SCIENTIFIC AMERICAN

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

Vol. XXX.—No. 16. [NEW SERIES.] | NEW YORK, APRIL 18, 1874. | $3 per Annum IN ADVANCE.

THE MITCHELL SAFETY STEAM GENERATOR.

Among the many and varied forms of steam boilers which have appeared of late years, few, we think, will awaken more curiosity and interest among engineers and mechanics than the apparatus to the illustration and description of which we devote our initial page. It consists essentially of a rotating cylinder, disposed transversely over the fire, into which water is fed in a state of fine division, through a small pipe which runs through the axis, and through the length of the chamber. The revolution of the cylinder is effected by suitable mechanism in connection with the engine to which, with the other devices regulating water supply, etc , detailed reference is made below. Although the idea of generating steam in quantities by the direction of fine streams of water upon highly heated surfaces has been sought to be applied in various ways, experiments in that direction have met with little success, and certainly have not attained the practical results which the inventors of the present generator seem to secure by their system.

Referring to the engraving, the cylinder, A, which is constructed of ordinary boiler iron, riveted, rotates on friction rollers under the trunnions, P. Into this, water is injected by means of the steam pump, B, through the feed pipe, C. The latter passes through the axis of the cylinder, and is plugged at its extreme end where it rests upon the trunnion. At D a check valve is provided which prevents the return of the water to the pump. F is the pipe which conducts the steam to the pump, through the regulating valves, G and H, the latter of which is set to close at the required pressure of steam, and so stop the motion of the pump The valve, G, serves a similar purpose whenever the steam is lowered twenty-five pounds below the desired pressure in the generator. The overflow valve, I, is set at the same pressure as the valve, H. The steam passes through the stationary steam pipe, K, in the packing box through pipes, L L, and is discharged at M, to the engine or wherever required. Bolted to the flange of one trunnion is a worm gear, O, which rotates the cylinder by means of a belt from the engine on the pulley. A steam damper regulator is attached to the damper in the smoke pipe at Q, the weight on the lever of which is so set that the damper will close on a required pressure of steam being obtained. Before the fire is started, three or four inches of water are admitted into the generator by working the pump by hand. After steam is up, the pump is actuated by the pressure and is subsequently self-regulating.

No further description is, we think, necessary to insure a comprehension of the mechanism of the invention, as the parts are quite simple and their uses easily apprehended from our illustration. It remains, therefore, to consider the merits and practical advantages which the inventors claim for their device.

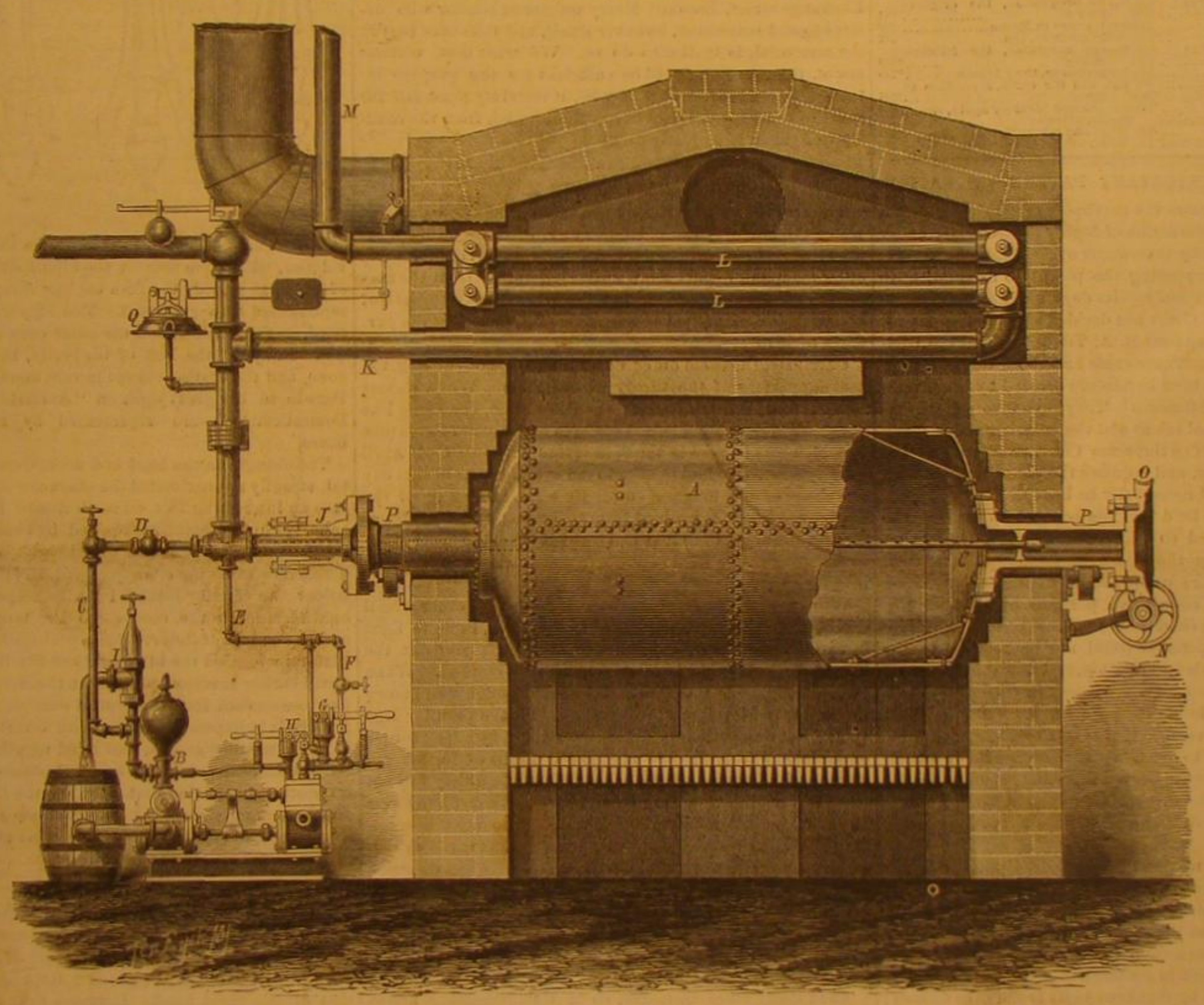
We have already pointed out that the pressure of water entering the cylinder may be regulated at will. Let it be supposed that this is fixed at sixty pounds per square inch. It is clear that, as long as the pressure of steam within the generator is below this limit, the entering flow will continue, but the instant it arrives at or exceeds the same, then the supply must cease. The water seeking a vent will then return into a reservoir beneath the valve, until the steam pressure falls below sixty pounds, when it will again re-enter the cylinder. If, however, the full steam-producing capacity of the boiler is being used, the rapid withdrawal of steam will diminish the pressure to, say, thirty-five pounds; hence, again the water will continue flowing out at a pressure of twenty-five pounds—the difference between sixty and thirty-five—and feed in just sufficient quantity to maintain a steady supply. The inventors, therefore, claim that the generator is perfectly secure against explosion, because the supply of steam is constantly made equal to the demand, and because the pressure cannot exceed that of the limit set by adjusting the valve which admits the water; and this adjustment may be set at the highest pressure which it is safe for the boiler to undergo. There are two results which the entering water can produce; first, if the cylinder be highly heated, steam will be made as fast as the water is supplied. But, as we have already stated, the moment the fixed pressure is exceeded, the overflow valve opens, and the supply is stopped until the steam is worked off sufficiently. The other result is the reverse of this, and consists in flooding the cylinder, when the same is not hot enough to make the steam. This necessarily cannot produce explosion, while, to obviate the difficulties which might be caused by the overplus, the valve is so set that the superior pressure of water above it, exceeding that of the steam below, brings it to its seat, thus stopping the water supply. The water in the pipe, C, it will be observed, is continually surrounded by steam, and is also heated by the exhaust, so that it is, the inventors assert, always kept at the boiling point.

