dealer, he will be inclined to think that it is the canvas, not the painting on it, which the Shylock wishes to buy.

In answer to **C. D.**, who asked for a mode of fixing pearl coatings on various articles, S. F. says: Pearl articles are made from the shells of the pearl oyster, known as mother of pearl. They are found round the islands of Manilla and Ceylon, in the East Indies. The shells are cut with saws and ground to the various shapes on grindstones running in water, and are afterward filed and carved into various patterns.

**A. G. C.**, who asked how to temper taps, should draw the temper in hot sand; he will then have no trouble in getting an even temper and will not be troubled with smoke.—W. H. W.

**J. H. W.** says, in answer to C. R. M., who wants a receipt for cement that will stick flannel on iron rollers: I have used the following for over 25 years with success: I dissolve common glue in good cider vinegar and cook it at a slow heat until it is all dissolved; I then add to 1 quart glue, so dissolved, two or three liquid ounces Venice turpentine or white pine pitch direct from the tree.

## COMMUNICATIONS RECEIVED.

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

On a Method of Utilizing the Waste Heat of Street Gas Lamps. By R. B. M.

On the Proper Ventilation of Apartments. By E. M.

On Steam Boiler Pressure. By C. P. E.

On Marine Camels for the Bar of the Mississippi. By W. K.

On Steam and Air Engines. By E. L. B.

On a Telescope to cost One Million Dollars. By L. L.

On Forests and Drought. By C. G. F.

On Design Patents. By W. E. S.

On the Delineation of the Mechanical Movements. By J. H.

On Protection from the Spread of Fires. By B. G.

On Polar Mutations. By J. E. H.

On the State Reward for Improvements in Canal Navigation. By R. L.

On the Austrian Show. By J. M. B.

On the Influence of the Earth's Central Fires on its Surface. By E. B.

On the Transplanting of Trees. By E. H. R.

On Legislation concerning Steam Boilers. By J. A. W.

On the Moon and the Tides. By H. McK.

On the Auburn Incline Railway. By O.C.W.

On Scientific and Mechanical Possibilities. By E.

On Entomology in Congress. By S. F. P.

On a Remarkable Astronomical Phenomenon Recently Seen in Missouri. By D. M. W.

[OFFICIAL.]

# Index of Inventions

FOR WHICH

## Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

## January 14, 1872,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

| | |
|---|---|
| Auger, B. Walch, (r) | 5,238 |
| Auger, earth, Collins & Morrison | 134,734 |
| Axle box and spindle, J. Bower | 134,725 |
| Axles, tool for finishing, H. E. Forrest | 134,742 |
| Barrel staves, chamfering, J. W. Jones | 134,892 |
| Baskets, machine for making, Moore & Day | 134,920 |
| Bed bottom, A. H. Bell | 134,839 |
| Bedstead, sofa, J. Brada | 134,843 |
| Bedstead, crib for, E. F. Bryan | 134,847 |
| Boiler, steam, H. Camp | 134,784 |
| Boiler, mud collector, etc. for, Leonard & Hancock | 134,811 |
| Boiler, wash, S. B. Hartman | 134,800 |
| Boot heels, making, A. Knowlton | 134,899 |
| Bottles, ejecting apparatus for, W. S. Ward | 134,955 |
| Box, match, O. Paddock | 134,764 |
| Bracelet, T. L. Cornell | 134,735 |
| Brush, paint, J. J. German | 134,745 |
| Butter worker, D. W. Dake | 134,788 |
| Can stopper, oil, L. R. Boyd | 134,812 |
| Can, fruit, etc. W. H. Hammond | 134,790 |
| Can for paint, etc., H. Tucker | 134,947 |
| Cans, metallic bottom for, T. M. Bell | 134,723 |
| Cans, forming, J. Bowers | 134,726 |
| Car brake, A. M. Rouse | 134,934 |
| Car starter, L. D. Benner | 134,840 |
| Car wheel, R. Ramsay | 134,929 |
| Car truck, railroad, P. G. Gardiner | 134,743 |
| Car axle box, railway, C. W. Harvey | 134,801 |
| Carpet stretcher, L. Fankhauser | 134,873 |
| Carriage, child's, J. A. Crandall | 134,856 |
| Carriage curtain, H. Donnell | 134,862 |
| Carriage wheel, S. Vreeland, (r) | 5,237 |
| Carriage spring, plate for, N. C. Dean | 134,859 |
| Case, grocer's sample, N. B. McCreary | 134,913 |
| Caster stand, G. D. Dudley | 134,738 |
| Caterpillars, destroying, G. F. Whisenant | 134,959 |
| Chair, L. H. Baker | 134,834 |
| Chair, tip, B. A. Carlan | 134,850 |
| Chair foot rest, E. Collins | 134,733 |
| Chair, bed, etc., folding, E. Fash | 134,875 |
| Chair back, bow for, C. Kilburn | 134,896 |
| Cigar bunches, pressing, G. Pierce | 134,768 |
| Cloth cutting machine, I. Fenno | 134,793 |
| Cloth steaming machine, C. H. Weston | 134,956 |
| Clothes dryer, D. R. Watson | 134,828 |
| Clothes line, support for, M. Bubser | 134,849 |
| Coal boring machine, S. Hipkins, Jr. | 134,834 |
| Coal, etc., bit for boring, S. Hipkins, Jr. | 134,805 |
| Coal, machine for mining, G. Elbreg | 134,870 |
| Coffee, treating damaged, F. Evans | 134,791, 134,792 |
| Coin counting implement, A. Whittemore | 134,962 |
| Composition for coating metals, etc., J. Specht | 134,822 |
| Corn sheller, cob carrier for, H. H. Eby | 134,790 |
| Corset, J. W. Lane | 134,902 |
| Crib, folding, C. Kilburn | 134,895 |
| Cultivator, S. S. Bushnell | 134,728 |
| Cultivator, I. N. Cauthorn | 134,732 |
| Cultivator, A. C. Tower | 134,824 |
| Cultivator, G. Waggoner | 134,949 |
| Curtain cord rack, W. D. Ludlow | 134,812 |
| Cylinder, steam drying, W. C. Collier | 134,785 |
| Dredger, R. G. Packard | 134,817 |
| Drill, etc., rock, H. Sontag | 134,943 |
| Drills, rotary motion of, G. A. Hinckley | 134,889 |
| Drilling machine, rock, F. Watts | 134,951 |
| Dyeing and washing fibrous material, C. G. Sargent | 134,935 |
| Electro magnetic adjuster, T. A. Edison | 134,868 |
| Elevator, water, A. Balding | 134,835 |
| Engine, hydraulic, J. C. Hodges | 134,806 |
| Engines, flue blast for steam fire, J. Grabner | 134,796 |
| Engine valve, E. Sprague | 134,941 |
| Evener, two horse, J. Sturgis | 134,946 |
| Fan, rotary, I. S. Eastman | 134,740 |
| Feather renovator, McKimm & Gearhart | 134,914 |
| Feed box, folding, J. L. Edwards | 134,869 |
| Feed regulator for calender rolls, M. Lawler | 134,810 |
| Fifth wheel for carriages, H. A. Luttgens | 134,907 |
| File, paper, G. W. Billow | 134,724 |
| Fishing reel, G. Mooney | 134,917 |
| Flower pots, bracket for, M. D. Jones | 134,751 |
| Fluting machine, D. R. Saunders | 134,936 |
| Furnace, hot air, W. B. Geddes | 134,879 |
| Furnace, ore, Z. A. Willard | 134,782 |
| Gage, J. W. Butler | 134,729 |
| Gas main, W. Farmer | 134,874 |
| Gear, friction driving, W. W. Tunis | 134,825 |
| Generator, tubular steam, J. M. Hicks | 134,803 |
| Glass, pot for melting, J. Dougherty | 134,789 |
| Glass, making window, W. W. Pilkington | 134,926 |
| Goods on bias, marking, G. Moore | 134,919 |
| Goods on bias, aiding cutting, G. Moore | 134,918 |
| Grain register, Price & Miller | 134,928 |
| Grates, casting fire, H. Anshutz | 134,832 |
| Gun sight, Schottky & Simendinger | 134,772 |
| Harvester rake, T. P. Barbour | 134,722 |
| Harvester, pitman for, B. F. Waters | 134,954 |
| Heater, base burning, J. S. Perry | 134,767 |
| Heating apparatus, H. L. Palmer | 134,765 |
| Heel stiffener, L. C. Crowell | 134,736 |
| Heel stiffener, I. R. Rogers | 134,933 |
| Hoist, brake for, T. A. Weston | 134,957 |
| Hoist, brake for, T. A. Weston | 134,958 |
| Holder, spool, L. F. Ward | 134,952 |
| Horse cover, A. H. Morris | 134,921 |
| Horseshoe nail machine, A. D. Bingham | 134,841 |
| Horseshoe nails, Turbayne & Wyman | 134,948 |
| Hub for vehicles, S. T. F. Sterick | 134,945 |
| Inhaler, W. R. Crumb | 134,858 |
| Inhaler, medical, M. I. Donaldson | 134,861 |
| Inkstand, S. W. Baldwin | 134,836 |
| Jack, lifting, S. S. Eccleston | 134,865 |
| Jam nut, rubber, W. Todd | 134,823 |
| Kettles, etc., making brass, F. J. Seymour | 134,939 |
| Knitting machine, H. Gunther | 134,881 |
| Latch for gates, J. R. Finley | 134,877 |
| Lamps, etc., filler for, J. A. Ryan | 134,819 |
| Leather punch and cutter, H. S. Fickett | 134,794 |
| Locomotive fire box, C. H. Farley | 134,741 |
| Loom shuttle, H. H. Bryant | 134,848 |
| Looms, shuttle guide for, J. B. Bancroft | 134,837 |
| Lounge, F. Krater | 134,752 |
| Lubricating compound, H. B. Hutchinson | 134,890 |
| Mattresses, coupling for, W. B. Judson | 134,893 |
| Mechanical movement, W. Park | 134,766 |
| Medical compound, J. Andrews | 134,721 |
| Medical compound, T. Morley | 134,762 |
| Medical compound, B. J. Kintz | 134,898 |
| Mold for knobs, Bobstock and Ostner | 134,931 |
| Mop head, W. Duncan | 134,789 |
| Mortising machine, C. Muschar | 134,815 |
| Mowing machine grinder, M. W. Knox | 134,809 |
| Nail distributing machine, C. M. Chase | 134,853 |
| Needle case, G. Wempe | 134,829 |
| Nut lock, A. Williams | 134,781 |
| Nut and bolt fastening, E. B. Wingate | 134,963 |
| Offal, apparatus for treating, W. L. Bradley | 134,844 |
| Oil wells, hanger for, Hollings and Innis | 134,807 |
| Organ, reed, R. E. Letton | 134,754 |
| Organ, reed, G. Woods | 134,830 |
| Painting, oil, J. C. Walker | 134,827 |
| Paper sizing, P. Grady | 134,797 |
| Paper ruling machine, A. Hathaway | 134,883 |
| Papers, filing and binding, P. Mac Vicar | 134,908 |
| Pencils, cutting off lead, Schrag and Hufeland (r) | 5,236 |
| Pianoforte action, J. Schandelle | 134,940 |
| Piano pedal attachment, Held and Baugh | 134,886 |
| Piano music desk, M. Doherty | 134,860 |
| Piston rods, etc., bushings for, G. W. Welch | 134,955 |
| Planter, corn, G. D. Haworth | 134,747 |
| Planter, corn, A. D. Smith | 134,942 |
| Planter, hand corn, F. A. Hawkins | 134,884 |
| Planter and seeder, corn, R. Cowan | 134,855 |
| Plow, steam, A. E. McGaughey | 134,913 |
| Plow, wheel, Freeman, Lowe and Stevens | 134,878 |
| Potato bug collector, J. Corbell | 134,854 |
| Press for cheese, fruit, etc., B. G. Martin | 134,910 |
| Pruning shears, A. R. Moulton | 134,922 |
| Pulley, band, E. P. West | 134,778 |
| Pump, F. Catudal | 134,785 |
| Pump, reaction, E. Rhodes, Jr. | 134,770 |
| Pump, steam, J. W. Handren | 134,746 |
| Pump, lift and force, A. H. Powell | 134,927 |
| Purifier, middlings, C. Janney | 134,750 |
| Railroad rail, W. S. Hunter | 134,749 |
| Railroad rail joint, S. Nunamaker | 134,924 |
| Railway, street, T. R. Lovett | 134,906 |
| Reapers, etc., heel for, R. Allstater | 134,831 |
| Refrigerator, Seltzer and Fink | 134,937 |
| Row lock, J. M. K. Southwick | 134,821 |
| Rubber, hard, A. G. Day (r) | 5,232 |
| Rubber, hard flexible, A. G. Day (r) | 5,231 |
| Rubber, hard, A. G. Day (r) | 5,230 |
| Ruler, parallel, W. B. Mason | 134,814 |
| Sad iron and crimping shoe, J. Hewitt | 134,887 |
| Safe, bleaching, C. W. Shiveley | 134,941 |
| Sash fastener, T. P. I. Magoun | 134,813 |
| Sash holder, W. B. Bradford | 134,727 |
| Sash holder, D. Pike | 134,925 |
| Saw, jig, B. Merritt | 134,760 |
| Saw mill, W. Gowen | 134,795 |
| Saw, scroll, F. H. Hardenbergh | 134,882 |
| Saw, cotton gin, T. C. Craven (r) | 5,229 |
| Sawing laths, machine for, S. P. Brower | 134,846 |
| Scaffold, J. F. Darley | 134,737 |
| Screw, wood, Bidwell and Chisholm | 134,783 |
| Screw cutting die, W. E. Ward | 134,777 |
| Screw cutting machine, G. Emig | 134,871 |
| Screws, die for capping, G. W. Briggs | 134,845 |
| Screw heads, slotting, Pierce and Ayres | 134,818 |
| Scythe, E. L. Wheeler | 134,779 |
| Sewing machine, J. H. Whitney | 134,961 |
| Sewing machine table, J. B. McLure | 134,759 |
| Sewing machine table, H. Loth | 134,904, 134,905 |
| Sewing machine, F. N. Violet | 134,826 |
| Sewing machine treadle, A. B. Shaw | 134,820 |
| Sewing machine ruffler, H. C. Goodrich | 134,744 |
| Sewing machines, operating, D. Whitlock | 134,780 |
| Shawl strap, J. B. Higgins | 134,748 |
| Shell, cutting and shaping pearl, E. Carrington | 134,851 |
| Shingles, machine for bundling, R. Law | 134,753 |
| Shirt, A. D. Marr | 134,909 |
| Shoe, etc., fastening for, G. Merrill | 134,761 |
| Shoe binding strips, fastening, C. E. Morrill | 134,763 |
| Slate dressing machine, F. Shenton | 134,773 |
| Slotting machine, J. H. Cranston | 134,857 |
| Soda fountains, sirup device for, W. Gee | 134,880 |
| Soldering iron, J. D. Norton | 134,923 |
| Spectacle, J. King | 134,897 |
| Spinning frame, G. Draper | 134,864 |
| Spinning mule, Metcalf and Gibbons | 134,915 |
| Spinning mule brake, J. W. Whitehead | 134,960 |
| Spinning machine spindle, D. H. Rice | 134,771 |
| Spinning sheet metal, F. J. Seymour | 134,939 |
| Spinning bolster and step, G. Draper | 134,863 |
| Stalk cutter, Galt and Tracy (r) | 5,233 |
| Steam condenser, E. Korting | 134,900 |
| Steam and air brake, Smith and Ogden | 134,774 |
| Steel, process of hardening, S. W. Etchell | 134,872 |
| Tag, T. P. Marston | 134,757 |
| Tag fastener, T. P. Marston | 134,756 |
| Tag fastening, J. S. Loughery | 134,755 |
| Telegraph printing, T. A. Edison | 134,866 |
| Telegraph repeater, duplex, J. B. Stearns | 134,776 |
| Telegraph, automatic, T. A. Edison | 134,867 |
| Thrashing machine, A. Johnston | 134,891 |
| Thrashing machine, D. O. B. Ladd | 134,901 |
| Tongs, griping, W. J. Hallefas | 134,798 |
| Transplanter, Stanton and Pedrick | 134,775 |
| Trap, fly, S. B. Bacheller | 134,833 |
| Tray or show board, D. H. Klotz | 134,898 |
| Truck for moving buildings, T. A. Reamy | 134,930 |
| Truck for moving buildings, W. E. Walker | 134,950 |
| Tweer for Bessemer converter, Haws & Vaughan | 134,885 |
| Umbrella frame, etc., A. Herzberg (r) | 5,234 |
| Valve, balanced slide, T. Beesley | 134,838 |
| Vehicle, spring, J. M. Miller | 134,916 |
| Vehicle spring, E. Cliff | 134,853 |
| Vehicle wheel, H. Kellogg | 134,894 |
| Vessels, propelling, H. C. Camp | 134,730 |
| Vise, I. Roberts | 134,932 |
| Wall, waterproof, H. Mattfeld | 134,911 |
| Wash stand, A. H. Lorton | 134,903 |
| Washing machine, E. Norton | 134,816 |
| Washing machine, E. Potts | 134,769 |
| Watchmaker's lathe, R. Cowles | 134,787 |
| Water wheel, J. T. Case | 134,731 |
| Whiffletree, C. B. McClymond | 134,758 |
| Whip socket, C. B. Morehouse (r) | 5,235 |
| Whip stock, L. Heywood | 134,802 |
| Winding machines, guide for, D. C. Hill | 134,888 |
| Yucca, extract of, L. G. Fellner | 134,876 |

## 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:

23,665.—Cooking Range.—B. W. Dunklee. April 2.