The generating cylinder rotates over the fire at a speed of about two revolutions a minute; thus, it is claimed, heating the iron of which it is composed to an equal temperature throughout, so that even expansion and contraction necessarily follows. The crown sheet and other metal around the fire box of ordinary boilers, as is well known, usually first deteriorate, owing to their being subject to unequal contraction and expansion, due both to the excess of heat there applied over other portions of the generator, and to the shifting of the water line. The form of the present apparatus, it is claimed, necessarily precludes this defect, and hence its durability is largely increased. The generator, in fact, has no water line, and is all steam space, so that scale cannot form therein. When the foreign matter in the water becomes dense, it is carried around by the rotation of the cylinder, and literally, before it has time to settle, is blown out of the trunnions by the force of the steam. The inventors inform us that new boilers clear themselves of dirt or chips left in them after manufacturing, and that the interior of a cylinder, after two years' continuous use, on examination, presented the appearance of perfectly new iron.

The saving of fuel effected is claimed to be one third. That a certain amount, whether greater or less than thus estimated, must be saved is evident, both from the non-formation of scale, and from the fact that there is no large body of water, or even a quantity of flues, etc., to heat to 212°, before a particle of useful steam is obtained. Only the iron itself has to be raised to a suitable temperature, and steam will at once be produced, an operation occupying hardly a minute of time after the water is turned on, or barely twenty minutes after starting fires. Moreover, the water is kept in constant agitation, and thus the formation of steam is again expedited. In a word, the force is made as it is required, and not stored up in a reservoir—a point which seems to us to set forth more clearly the advantages of the system than any other we have adduced. The apparatus is easily managed, occupies about two thirds of the space of the ordinary tubular boiler, and weighs one quarter as much.

We recently had occasion to inspect one of these boilers in actual operation at the Empire Laundry, one of the largest establishments of its class in the world. The proprietors state that the generator, which is 6 feet 6 inches long by 3 feet 8 inches in diameter, has taken the place and does the work of two return flue boilers, each 2[illegible] feet long by 4 feet in diameter, having two 14 inch flues in each. It has also effected a saving of thirty per cent of fuel, although the capacity of the drying closets in the laundry has been doubled. With the old boilers 65 pounds of steam were needed to keep up 116 revolutions of the engine. With the Mitchell generator, 45 pounds pressure to the square inch in the boilers is found to be sufficient. The engine used is rated at 50 horse power.

For rights of territory, further information, etc., address the inventors, Messrs. T. & T. H. Mitchell, No. 329 East 53d street, New York city.



THE MITCHELL SAFETY STEAM GENERATOR.

If You "Go West," Young Man.

To both single and married men in the East who have decided to go West, we would whisper in their ears one thing which, if heeded, will be of value to them. It is this: Avoid a too common error, that of puffing yourselves up with the notion that you are going West to show the natives how to work; that out there you will be looked up to as somebody unusually smart in your line. The Western people estimate a man by what he really is as a mechanic, and do not give him credit for what he is not. True, if you are heralded as a workman of superior skill, they await your coming anxiously, and will lay nothing in the way when you have stripped off your coat and are one among them. But the moment it is discovered that you have been overestimated, all your pleadings about "how they do it East" will avail nothing. Hundreds of instances have come under our observation wherein workmen from the East have gone West inflated with conceit, and, when they were put to the test, were found almost worthless.—*Carriage Monthly.*

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
Over ten copies, same rate, each	2 50

VOLUME XXX, No. 16. [NEW SERIES.] *Twenty-ninth Year.*

NEW YORK, SATURDAY, APRIL 18, 1874.

Contents:

(Illustrated articles are marked with an asterisk.)

DECISION OF AN IMPORTANT PATENT LITIGATION.

For nearly twenty years the monopoly of making glycerin from fatty bodies by the action of highly heated water under pressure has been held by the owners of the Tilghman patent; and various parties, supposing the patent to be valid, have paid tribute to the monopoly. Its days are, however, numbered. The Supreme Court has decided against the patent, in two cases brought against R. A. Tilghman, and the complaints are dismissed. These cases have been carried on for a long time, and have been heretofore decided by the Circuit Court in favor of the patentees. They have involved the employment of much legal talent and the examination of many scientific witnesses. The Supreme Court now reverses the Circuit Court decisions, and requires the plaintiff to pay all the costs. These will necessarily be heavy.

The Supreme Court held that the scientific witnesses who were examined differed so widely in their testimony that they gave little aid to the Court in settling the question. The Court was therefore compelled to depend chiefly upon the comparison of the descriptive portions of the specifications, and came to the conclusion that the results and process claimed by the patentee could not be realized in the manner described in his specification, and that the defendant did not make use of any process covered by the original patent. Among other things it appeared, from the original specification of the inventor, that it was necessary for him, as a matter of safety, to use an apparatus capable of standing the enormous pressure of ten thousand pounds to the square inch, although he expresses the opinion that an actual working pressure of two thousand pounds to the square inch would answer.

The defendant only needed three hundred pounds to the inch to make his process successful.

In so simple a matter as the effects of hot water upon grease, it would seem as if scientific experts ought to be able to give intelligible information to the Court. But in this case they only succeeded in contradicting each other. This is, however, explained by the Court in its remarks as follows:

"Chemical and mechanical experts were examined as witnesses on both sides in about equal numbers. Those called by the complainant expressed the opinion that the patented process may be applied, by the means and in the mode of operation described in the specification, so as to accomplish useful results, and of a character to give commercial value to the new product. On the other hand, those examined by the respondent express opinions widely different, and most or all of them are of the opinion not only that the means and mode of operation described in the patent cannot be so applied that the invention will be practically useful, but several of them state that the attempt to apply it without the exercise of extraordinary precautions must be attended with danger to the operator.

"Most of the expert witnesses made experiments in applying the process, and in the course of their examination were required to state the results of the same as supporting their opinions: but experiments made, as most of these were, with small apparatus, admitting only a small charge of the fatty substance or mixture to be treated, are not entitled to much weight in determining such an issue, however satisfactory the analysis may have been to the chemist who conducted it, as the issue necessarily involves very difficult questions of mechanics as well as of chemistry.

"Taken as a whole, the evidence convinces the Court that the patentee never did succeed in introducing his invention into practical use, by the means and in the mode of operation described in the specification, to such an extent as would warrant the Court in finding that issue in his favor."

In another column we give a brief *resumé* of the findings of the Court.

THE AGASSIZ MEMORIAL.

No more fitting monument of the great naturalist so lately passed away can, we think, be reared than that which already exists in the Museum of Comparative Zöology at Cambridge. Begun by him and for years the cherished work of his life, the collection has grown steadily in extent and value until at the present time its renown is worldwide. It was founded by him, with that spirit of self abnegation which characterizes his life, not as an evidence of his own matchless skill and profound learning in the study of Nature, but as a means of education to others, and as a school to be open to all who might desire to possess themselves of the vast store of information enclosed within its walls.

Agassiz labored as a teacher, but not from books nor of the learning of others, but rather as one who, a preceptor in the truest sense of the term, points out to his pupils the means by which they may question Nature for themselves and obtain their knowledge from her infallible responses. There is a particular appropriateness therefore in the plan proposed that the teachers and the pupils of the country should contribute the funds for a suitable memorial in his honor; and the selection of the Museum above referred to as the object of the contributions, which will serve to establish it on a firm, enduring basis, is the most creditable and suitable that could be made. The money, which it is suggested shall be collected on the birthday of Agassiz, May 28, 1874, is to be set apart and known as the Teachers' and Pupils' Fund of the Agassiz Memorial, and remittances are to be made to the Treasurer, Mr. J. M. Barnard, room 4, No. 13 Exchange street, Boston. Every teacher or scholar who desires to add something, however small, and thus take part in the memorial, is invited to do so. We trust that, without doubt, the sum raised will be sufficient for the purpose intended. However great it may be, it certainly must fall far short of repaying the debt of gratitude which from the country to Agassiz is so justly due.

THE GENESIS OF THE HORSE.

The specialized structure of the small group of animals, of which the horse is the chief member, used to form one of the strongest supports to the theory of specific creation. No other mammals depart more characteristically from the average type, and none seemed to show more positive proofs of design in the adaptation of the modified parts to suit the purposes of man.

Curiously, the same order of animals is now among the best supporters of the theory of evolution. When Cuvier found, in the tertiary beds of the Paris basin, the horse like yet characteristically distinct remains of the *palæotheria* (one of which was figured in the SCIENTIFIC AMERICAN of April 4), they seemed to him to offer to the evolutionists of that day a problem of the toughest sort. By what process could the single-toed horse be evolved from these many-toed predecessors, in the short time that had elapsed since those comparatively recent beds were deposited, and where were the connecting links?

With the progress of geological discovery, other fossil forms, more or less closely allied to the horse, came to light in various parts of the world, and with each addition the line of descent seemed to be more clearly marked. When Darwin wrote his "Origin of Species," enough was known to justify, to his mind, the hypothesis that the peculiar legs and feet of those animals had been produced by a long course of variations from the less specialized forms of former periods; and he expressed the belief that, though they had not been, and might never be, discovered, the intermediate forms had made a continuous series. By his opponents this confident belief, in what no one had ever seen, was taken as evidence only of his abandonment to theory. He had created a system, they said, without substantial basis in fact, then argued the existence of improbable facts, because the theory called for them. "Show us one of those hypothetical connecting links," they replied, "and then your doctrine will have something to stand on."