23,700.—Drain Pipes.—B. S. and M. R. Pierce. April 2.

23,707.—Harvester.—S. Ray and M. R. Shalters. April 2

23,730.—Animal Trap.—A. S. Blake. April 9.

23,732.—Gas Pipe Cutter.—J. E. Stanwood. April 9.

24,009.—Tire Upset.—C. L. Crowell, R. Smith. April 30

24,066.—Sewing Machine.—P. S. Carhart. May 7

## EXTENSIONS GRANTED.

23,664.—Lamp Holder.—C. Monson.

23,668.—Coloring and Curing Tobacco Stems.—B. Faya

23,671.—Truss Spring.—J. W. Riggs.

2 ,6 .—Cooking Stove.—E. C. Stewart.

DISCLAIMER.

53,882.—MOLDING APPARATUS, ETC.—G. Ross.

DESIGNS PATENTED.

6,340.—HEATING STOVE.—I. J. Baxter, Peekskill, N. Y.
6,341.—SHOW CARD.—Thomas Hall, Jersey City, N. J.

TRADE MARK REGISTERED.

1,132.—PYROXYLIN.—Celluloid Manufacturing Company, Albany, N. Y.

**SCHEDULE OF PATENT FEES:**

| | |
|---|---|
| On each Caveat | $10 |
| On each Trade-Mark | $25 |
| On filing each application for a Patent (17 years) | $15 |
| On issuing each original Patent | $20 |
| On appeal to Examiners-in-Chief | $10 |
| On appeal to Commissioner of Patents | $20 |
| On application for Reissue | $30 |
| On application for Extension of Patent | $50 |
| On granting the Extension | $50 |
| On filing a Disclaimer | $10 |
| On an application for Design (3½ years) | $10 |
| On an application for Design (7 years) | $15 |
| On an application for Design (14 years) | $30 |

# VALUE OF PATENTS

## And How to Obtain Them.

## Practical Hints to Inventors.

PROBABLY no investment of a small sum of money brings a greater return than the expense incurred in obtaining a patent even when the invention is but a small one. Large inventions are found to pay correspondingly well. The names of Blanchard, Morse, Bigelow, Colt, Ericsson, Howe, McCormick, Hoe and others, who have amassed immense fortunes from their inventions, are well known. And there are thousands of others who have realized large sums from their patents.

More than FIFTY THOUSAND inventors have availed themselves of the services of MUNN & Co. during the TWENTY-SIX years they have acted as solicitors and Publishers of the SCIENTIFIC AMERICAN. They stand at the head in this class of business; and their large corps of assistants, mostly selected from the ranks of the Patent Office: men capable of rendering the best service to the inventor, from the experience practically obtained while examiners in the Patent Office: enables MUNN & Co. to do everything appertaining to patents BETTER and CHEAPER than any other reliable agency.

## HOW TO OBTAIN *Patents*

This 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, 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.

### Reissues.

A reissue 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, New York, for full particulars.

### 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.

### 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.

### Canadian Patents.

On the first of September, 1872, the new patent law of Canada went into force, and patents are now granted to citizens of the United States on the same favorable terms as to citizens of the Dominion.

In order to apply for a patent in Canada, the applicant must furnish a model, specification and duplicate drawings, substantially the same as in applying for an American patent.

The patent may be taken out either for five years (government fee $20), or for ten years (government fee $40) or for fifteen years (government fee $60). The five and ten year patents may be extended to the term of fifteen years. The formalities for extension are simple and not expensive.

American inventions, even if already patented in this country, can be patented in Canada provided the American patent is not more than one year old.

All persons who desire to take out patents in Canada are requested to communicate with MUNN & Co., 37 Park Row, New York, who will give prompt attention to the business and furnish full instruction.

### 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, when 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.

Address

**MUNN & CO.,**
PUBLISHERS SCIENTIFIC AMERICAN,
**37 Park Row, New York.**
OFFICE IN WASHINGTON—**Corner F and 7th streets,** opposite Patent Office.

## Advertisements.


RATES OF ADVERTISING.
**Back Page - - - - - - - $1.00 a line.**
**Inside Page - - - - - - 75 cents a line.**
*Engravings may head advertisements at the same rate per line, by measurement, as the letter-press.*

GENUINE CHESTER EMERY.
AMES.
EMERY CLOTH. Trade A Mark. EMERY PAPER.
BEST QUALITY. LOWEST PRICES.
**E. V. HAUGHWOUT & CO.,**
**25 Park Place, NEW YORK.**

NEW AND VALUABLE SAW MILL TOOLS, for fitting Saws. Patents for Sale. Manufactured by G. A. PRESCOTT, Sandy Hill, N. Y.

THE INDUSTRIAL MONTHLY.
**For 1873.**
NOW IN ITS FOURTH YEAR.
The January and February numbers are splendidly illustrated with engravings of Steam Engines, Boilers, Machinists' tools, Machinery, etc.
Science for the Household and the Shop.
This is an extremely interesting and useful department, and is alone worth the subscription price of the Journal.
You ought to read its practical articles upon all the various topics connected with the Industrial Arts.
MANUFACTURERS, MECHANICS, BUILDERS, ENGINEERS AND INVENTORS.
This Journal is especially devoted to your interests. It is the *handsomest* and *cheapest* Monthly Mechanics' Journal in the country.
NOW IS THE TIME TO SUBSCRIBE.
Subscription Only $1.50 per Annum.
SPECIMEN COPIES, 15 CENTS EACH.
Liberal discount to clubs.
See our premium list in the January number.
Address
**INDUSTRIAL PUBLICATION COMPANY,**
**176 Broadway, New York.**
POST OFFICE BOX, No. 4875.

WAY'S EPILEPTIC REMEDY.—CURE GUARANTEED, if directions are followed. Qts., $5; pints, $2.50. Address C. WAY & CO., Portland, Me.

AMERICAN ROLLED NUT & TUBE CO., Richmond, Va. Nuts from ¼ in. to 3 in., hollow Shafting, Turnbuckles, &c., manufactured by Ostrander's process. Better, and thirty per cent cheaper than any others made. Send for circular. WM. E. TANNER, Prest

Wood Working Machinery.
SPECIALTIES: Daniels' and Woodworth Planing Machines; Pail, Tub, Clothespin, and Washboard Machinery; Gage, and Stretcher Lathes. CHARLES BUSS & SON, Marlborough, N. H.

TO THE WORKING CLASS, male or female, $60 a week guaranteed. Respectable employment at home, day or evening; no capital required; full instructions and valuable package of goods to start with, sent free by mail. Address, with 6 cent return stamp, M. YOUNG & CO., 16 Courtlandt Street, New York.

THREE SPECIMEN COPIES of the AMERICAN STOCK JOURNAL, Handsomely Illustrated with Engravings of Horses, Cattle, Sheep, Swine, Poultry Dogs, and Birds, and three Packages of NEW FARM SEEDS, SENT FREE to all who send *two* Stamps for Postage. Address N. P. BOYER & CO. Parkesburg, Pa.

SEE in another column advertisement about **Iowa and Nebraska Lands.**

*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

What Next? Wonderful!!
The Great Juvenile Magazine. Only 30 cents a year—168 large pages of choicest reading—a splendid $1.00 Chromo to every subscriber, by first mail. A marvel of cheapness, worth and beauty combined! Specimen, 3 cents. Raise a club! Say where you saw this. JOHN B. ALDEN, Publisher, Chicago, Ill.

ONE WHITNEY WATER WHEEL, 18 in. diam., new and complete, price $135, for sale by SNEAD & SAYRE, Louisville, Ky.