As in many other instances, so in this, increasing knowledge has proved Darwin right, and his critics wrong. One by one the predicted connecting links have been discovered, to the number of thirty or more, and the horse's pedigree is now practically complete for several geologic periods.

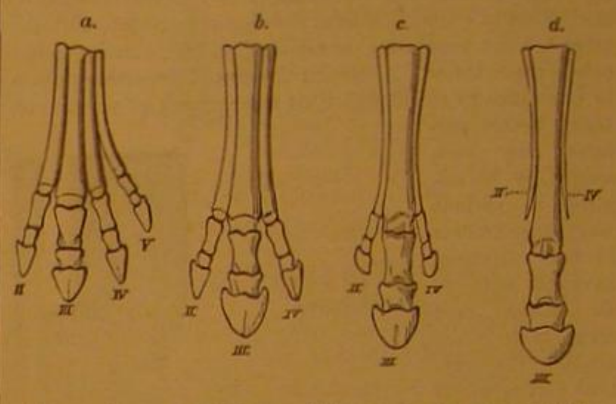
In his annual address before the London Geological Society, in 1870, Huxley reviewed the case as it stood at that time, making out a tolerably complete lineage, connecting the horses of today with the fossil horses of the quarternary period, the *hipparion* of the later tertiary, and the *anchitherium* of the middle tertiary, or miocene period. The process by which the last named had been converted into the modern horse was one of more and more complete deviation from the average form of hoofed mammals. The *anchitherium*, for example, had three serviceable toes on the fore foot. In the *hipparion*, the lateral toes did not touch the ground. In the horse, these supplementary hooflets have disappeared, and nothing remains but splints of bone to hint at the vanished digits. Corresponding changes went on in other parts of the skeleton. Though the specialization was less marked in the *anchitherium* than in the *hipparion* or the horse, yet, as compared with other mammals, it was still great. In view of these facts, the speaker asked whether it was not probable that, if we were to pursue the investigation to the eocene period, we should find some quadruped related to the *anchitherium*, as *hipparion* is related to *equus*, and consequently departing less from the average form.

The intimation has been justified by the discoveries of later years, especially in our own country, where the line of descent appears to be more direct and the record more complete than has been found in the Old World. It reaches clearly to the eocene period; and the remains already known supply—as pointed out by Professor Marsh in the current number of *Silliman's Journal*—every important intermediate form.

"The natural line of descent would seem to be through the following genera: *Orohippus* of the eocene, *miohippus* and *anchitherium* of the miocene; *anchippus*, *hipparion*, *protohippus*, and *pliohippus* of the pliocene, and *equus* of the quarternary and recent."

The development in size, from the earliest form to the latest, was something remarkable. The *orohippus* was about the size of a fox. The miocene forms were as large as a sheep. *Hipparion* and *pliohippus* equalled the ass in hight: while some of the quarternary equine forms rivaled the modern dray horse. Accompanying this change in size, the species of the successive genera exhibit an increasing concentration of the limb bones, and a progressive elongation of the head and neck, with corresponding modifications of skull. The changes in the limbs were steadily toward their simplification by the enlargement of their axial element and the reduction of their lateral ones. As a part of this process, the number of toes was reduced, until the third toe alone remained effective.

The nature of these changes is shown in the accompanying diagram, showing the forefeet of the typical genera of the series.



The *orohippus* had all four digits on the fore foot well developed, with three toes on the hind foot. In the *miohippus* of the next period, the fifth toe has disappeared, or is only represented by a rudiment. The *hipparion*, as already noticed, has three toes, but the outer ones have ceased to be of use. In *equus*, the last of the series, the lateral hoofs are gone, and the digits—except in rare cases, as pointed out by Darwin in his great work on "Animals and Plants under Domestication"—are represented by rudimentary splint bones.

The changes in the head and neck, though less fundamental, steadily approximated the character of the modern horse. It is an interesting fact, adds Professor Marsh, that the peculiarly equine features acquired by *orohippus* are retained persistently throughout the entire series of succeeding forms.

But how came the *orohippus* with its specialized characteristics? As Huxley looked for a less specialized form than *anchitherium* in the eocene, so Professor Marsh infers an earlier ancestor of the *orohippus*, perhaps in the lower eocene, with four toes on the hind foot and five in front, and to this a still earlier ancestor, possibly in the cretaceous period, with five toes on each foot, the typical number in mammals.

Since it is impossible to say with certainty through which of the three-toed genera, that lived together during the pliocene period, the succession came, Professor Marsh makes the interesting suggestion that possibly the later species, which appear generally identical, may be descendants of more distinct pliocene types, as the persistent tendency of all the earlier forms was in the same direction.

THE SUPPRESSED MEMBER AGAIN.

Not long since we noticed some of the manual evils resulting from the customary repression of the left hand, and advocated, on physical grounds, its culture equally with that of the right hand. It seems that there are not less cogent mental reasons for developing the two sides of the body impartially.

It is coming to be well known that mental development is the result of properly directed physical training: that the brain grows in size and power by the varied exercise of the senses and the will in mechanical employments quite as rapidly as by purely intellectual efforts in study or otherwise. It is equally well known to physiologists that most men are one-sided in their heads as in their bodies. The two halves of the brain are rarely developed symmetrically, as may be readily seen in the "conforms" or head measures accumulated by hat makers supplying individual customers. To some extent, the difference in the contour of the two sides of the head may be due to unequal pressure on the nurse's arm, or to the habit of lying chiefly on one side while sleeping, thus causing a permanent displacement of the walls of the skull; but the main reason appears to be our one-sided habit in education.

In his fourth lecture before the Lowell Institute, Boston, of which we print a *resumé* on another page, Dr. Brown-Séquard observes that the study of the facts relating to the brain has led him to believe that "each half of the brain—paradoxical as it may seem—is a whole brain," each lobe being normally competent to perform all the functions of both, not so vigorously, of course, as the two acting together, yet with apparent completeness. Unfortunately, however, the most of us are single brained as we are single handed, and for the same reason. We fail to do what is really needed to give us two working brains. "There is no question, concludes this skillful observer, "that it is our habit of making use of only one side of the body that consigns to one half of

the brain—the right side—the faculty of expressing ideas by speech. If we developed both sides of our body equally, not only would there be the benefit that we could write or work with the left hand as well as with the right, but we should have two brains instead of one, and would not be deprived of the power of speech through disease of one side of the brain."

HOW A GREAT DISCOVERY WAS MADE.

M. Claude Collas, a celebrated French chemist, communicates to *Les Mondes* an interesting paper on how discoveries are made. To M. Collas is due the honor of first recognizing nitro-benzol, or, as it is better known, essence of mirbane, a yellowish oil derived from coal tar, having a very sweet taste and an odor strongly resembling that of bitter almonds, which latter peculiarity has led to its extended use in perfumery. In telling the story of how he found this substance, he says that, during the year 1848, he was engaged in researches with a view of utilizing industrially the quantities of light oil which, having no employment and hence very small value, filled up the cisterns in gas houses. It was at that time worth about one cent a pound. After vainly endeavoring to solve the problem for some time, M. Collas was about to relinquish the task, when it occurred to him to treat the oil in the same manner as gun cotton, that is, with a mixture of monohydrated nitric acid and sulphuric acid. "After the operation, the acids being separated by water," he says, "I was astonished to find at the bottom of my vessel a yellow button. The oil, at first lighter than the water, had become heavier, and hence sunk. I touched it with my finger and rubbed it on my hand, when the strong characteristic odor at once became forcibly apparent. I had found an essence which, at the cheapest, could replace a substance in great demand, and which was worth, instead of five centimes (one cent), fifty francs (ten dollars), a pound."

This discovery of mirbane was, however, only the prelude of the greater one, subsequently made, of the magnificent colors which could be derived from the aniline obtained by its deoxidation by means of nascent hydrogen evolved from iron filings and acetic acid. In 1856 Perkin obtained from aniline the beautiful violet color known as mauve, and since then the dyes thus derived have been produced to such an extent that their value to industry is almost beyond calculation. The little button of mirbane, however, in the modest laboratory of a Parisian apothecary, was the germ from which the whole grand series sprang.

There seems to be a kind of fatality about great discoveries which brings them forth in its own time. Men stumble across valuable ideas, and learn important truths too soon, which lie dead during their life time, only to be appreciated by the world after their death. The history of arts and sciences abounds in examples. Faraday, in 1825, found benzol in the tarry residues of gas works, but that illustrious chemist obtained neither fame nor profit for his discovery, which would doubtless have remained buried in the archives of the British Royal Institution until the attention of the scientific and industrial world was drawn to the chemical properties of the substance, almost forty years later. Again, it often happens that discoveries escape those who are, by accident, placed in the very position to seize upon them. M. Collas cites, as evidence of this, the case of a French chemist who, in 1845, made a yellow dye for silk by the action of nitric acid on coal oil. The peculiar odor of the mirbane, which he must have produced, escaped him, and he failed to recognize the new substance which he had obtained.

THE ORIGINATION OF SCREW PROPULSION.

In our columns of correspondence this week is an interesting letter from Mr. C. H. Delamater, proprietor of the well known Delamater Iron Works in this city, relative to the subject of the first practical application of the screw propeller to marine propulsion. Mr. Delamater considers that the practical establishment of the art is due to Captain John Ericsson, and tacitly takes exception to the reference in our recent biographical notice of Sir Francis Pettit Smith, in which we ascribed a large share of the honor, of introducing the propeller, to that inventor. The subject is a very interesting one, and the issue raised renders a slight historical retrospect necessary to the formation of an intelligent opinion.

It is certain that, for many years previous to the date of either Smith's or Ericsson's patents (1836), experiments had been made proving that vessels could be propelled through the water by means of a screw. But the inventors were either deficient in persistency of effort, or they found that, as is very often the case, the times were not ripe for the introduction of so radical an innovation. It is, therefore, a fact that, when Smith and Ericsson took up the subject, no vessel of the kind was in actual employment; and so far as past experiments extended, the simple fact of their abandonment, or rather non-continuation, held out a prospect for future inventors far from encouraging.

As our correspondent states, Ericsson's patent was obtained about a month and a half subsequently to that of Smith, but while the first trial of Smith's boat was made in May, 1836, immediately on the granting of protection, Ericsson's experiment did not take place until April 30, 1837. The Ogden, built by Ericsson in the latter year, was undoubtedly successful, but Smith's first vessel was equally so, for she made a voyage of 400 miles, and averaged a speed of 8 knots per hour. Hence, while both ships proved the value of the invention, Smith's was undoubtedly first in so doing, in point of time.