WOOD AND IRON WORKING MACHINERY of all kinds manufactured by T. R. BAILEY & VAIL, Lockport, N. Y. Illustrated Catalogue free.

THE MORRIS & HEYWOOD TIMBER Bending Co. Manufacture, Sell, and License the use of Wood-bending Machinery. Address B. M. BARRETT, Prest., corner Front and Walnut Sts., Cincinnati, Ohio.

Purchasers of Saw Mills
are notified that we have commenced suits in the U. S. Circuit Courts against COLE, BURBEE & Co., Lebanon, N. H., LUKE BURBEE, St. Johnsbury, Vt., and F. C. CANDEE & Co., New York, (selling agents of Belknap, Ely & Co., Northfield, Vt.) for infringements of patents granted Dennis Lane for improvements in Circular Saw Mills. The public is cautioned against buying Mills or Set Works manufactured and sold by the above named parties, or any other, in violation of our rights, as we shall prosecute infringers to the full extent of the law, and hold purchasers of infringing Mills or Set Works responsible for the use of the same.
Our patents cover improvements in head-blocks generally, setting devices, dogging devices, tapering devices and frictional set works.
Descriptive pamphlets sent to any address, and copies of Lane's patents furnished upon request.
LANE, PITKIN & BROCK,
Montpelier, Vermont.

SEE in another column, advertisement about **Iowa and Nebraska Lands.**

HOW IS YOUR HEALTH?
If you would be well and strong, study the laws of Life and Health by reading "THE SCIENCE OF HEALTH," the best health journal published—not the organ of any business or institution, but an independent earnest educator of the people in all that pertains to the *preservation* and *regaining* of health. Only $2.00 a year; 20 cents a number, and a splendid Oil Chromo, printed in sixteen colors, called the
ANXIOUS MOTHER,
worth $5, is given to every new subscriber. Our Chromos are now READY FOR DELIVERY. If sent by mail, mounted and varnished ready for framing, 30 cents extra must be sent by subscribers for each picture.
To every reader we would say DON'T THINK because you now take other publications, that is any reason why you should not subscribe for THE SCIENCE OF HEALTH. It is needed in your family; will show you how to save many times its cost in the DOCTORS' BILLS every year, besides the great gain in comfort and happiness that will come from health, which you certainly secure by knowing HOW TO LIVE. As **The Science of Health** has been sustained beyond expectation, we are prepared with additional facilities for making the next volume respond fully to the popular demand for an independent HEALTH MONTHLY. Ample arrangements have been made to render each department a welcome and instructive visitant to the reader.
**Terms.**—$2.00 a year; single numbers, 20 cents; ten copies, $15.00, and an extra copy to agent, and the **Oil Chromo** to each new subscriber, who sends the 30 cents extra for postage and mounting Chromo.
**Premiums.**—Besides the above Rates, we are offering the most liberal Premiums, an Illustrated list of which will be sent on application. LOCAL AGENTS wanted everywhere, and Cash Commissions given. Address
**S. R. WELLS, Publisher,**
389 Broadway, New York.

WOOD-WORKING MACHINERY.
New and Improved Woodworth's, Daniel's, and Dimension Planers, Moulding, Mortising, Tenoning, Sawing, Boring, Upright Shaping Machines, etc. Machine Chisels and Augers, Moulding Cutters and **Farmer's Celebrated Patent Matcher Heads and Cutters**, constantly on hand and made to order.
R. BALL & CO., 36 Salisbury St., Worcester, Mass.

CHAMPION SPRING MATTRESS—The latest and best improvement. Do you want a healthy and comfortable bed? Here it is. The softest, easiest, cheapest, most popular, and durable Spring Bed in market. Sold by all leading dealers. No stock complete without it. Wholly composed of tenacious tempered steel springs, so united that the pressure is equally distributed. Easily moved or carried about the house. Can be lifted, turned, or rolled up like a blanket. Both sides alike. No frame, no wooden slats, no straps. May be used on floor without bedstead. No under bed required. Needs only half thickness of hair mattress. The regular size double bed, 4 ft. 6 in. by 6 ft., contains 192 tempered steel upholstery springs and weighs only 25 lbs. More springs for your money in this bed than in any other. Warranted noiseless. Any sizes made to order. Send for pictorial circular. Retail price of double bed, $12. Shipped, by single bed or quantity, to all parts of the world. Liberal discount to the trade. Agents wanted. F. C. BEACH & CO., Makers, 131 and 133 Duane Street, New York.

WOODWARD'S COUNTRY HOMES.

150 DESIGNS and PLANS for Houses of moderate cost $1.50, post paid.
ORANGE JUDD & CO.,
PUBLISHERS 245 Broadway, N. York
Send for Catalogue of all books on Architecture, Agriculture, Field Sports and the Horse

ERIE RAILWAY COMPANY.
(P. O. Box 830.) VICE-PRESIDENT'S OFFICE, New York, January 8, 1873.
TO BRIDGE BUILDERS:
The Erie Railway Company propose, as they renew the bridges on their Road, to substitute Iron for Wood. They have a large number of bridges in spans varying from 20 to 200 feet.
With a view to determining the best plan to adopt, they invite you to make a proposal, based upon plans and specifications, to be furnished by you for bridges of various spans from 20 feet upward, with your price for the same.
Let your price be predicated upon the fixed price of iron and steel, to be varied as those materials may advance or decline in price.
Yours &c., A. S. DIVEN, Vice-President.

THE
SCIENCE RECORD
FOR
1873.
A Compendium of the Scientific Progress and Discoveries of the Preceding Year. Illustrated with Steel Plate and other Engravings. 600 pages, octavo. Price, $2.

THIS NEW AND SPLENDID BOOK will be published about January 15, 1873. Its contents will embrace the most Interesting Facts and Discoveries in the various Arts and Sciences that have transpired during the preceding year, exhibiting in one view the General Progress of the World in the following Departments:

1.—CHEMISTRY AND METALLURGY.—Embracing accounts of all the chief Chemical Discoveries, Improvements, and Processes introduced in the various Industrial Arts, with engravings. Improvements in the Processes of Working Iron, Steel, Lead, Copper, Gold, Silver, and the various Metals with engravings of New Apparatus, descriptions of New Alloys and much other valuable information.
2.—MECHANICS AND ENGINEERING.—Embracing descriptions of New Mechanical Processes, Inventions, Public Works, Improvements in Steam Engines, Boilers, Motors, Railways, Canal Navigation, Naval Engineering, Mechanical Engineering, Civil Engineering, Building, New Mechanical Inventions, with many engravings.
3.—ELECTRICITY, LIGHT, HEAT, SOUND.—Embracing the latest Improvements in Telegraphy and Telegraph Engineering, Improvements in Galvanic Batteries, Electric Engines, New and Useful Applications of Electricity in the Arts—with engravings.
4.—TECHNOLOGY.—Embracing New and Useful Inventions and Discoveries relating to THE ARTS; Improvements in Photography, Printing, New Implements, New Machinery, New Processes, New Recipes, Improvements pertaining to Textile Industry, Weaving, Dyeing, Coloring, and the various branches of Industrial Labor, with accounts of New Industrial Products, Animal, Vegetable, and Mineral—with engravings.
5.—BOTANY AND HORTICULTURE.—Descriptions of New Plants, Trees, Shrubs and Flowers, introduced during the preceding year, with New, Useful and Interesting Facts in relation to Cultivation, Propagation, etc.—with engravings.
6.—AGRICULTURE.—New and Useful Information in the branches of Agriculture, with Notices of New Processes, New Implements, New Plants, Products etc. Improved modes of Treating Soils, Preparing Manures, Information concerning Domestic Animals, their Diseases, Treatment, etc.—with engravings.
7.—RURAL AND HOUSEHOLD ECONOMY.—The Latest Information concerning Building Materials, Improvements thereon, Improvements in Houses, Furniture, Lighting, Heating, Ventilation, Laundry Processes and Apparatus, Valuable information relating to Food, its Preparation, Preservation, etc., including New and Valuable Recipes, and a great variety of Miscellaneous Information pertaining to the Household—with engravings.
8.—MATERIA MEDICA, THERAPEUTICS, HYGIENE.—Exhibiting the progress of Medical Science in various branches, New Medicinal Preparations, New Health Inventions and Appliances, with much Interesting Information.
9.—NATURAL HISTORY AND ZOOLOGY.—The latest discoveries in Microscopy, Implements and Appliances in Microscopic Investigation, Scientific Explorations, Physiology, Anatomy, Discoveries relating to Pre-historic Man, Interesting Information and Discoveries relating to Mammals, Birds, Reptiles, Fishes, and Insects—with engravings.
10 & 11.—METEOROLOGY, TERRESTRIAL PHYSICS GEOGRAPHY.—Accounts of Interesting Atmospheric and Terrestrial Phenomena, Travels, Explorations and Discoveries, including descriptions of the Great National Park—with engravings.
12.—GEOLOGY AND MINERALOGY.—The Latest and most Interesting Geological Investigations and Reports, Accounts of New Minerals, New Mineral Discoveries, Fossils, and Remarkable Phenomena.
13.—ASTRONOMY.—Recent Interesting Discoveries and Information relating to the Planets, Comets, Meteorites, Aurora, the Sun, with Reports of Astronomical Phenomena, Progress, New Instruments, etc.
14 & 15.—BIOGRAPHY, NECROLOGY.—Biographies of distinguished Men of Science, with steel-plate and other Portraits. Notices of Prominent Men connected with Arts and Sciences, recently deceased, with Portraits.