In 1838 Smith's successful operation of his plan before the Lords of the Admiralty resulted in the building of the Archimedes, and the making of a long voyage around England and to various points of Europe. In 1840 and 1841 the Rattler was built for the navy, and in the same years merchant vessels were constructed at Newcastle, Londonderry, and Hull. These ships were fitted with double threaded screws set in the dead wood. Ericsson's vessels, however, had the blade screw, similar to that now employed. It will be seen that the course of the two inventors was very nearly parallel up to 1839, when Ericsson built the Stockton and started her across the Atlantic. The successful completion of that voyage resulted in the purchase of the vessel by the Delaware and Raritan Canal Company, and her subsequent use as a steam tug in the Delaware and Schuylkill rivers. While Smith was comparatively successful at the outset in gaining the support of the British authorities, Ericsson was not so. In fact, however, of heavy odds, he was the first, as our correspondent states, to place a boat in actual commercial use in England, equally the first similarly to introduce screw propulsion in America, and also in France. Bourne, in his "History of Screw Propulsion," in summing up the respective merits of Smith and Ericsson, leans to the side of the former in ascribing the weight of praise. Ericsson, he says, had the advantage of being a skilled mechanical engineer, while Smith was merely an amateur; but in almost the following sentence he renders the effect of this assertion nugatory, by stating that Smith accepted expedients known to engineers as his starting point, and hence submitted to the use of gearing in bringing up the speed of his screw, while Ericsson "threw the dogmas of the engineers to the winds and coupled the engine immediately to the propeller." Smith, however, showed great genius and resolute perseverance, and, so far as simple priority of time is considered, it is true that he maintained the lead; but the credit for this, in our belief, falls far short of that due to Ericsson for his extended practical applications of the system. Both courses of the two inventors were remarkable for successful issues. It may even, says Bourne, be probable that the exertions of either would have sufficed to introduce the screw into practical operation, but their simultaneous prosecution of the same object was not nevertheless a waste of power. The progress of each, therefore, was stimulated by that of the other, and their united force acted more powerfully upon the public, and procured for the screw a readier and wider introduction than could otherwise have been expected. Neither invented the screw, but both revived it.

While, however, opinions may be and probably will be divided as to the question above discussed, so far as Ericsson and Smith are concerned, a careful search through various authorities reveals the fact that to neither is justly due the credit of first practically demonstrating the ability of screw-propelled vessels to make sea voyages, a merit which Mr. Delamater seems to claim for Ericsson. That honor is due to Robert L. Stevens, of Hoboken, one, says Mr. Scott Russell, to whom "America owes the greatest share of her present highly improved steam navigation. Mr. Stevens' father, Colonel John Stevens, was associated with Livingstone in his experiments, previous to the connection of the latter with Fulton, and had persevered in his experiments during Livingstone's absence in France.

Fulton's boat, however, was first ready, and obtained an exclusive privilege from the State of New York. Being excluded from the Hudson and all waters of the State, Stevens conceived the bold idea of taking his steamboat by sea to the Delaware. He did so, and thus not only demonstrated the possibility of screw propulsion, but he used a bladed screw in the open sea. The engines and screw used are still in existence. To Stevens, then, is due the credit of being first in the field to prove the practicability of the system; to Smith that of first, after a long period of years, reviving it and re-demonstrating its value; while to Ericsson, finally, is due not merely also its revivification, but in addition the first practical application of screw propulsion to the necessities and requirements of commerce in three great countries.

ARTESIAN WELLS.

A recent question which appeared in our column of answers to queries, regarding the greatest depth attained in the boring of artesian wells, has elicited some interesting letters from our correspondents. We find it necessary from the information given by one writer to revise the statement that the well in Louisville, Ky., 2,086 feet in depth, is the deepest in the country, as the bore sunk for Belcher's sugar refinery in St. Louis has penetrated 2,200 feet, while that excavated for the insane asylum in the same city has reached the enormous depth of 3,843 feet, or in that locality, 3,000 feet below the level of the sea. This would give a water pressure at the bottom of 1,293 pounds to the square inch. Another correspondent, however, tells us of a bore in the old world which is deeper than the one last mentioned by several hundred feet. It is situated in the village of Speren burg, some twenty miles from Berlin. The government, it seems, in order to obtain a supply of rock salt, began the sinking of a shaft 16 feet in diameter. At a depth of 280 feet salt was reached, but excavations were continued, the diameter being reduced to 13 inches for 4,194 feet, at which point work was discontinued, the bit still remaining in the salt deposit, which thus exhibits the prodigious thickness of 3,907 feet.

The supply of water from an artesian well is practically inexhaustible. At Aire, in Artois, France, a well, bored over a century ago, has since then flowed steadily, the water rising 11 feet above the surface at the rate of 250 gallons per minute; and at Lillers, in the same country, one well has yielded a continuous steam since the year 1126. This fact, coupled with that of the large amount of water delivered, renders the artesian well of the greatest value for the irrigation of desert plains. Up to the present time, some seventy-five shafts have been sunk in the Desert of Sahara, yielding an aggregate of 600,000 gallons per hour. The effect of this supply is said to be plainly apparent upon the once barren soil of the desert. Two new villages have been built and 150,000 palm trees have been planted in more than 1,000 new gardens. Water, it is stated, is reached at a very slight depth, in some cases hardly 200 feet.

The success attending the efforts of the French engineers in Africa has led to the excavation of numerous wells in the dry alkali plains along the line of the Union Pacific Railroad. There is a desolate and arid section, extending along the Bitter Creek valley for a length of about 120 miles, and varying in width from 20 to 50 miles. Since the building of the road, water trains have been running over the whole distance, supplies being obtained from the Green and other rivers. The cost of running these trains was about $80,000 a year. It became therefore absolutely necessary to produce some other means for getting water for the locomotives, and to the miners working in the coal mines along the route. The only relief available was in boring artesian wells, and a correspondent of the *Tribune* says that, last year, six were begun. The subsequent success has been all that could be desired. The first well is at Separation, 724 miles from Omaha, and the last one is at Rock Springs, 832 miles. Another is in progress at Red Desert. The well at Rock Springs is 1,145 feet deep. There are layers of clay mixed with sandy loam, clear sand, and water-worn pebbles (in which the supply of water is usually found), layers of sandstone of varying degrees of density, and beds of sulphate of alumina and iron chemically combined, resembling the peculiar bluish clay of some of the surface soil. The Rock Springs well rises 26 feet above the surface, discharging at the latter 960 gallons per hour. The water in the various wells, it is said, sometimes holds in solution as much as 280 grains of mineral salts to the gallon, and hence produces undesirable effects on steam boilers. It is believed, however, that for agricultural purposes these salts could, with plenty of water, be washed out, when the result would be a remarkably productive soil, which would be as valuable as guano. A flowing well furnishing 1,000 gallons per hour will water a section of 640 acres.