Every person who desires to be well informed concerning the Progress of the Arts and Sciences should have a copy of SCIENCE RECORD FOR 1873. It will be a most interesting and valuable Book, and should have a place in every Household, in every Library.
600 pages, Octavo. Handsomely Bound. Many Engravings. Price, $2.
Sent by mail to all parts of the country, on receipt of the price. A liberal discount to the trade and to canvassers. For sale at all the principal Bookstores.
MUNN & CO., PUBLISHERS,
**37 Park Row, New York City.**

THE *SCIENTIFIC AMERICAN* will be sent one year and one copy of *SCIENCE RECORD FOR* 1873, on receipt of $4.50.

*SCIENCE RECORD FOR* **1872**, uniform with the above. Price $2.

THE SELDEN DIRECT-ACTING

Steam Pump
IS THE BEST Steam Pump made.
Send for Circu. and Price List to
A. CARR, 43 Courtland Street, New York City

THE Proprietors of C. N. Goss' patents, recently issued, for improvements in Horse Hay Rakes wish to arrange with a few more parties to manufacture the best horse rake in the country, upon royalty or otherwise. Address F. G. BUTLER, Bellows Falls, Vt.

ONE THOUSAND DOLLARS PER MONTH has been made by our AGENTS selling two new PATENTS. Address N. P. BOYER & CO., Parkesburg, Pa.

# Splendid Books FOR MECHANICS.

The Moulders' and Founders' Pocket Guide—A Treatise on Moulding and Founding in Green Sand, Loam and Cement; the Moulding of Machine Frames, Mill Gear, Hollow Ware, Ornaments, Trinkets, Bells and Statues; description of Moulds for Iron, Bronze, Brass and other Metals; Plaster of Paris, Sulphur, Wax and other Articles commonly used in Casting; the Construction of Melting Furnaces, the Melting and Founding of Metals; the Composition of Alloys and their Nature—with an Appendix, containing Receipts for Alloys, Bronze, Varnishes and Colors for Castings; also, Tables on the Strength and other Qualities of Cast Metals. By Frederick Overman, Mining Engineer. Illustrated by 42 Engravings. 12mo.......$1.50

The Practical Brass and Iron Founders' Guide—A Concise Treatise on Brass Founding, Moulding, the Metals and their Alloys, etc.; to which are added Recent Improvements in the Manufacture of Iron Steel by the Bessemer Process, etc., etc. By James Larkin, late Conductor of the Brass Foundry Department in Reaney, Neafie & Co.'s Penn Works, Philadelphia. Fifth edition, revised, with extensive additions. In one volume, 12mo.......$2.25

The Modern Practice of American Machinists and Engineers; including the Construction, Application and Use of Drills, Lathe Tools, Cutters for Boring Cylinders and Hollow Work generally, with the most Economical Speed of the same; the results verified by actual practice at the Lathe, the Vise and on the floor, together with Workshop Management, Economy of Manufacture, the Steam Engine, Boilers, Gears, Belting, etc., etc. By Egbert P. Watson, late of the "Scientific American." 86 Engravings. 12mo.......$2.50

The Principles of Mechanism and Machinery of Transmission; Comprising the Principles of Mechanism and Wheels and Pulleys, Strength and Proportions of Shafts, Couplings of Shafts, and Engaging and Disengaging Gear. By William Fairbairn, Esq., C. E. Illustrated by over 150 wood cuts. In one vol., 12mo.......$2.50

☞ The above, or any of my Books, sent by mail, free of postage, at the publication prices.

My new and enlarged CATALOGUE OF PRACTICAL AND SCIENTIFIC BOOKS—96 pages, 8vo—sent free to any one who will furnish his address.

HENRY CAREY BAIRD,
INDUSTRIAL PUBLISHER,
406 WALNUT STREET, Philadelphia.


## Purchasers of Saw Mills

DON'T BE FRIGHTENED! Having noticed an advertisement in the papers, from Lane, Pitkin & Brock, forbidding all persons from purchasing Circular Saw Mills made by us, we will say, that Dennis Lane claims the invention of mechanical devices which we have made and applied to mills for years previous to the date of his patents. We shall continue as before to manufacture Circular Saw Mills with all the modern improvements, and will defend our customers from any suits for damages, brought against them by Dennis Lane, or Lane, Pitkin & Brock.

LUKE BUZZELL, St. Johnsbury, Vt.
BELKNAP, ELY & Co., Northfield, Vt.
CONE, BUGBEE & Co., Lebanon, N. H.
F. C. CANDEE & Co, 57 Liberty St., N. Y. city.

Largest Organ Establishment in the World
7 Extensive Factories.
J. ESTEY & COMPANY,
BRATTLEBORO, VT., U. S. A.
THE CELEBRATED

## Estey Cottage Organs

The latest and best improvements. Everything that is new and novel. The leading improvements in Organs were introduced first in this establishment.

ESTABLISHED 1846.

SEND FOR ILLUSTRATED CATALOGUE.

TO ARCHITECTS AND BUILDERS.—CHARLES K. BILL, Photographer, 1164 Broadway, New York, will send, on approbation, a choice collection of Views of the Public Buildings and of Central Park, photographs 8x10 on 12x14 Mounts.

$425 Upright Engine and Tubular Boiler (4) HORSE POWER, with all Trimmings—ALSO, (10) HORSE POWER. Send for circulars. VARIETY IRON WORKS COMPANY, Cleveland, Ohio.

## An deutsche Erfinder.

Diese große und thätige Classe unsrer Bevölkerung machen wir besonders darauf aufmerksam, daß unsre Firma durch ihre Verbindung mit Washington und den europäischen Hauptstädten, besondere Vortheile zur Erlangung von in- und ausländischen Patenten bietet.

Jeder Erfinder, gleichviel welcher Nationalität angehörig, ist durch die liberalen Patentgesetze der Vereinigten Staaten zum Patentschutz für Erfindungen berechtigt. Unsre Firma ist bereit, gestützt auf 26jährige Erfahrung, deutsche Erfinder jeder Zeit zu berathen und zu mäßigen Preisen rasch und pünktlich Patente zu erlangen.

Die Deutsche Section ist in den Händen fähiger deutscher Ingenieure, welche in der Office persönlich mit Erfindern verkehren werden.

Der „Scientific American" wird in seinen Spalten die bedeutenderen Erfindungen besprechen.

Correspondenz erbeten und prompt beantwortet. Pamphlete in deutscher Sprache werden auf Verlangen franco zugesandt.

Adressire:

Munn & Co.,
„Scientific American" Patent Agentur,
37 Park Row,
New York City

WHALEN TURBINE. No risks to purchaser. Pamphlet sent free. SETH WHALEN, Ballston Spa, N. Y.

RISDON'S IMPROVED
Turbine Water Wheel

Is Cheap, simple, strong and durable; upon a test has yielded over 86 per cent at full gate, and over 78 per cent at eight-tenths gate. Send for circular to T. H. RISDON & CO., Mount Holly, New Jersey.

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

TO PATENTEES—Patent Rights Bought and Sold on Commission. Agents make $500 per month. Address NATIONAL P. R. AGENCY, Philadelphia, Pa.

FOOT SAWING MACHINE—best out—Cuts very fast, as smooth as a plane. S. C. HILLS, 51 Courtlandt Street, New York.

LEFFEL IMPROVED DOUBLE TURBINE
WATER WHEEL.
6000 IN USE.
NEW WHEEL BOOK 152 PAGES FOR 1872
SENT FREE
JAMES LEFFEL & CO. SPRINGFIELD, O.
109 LIBERTY ST. NEW YORK CITY.