An artesian well, we learn, is also in progress at Denver; it is already down 800 feet, and water has risen nearly to the surface. The government has appropriated $10,000 to sink one at Fort D. A. Russell, and it is now nearly 900 feet deep. A well 1,000 feet deep costs about $10,000; and out on the plains, this outlay would make a most productive farm and might be made the nucleus of a stock range of thousands of acres.

SCIENTIFIC AND PRACTICAL INFORMATION.

SOUTH AFRICAN DIAMONDS.

A note on the diamonds of South Africa was communicated to the geological section of the British Association, during its recent meeting at Bradford, by Professor Tennant. He said that the first diamond arrived in England from South Africa in 1867. It weighed 21 carats. Last year there was one of 110 carats, and this year one has been brought over which in its present rough state is larger than the Koh I Noor itself, and which when cut down will probably be not much smaller than that celebrated gem. He gave a history of the Koh-I-Noor, showing how it has been reduced from its original weight of 787 carats to 102 carats, its present weight. It is a great mistake, said the speaker, to suppose that, because the diamond is the hardest substance known, it is not easily fractured. He showed by means of a diagram the fractures that had been made in the Koh I-Noor, and remarked that the diamond is in fact one of the most brittle stones we know of.

ACTION OF LIGHT ON THE ELECTRIC RESISTANCE OF SELENIUM.

M. Sale, in experimenting on the electric conducting power of selenium, which varies with the degree of light to which it is exposed, as described on page 193 of our volume XXVIII, says that, after careful experiments, he concludes that the effect of the light is not produced by the chemical rays, since the maximum of diminution is observed in the maximum point of the red rays. Neither is the change in the resistance due to an augmentation in the temperature. While the effect also of the light is sensibly instantaneous, the return of the selenium to its normal resistance after the light is cut off is not so rapid. Finally it appears that there exists in the red rays, which are the most intense in heating properties, a power which, without modifying the temperature, changes the molecular conditions of the particles.

A NEW SIGN OF DEATH.

At the moment of death, there become disengaged from venous blood certain gases which are normally confined therein, and which form a pneumatosis or swelling of the veins. This action in the veins of the retina, says M. Bouchut, is easily appreciable by the ophthamoscope, and constitutes an immediate and certain sign of death. The pneumatosis is indicated by the interruption of the column of blood, and is comparable to that observed in an interrupted column of a colored alcohol thermometer.

T. W. Y. says: I recently witnessed the application of a known medical fact in an unusual way, namely: the vaccination of a dog to prevent distemper. The pus was inserted in the ear, when the pup was only a few days old, and the effect was about the same as when the operation is performed upon a child.

NEW ELECTRIC DISENGAGING GEAR FOR KNITTING MACHINES.

We present herewith diagrams of a novel and ingenious application of electro-magnetism to the knitting machine, the object being to stop the loom instantly and automatically whenever a thread breaks, is injured, or is of abnormal thickness, or when a needle becomes bent.

The wheel, A, in Fig. 1, receives motion and transmits it by friction to the pulley, B, which, in turn, communicates, by means of a belt, with the driving pulley, D, of the machine. Pulley, B, is journaled on the rod, W, and the latter may be moved from right to left, or *vice versâ*, so as to throw said pulley into or out of gear with the wheel A. E E are jointed arms connecting with the rod, W, and also at their point of junction with another rod, F, G is a lever which oscillates about its center of figure, communicating, as shown, at one end with F, and at the other with a plate, Q. K is an electro-magnet, and L the armature. As represented by the dotted lines, the rock lever, G, is supported by the upper portion of the latter. If, therefore, a current be sen through the magnet, the armature is attracted and drawn away from under the lever. The latter, being overbalanced by the plate, falls so that the plate enters between the wheels, A and B. These, rotating in opposite directions, seize it and drag it violently between them, thus supplying, for an instant, sufficient power to draw the rod, W, to the left, through the intermediation of the lever, G, and rods, F and E, and thereby throw the wheel, B, out of gear.

In order to arrest the motion of the machine promptly, the last mentioned pulley takes against a block, shown to the left, which is cut out and lined with india rubber to form a brake shoe. The effect of the spring, represented at M, is to so hold the hinged piece, when the lever is located as shown in the dotted lines, that the contact of wheels, B and A, is close. When the lever is in the other position, the tendency of the spring is to force the wheel, B, against its shoe. The spring serves to regulate the pressure in both instances.

From the above we think the direct application of the current to the mechanism will be rendered clear. It now remains to examine how the action of the magnet is governed by the broken threads or bent needles. For the latter purpose there are two separate appliances, one relating to the needles, the other to the thread. The latter, Fig. 2, is extremely simple. Each of the four threads used in the knitting passes over a pair of little grooved pulleys, P, between which it is horizontally extended. Between the pulleys and riding the thread is a bit of bent wire, the ends of which enter cups containing mercury. To the latter the battery wires pass. So long as the thread is whole and even, the wire is held up above the mercury. If, however, it becomes broken or very thin, the wire is dropped into the quicksilver, establishes a circuit, and the operation already described takes place.

Fig. 3 shows the appliance which will stop the machine if a needle become bent. The needles are horizontal and radiate around the vertical axis of a circular frame. They pass between two small plates, V and V', placed in a vertical plane and pivoting around horizontal axes, *b b*, *c c*. If a needle gets out of line to the top or bottom, it catches against one of these plates, and, if the bottom one, swings it forward. In its movement the latter strikes an appendage, *m*, carried by the other plate, and thereby oscillates a hammer, M, attached to the upper of the pair which, falling between two mutually isolated springs, establishes a circuit.

In Fig. 4 is shown a side view of the same device, which is actuated in precisely the same manner by an abnormal thickness of the thread.