MILLIONS OF ACRES

## Iowa & Nebraska Lands

*FOR SALE BY THE*

Burlington & Mo. River R. R. Co.

*On Ten Years' Credit at 6 per cent. Interest.*

PRODUCTS will pay for the land and improvements much within the limit of this generous credit. Better terms are not offered, and probably never will be.

CIRCULARS giving full particulars, gratis; call for all that are wanted to circulate.

COME WEST and thrive. Friends will follow.

A SECTIONAL MAP, showing the exact location of Iowa lands, is sold at 30 cents, and of Nebraska lands at same price. For Circulars and Maps, apply to

GEO. S. HARRIS,
Land Commissioner, Burlington, Iowa.

☞ And please say in what paper this advertisement was seen.

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

SILICATE OF SODA in its various forms. PHILADELPHIA QUARTZ CO.

WANTED, LOCOMOTIVE ENGINEER to run a Steam Plow, and portable engines on a farm. Must be thoroughly competent, and sober, and have unexceptionable reference. Must be able to turn his hand to rough mechanical work in carpenter and blacksmith shops. Married man preferred. House and garden on the farm. Sons can have work on the farm, and daughters constant indoor employment. A desirable permanent situation. Apply to D. LANDRETH & SON, Bristol, Pa.

*ESTABLISHED* 1858.


ABK.

FIRST PREMIUM AWARDED BY THE AMERICAN INSTITUTE FAIR, 1871.

Waste no time, oil, or labor on worthless paints. Use PRINCE'S METALLIC, an indestructible coating for iron, tin and wood. Send for a circular and sample For sale by the trade, and PRINCE'S METALLIC PAINT COMPANY, 96 CEDAR STREET, New York.

*NEW PATTERNS.*

MACHINISTS' TOOLS—all sizes—at low prices. E. & R. J. GOULD, 97 to 113 N. J. R. R. Ave., Newark, N. J.

## Machinery,

Wood and Iron Working of every kind. Leather and Rubber Belting, Emery Wheels, Babbitt Metal, &c. GEO. PLACE & CO., 121 Chambers & 103 Reade Sts, N.Y

## Machinists' Tools.

The largest and most complete assortment in this country, manufactured by NEW YORK STEAM ENGINE COMPANY, 121 Chambers & 103 Reade Streets, New York.

## Cold Rolled Shafting.

Best and most perfect Shafting ever made, constantly on hand in large quantities, furnished in any lengths up to 24 ft. Also, Pat. Coupling and Self-oiling adjustable Hangers. GEORGE PLACE & CO., 121 Chambers & 103 Reade Streets, New York.

## Sturtevant Blowers.

Of every size and description, constantly on hand. GEORGE PLACE & CO., 121 Chambers & 103 Reade Streets, New York.

WILDER'S

## Pat. Punching Presses

For Railway Shops, Agricultural Machine Shops, Boile Makers, Tinners, Brass Manufacturers, Silversmiths, &c Warranted the best produced. Send for Catalogue, &c. NEW YORK STEAM ENGINE CO., 121 Chambers & 103 Rea de

J. H. WHITE, Newark, N. J., Manufacturer of Tin, Zinc, Brass and Copper Spun Bottom Oilers, Children's Carriage Trimmings, Cowell Pat. Door and Gate Spring, &c. &c. Stamped, Cast and Spun Metal Work, Dies, Tools, and Patterns to order.

RUBBER STAMPS, Steel Letters, the Little Gem, Stencil Dies, &c., U. S. M'f'g Co., 97 W. Lombard St., Baltimore. $10 a day to Agents.

SAFETY FUSE Best quality, Cotton, Hemp, and Water proof. Manufactured by F. M. ALFORD, Avon, Conn.

12 Samples sent by mail for 50 cts., that retail quick for $10. R. L. WOLCOTT, 181 Chatham Square, New York.

$5 to $20 per day! Agents wanted! All classes of working people, of either sex, young or old, make more money at work for us in their spare moments or all the time than at anything else. Particulars free. Address G. Stinson & Co., Portland, Maine.

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.

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

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.

HINKLEY KNITTING MACHINE
The Simplest, Cheapest, and Best in use! Has but one needle! A Child can Run it. AGENTS WANTED IN EVERY TOWN. Manf. Florence S. M. Co. Send for circular and Sample Stocking, to HINKLEY KNITTING MACH. CO., Bath, Me.

The ARION PIANO is THE BEST! SAVE MONEY by purchasing the best Piano-Forte. Do not decide what make to get until you write for our Illustrated Circular, which we mail free. The "Arion Piano" contains four patented improvements that make it *more durable* than any piano in the market.

Write for Circular, and mention where you saw this notice.

Address THE ARION PIANO-FORTE COMPANY, 5 East Fourteenth Street, New York City.

BUY BARBER'S BIT BRACE.

FELT. Cheapest, best, and most durable non-conductor known. BOILER FELTING WORKS, 46 Courtlandt St., New York.

INVENTORS' NATIONAL UNION. E. H. GIBBS & CO., 178 Broadway, New York. Patents Sold on Commission. Send for Circular.

Write for Large Illustrated Descriptive Price List to


PITTSBURGH, PA.

Double, Single, Muzzle and Breech-Loading Rifles. Shot Guns, Revolvers, Pistols, &c., of every kind, for men or boys, at very low prices. Guns, $3 to $300; Pistols, $1 to $25.

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.

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, Send for Circulars. 91 Liberty street, N. Y.; 67 Sudbury street, Boston.

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

## Corrugated Iron,

Iron Buildings, Roofs, Shutters, &c. MOSELY IRON BRIDGE & ROOF CO., Send for Circulars. Office, 5 Dey st., New York.

MASON'S PAT'T FRICTION CLUTCHES are manufactured by Volney W. Mason & Co., Providence, R. I. Agents, L. B. BROOKS, 60 Cliff street, New York; TAPLIN, RICE & CO., Akron, Ohio.

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

PATTERN LETTERS KNIGHT BROS

*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.

100 YEAR ALMANAC. FOR 50 CENTS we send POSTPAID an Almanac giving every Year, Month, Week and Day of the Century, also a Pocket Calendar for 1873. Extra inducements to Agents. Address GEORGE A. HEARD & CO., Boston, Mass.

## Iron City and Siberian Iron Works.

ROGERS & BURCHFIELD,
MANUFACTURERS OF
Refined Charcoal and Best Bloom Sheet Iron, Brands Apollo and Siberian. Specialties: Stamping, Button, Trunk, Lock, Shovel, Tea Tray, Show Card, Tagger, and all other kinds of fine Sheet, from 12 to 40 gauge. Cut to size, as required by the trade. Equally to any imported Office and Warehouse, 108 Water St., Pittsburgh, Pa.

PROTECTION AGAINST FIRE.
HALL BROTHERS
*Are prepared to introduce their "System of Sprinklers" into Mills, Factories, &c., at short notice. Call and see a practical operation of same at their works,*
36 CHARDON STREET,
BOSTON.

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.

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

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, &c. Address TREVOR & Co., Lockport, N. Y.

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. Liberty st., New York.

RIVERVIEW Military Academy, Poughkeepsie, N. Y. A thorough-going school for boys.

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

*P. BLAISDELL & Co.,*
MANUFACTURERS OF FIRST CLASS MACHINISTS' TOOLS. Send for Circulars Jackson st., Worcester, Mass.

## Milling Machines.

STANDARD, UNIVERSAL, INDEX, CAM-CUTTING and PLAIN, in every variety, of unequalled design and first-class workmanship. Send for Illustrated Catalogue to the BRAINARD MILLING MACHINE Co., 11 Pemberton Square, Boston. Works at Hyde Park.

FOOT LATHES.—T. SHANKS, Baltimore, Md.


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 price, and warrant 5 Years. Send for illustrated circular, in which we refer to over 500 Bankers, Merchants, &c. (some of whom you may know), using our Pianos, in 44 States and Territories. Please state where you saw this notice.

U. S. Piano Co., 865 Broadway, N. Y.

CINCINNATI BRASS WORKS—Engineers and Steam-fitters' Brass Work. Best quality. Send for Catalogue. F. LUNKENHEIMER, Prop.

SEE in another column, advertisement about Iowa and Nebraska Lands.

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



OF THE

## SCIENTIFIC AMERICAN.

*The Best Mechanical Paper in the World*

A year's numbers contain over 800 pages and several hundred engravings of new machines, useful and novel inventions, manufacturing establishments, tools, and processes.

The SCIENTIFIC AMERICAN is devoted to the interests of Popular Science, the Mechanic Arts, Manufactures, Inventions, Agriculture, Commerce, and the industrial pursuits generally, and is valuable and instructive not only in the Workshop and Manufactory, but also in the Household, the Library, and the Reading Room.

*To the Mechanic and Manufacturer!*

No person engaged in any of the mechanical pursuits should think of doing without the SCIENTIFIC AMERICAN. Every number contains from six to ten engravings of new machines and inventions which cannot be found in any other publication.

*Chemists, Architects, Millwrights and Farmers*

The SCIENTIFIC AMERICAN will be found a most useful journal to them. All the new discoveries in the science of chemistry are given in its columns; and the interests of the architect and carpenter are not overlooked, all the new inventions and discoveries appertaining to these pursuits being published from week to week. Useful and practical information pertaining to the interests of millwrights and millowners will be found published in the SCIENTIFIC AMERICAN, which information they cannot possibly obtain from any other source. Subjects in which planters and farmers are interested will be found discussed in the SCIENTIFIC AMERICAN, many improvements in agricultural implements being illustrated in its columns.

We are also receiving, every week, the best scientific journals of Great Britain, France, and Germany; thus placing in our possession all that is transpiring in mechanical science and art in these old countries. We shall continue to transfer to our columns copious extracts, from these journals, of whatever we may deem of interest to our readers.

TERMS.

| | |
|---|---|
| One copy, one year | $3.00 |
| One copy, six months | 1.50 |
| One copy, four months | 1.00 |
| 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," for 1873 | 4.50 |

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.

## 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.*

# To Investors.

To those having **funds to invest**, and those who wish **to increase their income** from means already invested in other less profitable securities, we recommend the Seven-Thirty Gold Bonds of the Northern Pacific Railroad Company as well secured and unusually productive.

The bonds are always convertible at Ten per cent. premium (1.10) into the Company's Lands at Market Prices. The rate of interest (seven and three-tenths per cent. gold) is equal now to about 8¼ currency—yielding an income more than one-third greater than U. S. 5-20s. Gold Checks for the semi-annual interest on the Registered Bonds are mailed to the Post-Office address of the owner. All marketable stocks and bonds are received in exchange for Northern Pacifics on most favorable terms.

JAY COOKE & CO.,
NEW YORK, PHILADELPHIA, AND WASHINGTON,
*Financial Agents Northern Pacific R. R. Co.,*

FOR SALE BY BANKS AND BANKERS.

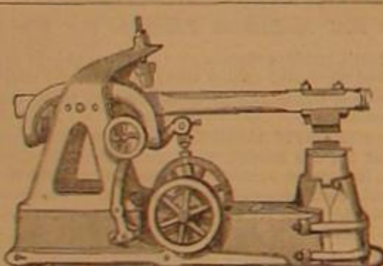

## A NEW TOMATO!

I introduce, this season, a new tomato, the CANADA VICTOR, which *is probably the earliest of all varieties*. It combines just what is wanted, viz: extreme earliness, large size, the round shape, solidity, richness of color, with an entire freedom from greenness and cracking around the stem, and first class cropping qualities. Single packets of 25 seeds, 25 cents; five packets, $1. Packets of 25 seed selected from the few very earliest, 50 cents each. My Seed Catalogue free to all. Dealers supplied at a liberal discount.
JAMES J. H. GREGORY, Marblehead, Mass.

## Grant's Bolt Cutter & Drill Combined

SMALLEST SIZE,
LENGTH, 42 IN.—WEIGHT, 140 LBS.

Threads of any form cut on bolts of any length by hand or power—perfect in once going over. Dies adjustable for wear. Fine efficient durable machines.
The smallest shop cannot afford to do without one. Used by Third Ave. car shop and Brooklyn Bridge Co. Send for circulars. WILEY & RUSSELL, Greenfield, Mass.



## Bradley's Cushioned Hammer.

This hammer has many valuable improvements that are made useful in the device for cushioning the blow, by using a Yoke and Rubber Springs, thereby relieving the machine of the jar and concussion which is the destroying element of other hammers: it is also adjustible in line of action, length of stroke, rapidity of motion and weight of blow, all of which is controlled at the will of the operator. It is also peculiarly adapted to the *exceeding difficult swedging of Cotton Spindles*, which requires as continuous, exact, positive, forcible and yet *elastic stroke*. There can be no more difficult or exacting work than this; no other hammer has been able to turn out this kind of work in quantity and quality as satisfactorily as this, and the work is accomplished at less expense for power than with the common Tilt Hammer. For particulars address BRADLEY MF'G CO., Syracuse, N.Y.

**ECLIPSE DOUBLE TURBINE WATER WHEEL**
**STILWELL & BIERCE MF'G CO. DAYTON, O.**

## R. A. Vervalen's Brick Machines,

Made at Haverstraw, Rockland Co., N. Y. Making nine tenths of all the brick used in the State. Send for circular.

BIDDLE MANUFACTURING CO.
"LYONS" PATENT
**Self-Feeding Hand Drill, Punching Press & Shear.**

☞Cutting Tools and Hardware Specialties.

*Are also prepared to furnish light work of any description and in any quantity to order. All kinds of die forgings promptly attended to.* Office and Ware Rooms,
78 CHAMBERS ST., 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.

WITH BREWER'S IMPROVED BRICK KILN ninety-five per cent. of bricks may be thoroughly burned with one fourth cord (¼) of wood to the (M) thousand. Send for circular. SAML. C. BREWER, Water Valley, Miss.

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS for grinding Raw Bones, Burnt Bones, Pot Shells, Ores, Clays, Guanos, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoa nut, Cocoa, Oil Cake, Tomatoes, Gums, Leather, &c., and whatever cannot be ground by other mills. Also, for Paints, Printers' Inks, Paste Blacking, &c. JAMES BOGARDUS, cor. White and Elm Sts., N. Y.

RANSOM SYPHON CONDENSER perfects and maintains vacuum on Steam Engines at cost of one per cent its value, and by its use Vacuum Pans are run with full vacuum without Air Pump. Send to WM. ALLEN, 51 Chardon St., Boston, for a personal call, or the Company, at Buffalo, N. Y., for a circular.

**Send for Shearman's Illustrated Catalogue** of American Machinery, with monthly Reporter of New and Second Hand Machinery ready to deliver in the United States. Price 50 cts. per year. ISAAC H. SHEARMAN, 132 N. 3d St., Philadelphia, Pa.

# "The Harrison Boiler."

Seven years' *service in some of the largest establishments* in New England and elsewhere, with boilers varying from One Hundred to Fifteen Hundred Horse Power, with repeated orders from the same parties, shows that this improved generator has taken a permanent place in the use of steam.

Fifty Thousand Horse Power, have been made and put in use with a present steady demand.

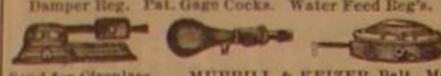
When the destructible portions of this boiler are worn out, its generating surface can be made entirely new, for one half the cost of original.

For all information, circulars, etc., application must be made direct to the
HARRISON BOILER WORKS,
Grays Ferry Road, Philadelphia, Pa.


## Union Stone Co.,

Patentees and Manufacturers of **Emery Wheels & Emery Blocks** in size and Form to Suit various Mechanical Uses; GRINDERS, SAW GUMMERS, DIAMOND TOOLS, and WOOD'S PATENT KNIFE GRINDER, For Planing, Paper Cutting, Leather Splitting, and all other Long Knives.
OFFICE, 16 EXCHANGE STREET, Boston, Mass.
BRANCH OFFICES { W. S. Jarboe, 93 Liberty Street, N. Y. | 503 Commerce Street, Philadelphia, Pa.
☞Send for circular.

Damper Reg. Pat. Gage Cocks. Water Feed Reg's.



Send for Circulars. MURRILL & KEIZER, Balt., Md

# MANUFACTURERS, NOTICE!

TO RENT—In a thriving New England City, 2 Stories of a first class Brick Building (just finished), 160x30 ft., with power. Splendidly lighted and well warmed. All the modern improvements. Especially adapted for Wood Working, Shoe Manufacturing and the like. Shipping facilities abundant. The building is situated near the R. R. depot and Steamboat wharf. The city is one of the largest "Lumber Markets" in the country. Address SHEPARD, DAVIS & CO., Burlington, Vermont.

# Always Reliable.

Wright's Double-Acting Bucket-Plunger.

# STEAM PUMPS.

Made by the Valley Machine Co.
EASTHAMPTON, Mass.

# HOME Insurance Company

OF
NEW YORK.
**Office, No. 135 Broadway.**

| | |
|---|---|
| Cash Capital - - - - - - | $2,500,000.00 |
| Assets Jan. 1, 1873 - - | 4,446,858.78 |
| Liabilities - - - - - - - | 590,914.19 |

**CHAS. J. MARTIN, Prest.**
**J. H. WASHBURN, Sec'y.**

$1 ROTARY HAND CORN SHELLER—Guaranteed to work well. Send for Sample and Circular to the HARRISBURG, PA., FAMILY CORNSHELLER CO., Lock Box 9

## SELDEN PACKING.

Best article made for Piston and Valve Rod Stuffing Boxes. Circulars sent. 8½ Oliver St., Boston Mass.

ISAAC S. CASSIN, Engineer, late Chief Engineer of the Philadelphia Water Works, No. 431 Race St., Philadelphia, Pa. Water Works constructed, Surveys and Estimates made, Drawings and Specifications, and all kinds of Hydraulic Machinery and materials furnished.

## *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 Conducters 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 arge stock constantly on hand at New York Warehouse, No. 117 Liberty street.

## *American Saw Co.*

No. 1 Ferry Street, corner Gold Street, New York.
MANUFACTURERS OF

Patent Movable Toothed
**CIRCULAR SAWS,**
Patent Perforated
**Circular, Mill,**
AND
**Cross-cut Saws.**
☞Send for Descriptive Pamphlet.

BEACH'S Scroll Sawing Machine, Improved guaranteed the cheapest and best in use. Thirty days' trial given. Send for illustrated circular and price list. Address H. L. BEACH, 90 Fulton St., New York.

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

# COVERING for BOILERS

AND PIPES. Superior Quality. First Prize Am. Institute Fair. VAN TUYL MF'G CO., 528 Water St., N. Y.

## *Boilers & Pipes covered*

with "ASBESTOS FELTING," saves 25 per cent in fuel. Send for circulars.
**Asbestos Felting Co.,**
**Nos. 316, 318, 320, 322, Front St., N. Y.**
☞Asbestos in all quantities and qualities for sale.

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

ESPECIAL ATTENTION of Manufacturers who have become disgusted with the odors of Paraffin Oils, and their ill effects upon machinery, is invited to
E. H. Kellogg's Sperm Engine Oil, at........$1.20 per gal.
E. H. Kellogg's Sperm Spindle Oil, at........$1.15 "
E. H. Kellogg's Tallow Engine Oil, at........$1.10 "
E. H. Kellogg's Tallow Spindle Oil, at........$1.05 "
Manufactured only by E. H. KELLOGG, No. 17 Cedar St., New York.

*.* *ONE POUND OF TEETH SAWS*


Extra Teeth Fifteen Cents each.
2,000,000 *FEET OF LUMBER*

## *Machinist's Tools,*

EXTRA HEAVY AND IMPROVED.
LUCIUS W. POND, MANUFACTURER
Worcester, Mass.
Warerooms, 98 Liberty Street, New York.
A. C. STEBBINS, Agent.

# Utica Steam Engine Co.

## STEAM ENGINES,

PORTABLE & STATIONARY.
"THE BEST, CHEAPEST, MOST DURABLE."
Improved Circular Saw Mills, Screw and Lever Set. ☞Send for Circular.
UTICA STEAM ENGINE CO., Utica, N. Y.
G. G. YOUNG, GENERAL AGENT, 42 Cortlandt St., New York.

Over 15,000,000 square feet in use.


For steep or flat Roofs, in all climates.
ASBESTOS ROOF COATING.
For restoring old Tin, Felt, and Shingle Roofs,
ASBESTOS BOILER FELTING.
The best non-conductor, and the lightest and most economical covering for Steam Pipes, Boilers, Oil Stills, etc., whether housed or exposed to the weather.
These materials are prepared ready for use, and can be easily applied by any one.
ROOFING AND SHEATHING FELTS, ASBESTOS BOARD, ASBESTOS PAPER, ASBESTOS, ASPHALTUM, &c.
Send for Descriptive Pamphlets, Price Lists, Terms to Dealers, etc.
H. W. JOHNS,
{ Established in 1858. } New Offices, 87 MAIDEN LANE, cor. GOLD STREET, New York.

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

PETER COOPER'S
# Refined Neats' Foot Oil,
FOR FIRST CLASS MACHINERY.

It contains no gum or acid, and is warranted pure and equal to the best Sperm Oil.
☞For sale at No. 17 Burling Slip, New York.

# 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 CORE 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

KEEP YOUR BOILERS CLEAN.
# ANTI LAMINA
prevents and removes scale in Steam Boilers—does not injure the Iron. In use over five years.
J. J. ALLEN, Patentee, Philadelphia, Pa.

HARDENED STEEL OR CHILLED CASTINGS worked fast as Soft Iron or Brass. Many Jobs easily accomplished that, with ordinary Tools, CANNOT BE DONE AT ALL. Circulars Free. AMERICAN TWIST DRILL CO., Woonsocket, R. I.

VALUABLEP ROPERTY FOR MANUFACTURING PURPOSES—At Auction, Saturday February 22, 1873. On L. S. & M. S. R. R., 23 miles East of Cleveland, Ohio. Lot 2 acres, Main Building 3 Stories, 32x82—Engine Room 15x30—Smith Shop 27x37—all brick. Engine, 50 Horse Power—Cooper Shop and Lot, one acre. Also Shafting, Belting, Shingle and Barrel Machinery, Smith and Cooper Tools. All new, and will be sold in parcels to suit bidders. WM. DE LONG, Prest.
Mentor, Lake Co., O., January 23, 1873.

# MAHOGANY,

ROSEWOOD, FRENCH WALNUT, SATIN WOOD, HUNGARIAN ASH, CEDAR, ETC.
Large and Choice Stock Foreign and Domestic Woods, in
**VENEERS, BOARDS, AND PLANK.**
Imported and Manufactured by
GEORGE W. READ & CO.,
Office, Mill and Yard, 186 to 200 Lewis St., cor. 6th, E. R.
Branch Salesroom—170 & 172 Centre St., N. Y.
Orders by mail promptly and faithfully executed.
☞Send for Catalogue and Price List.

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.

## THE TANITE CO.,

INVENTORS & BUILDERS OF SPECIAL MACHINERY CONNECTED WITH EMERY GRINDING.

SOLID EMERY WHEELS, from 1 in. to 3 feet in diam.

The TANITE EMERY WHEEL is rapidly taking the place of the *file* and the *Grindstone*. If you wish to make Improvements in your Factory, Foundry, Mill or Shop, introduce our **Emery Grinding Machinery**, and note the saving on *Files, Labor*, and *Wages*. A judicious use of Tanite Emery Wheels and Grinding Machinery will more than repay the cost in this year's work! Nothing will *shape, reduce* or *remove* Metal so cheaply and quickly as a Tanite Emery Wheel. The cutting points of a file are steel, and each minute's use injures its cutting edges. **A Tanite Emery Wheel never grows dull!** Emery is a substance harder than any metal! We have lately introduced half a dozen new Styles of Machines for Emery Grinding. Prices: $15, $30, $50, $60, $70, $75, $90, $95, $110, $125 and $175. Send for Circulars and Photographs to

**The Tanite Co.,**
Stroudsburg, Monroe Co., Pa.

THE
AMERICAN
# Turbine Water Wheel

Has recently been improved and subjected to thorough tests by James Emerson, Holyoke, Mass., showing higher average results than any Turbine Wheel ever known. A full report may be obtained of STOUT, MILLS & TEMPLE, Dayton, Ohio.

# PATENT COLD ROLLED SHAFTING.

The fact that this **shafting has 75 per cent** greater strength, a finer finish, and is truer to gauge, 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,
Try street, 2d and 3d avenues, Pittsburgh, Pa.
190 S. Canal st., Chicago.
☞Stocks of this Shafting in store and for sale by FULLER, DANA & FITZ, Boston, Mass.
GEO. PLACE & CO., 126 Chambers street, N. Y.
PIERCE & WHALING, Milwaukee, Wis.

MORRIS, TASKER & CO.,
MANUFACTURERS OF
AMERICAN CHARCOAL IRON
# Boiler Tubes.
WROUGHT-IRON TUBES
AND FITTINGS, FOR GAS, STEAM WATER, AND OIL.
☞Steam and Gas Fitters' Supplies, Machinery for Coal Gas Works, &c., &c.
NO. 15 GOLD ST., 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.