In a machine using four threads, there are, therefore, the mechanical disengaging apparatus shown in Fig. 1, four of the devices in Fig. 2 to show the breakage of a thread, one to show abnormal thickness, and one for bent or badly placed needles. Through this combination, the *Revue Industrielle* says, one man can easily attend to four looms. The apparatus, we learn, is in use in a large factory near Montargis, in France. A Gramme electric machine is here substituted for the battery, and supplies a current sufficient for 150 looms.

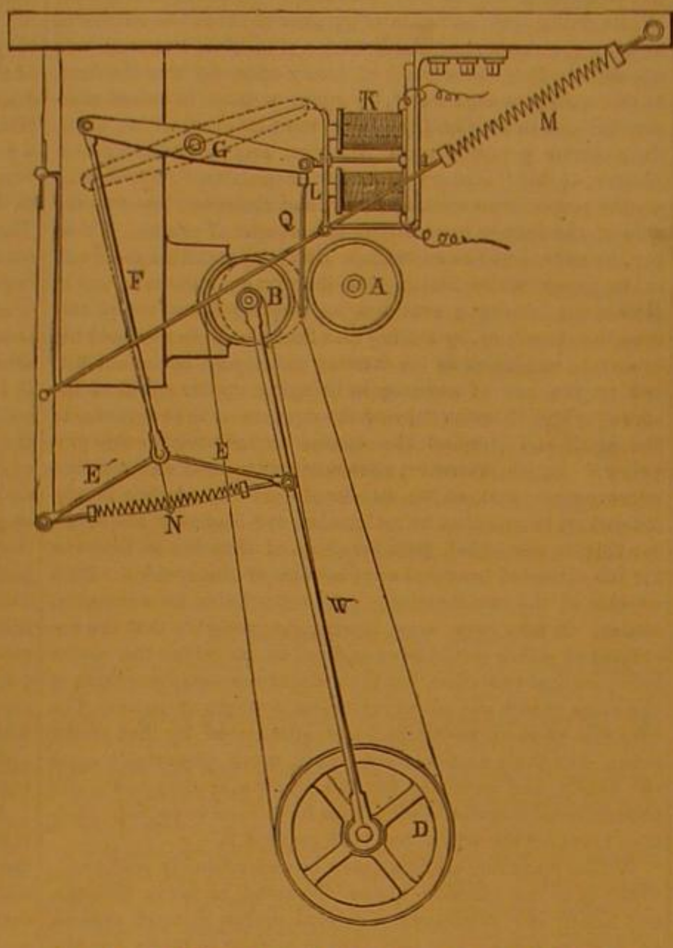


Fig. 1.—ELECTRIC KNITTING APPARATUS.

Fig. 2.

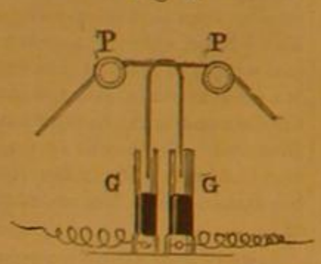


Fig. 3.

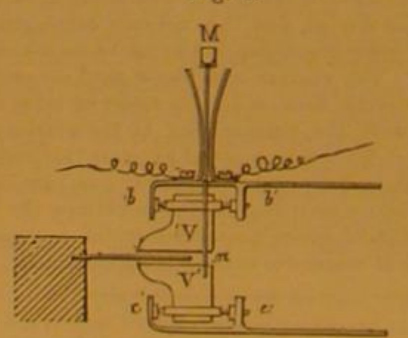
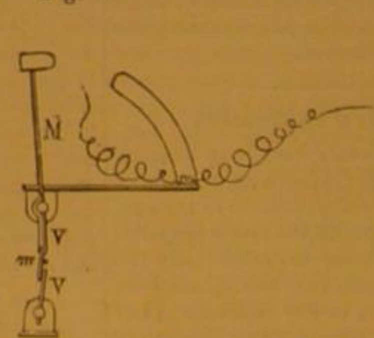


Fig. 4.



Phosphate of Ammonia for Purifying Sugar.

Kuhlmann's process of neutralizing the alkalinity of sugar juice by means of phosphate of ammonia, discovered some twenty-four years ago, is now being largely applied in France, and, to meet the demands, a large factory for the production of the phosphate has been established at Asnières.

The rich mineral phosphates are reduced to powder, and dissolved in very dilute sulphuric acid (5° Baumé). The acid liquor, clarified by repose and having the excess of sulphuric acid removed from it by carbonate of baryta, is concentrated at 20° Baumé, and then neutralized by caustic ammonia. Finally, the resulting alkaline solution of phosphate, separated from the insoluble deposits of sulphate of lime, etc., is mixed with a fresh quantity of ammonia in order to produce a tribasic phosphate, which has the advantage of being little soluble. Water is removed by pressure, and the substance is immediately packed in barrels. The deposits of phosphates of lime, iron, aluminum, etc., dried, constitute an excellent fertilizer, readily assimilable.

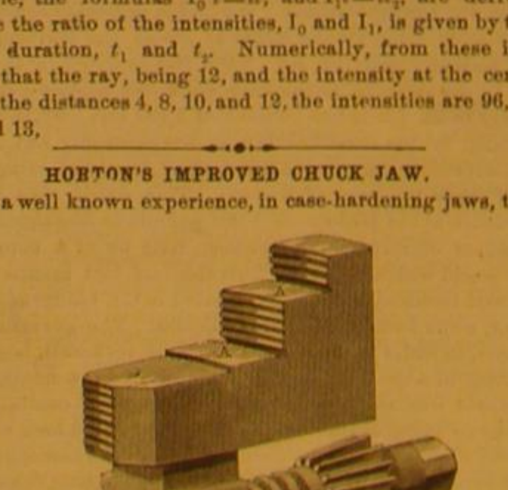
The Absorption of Chemical Rays by the Sun's Atmosphere.

The absorption, by the solar atmosphere, of chemical rays of high refrangibility, has recently been studied by M. Vogel. The method employed is that devised and described by Bunsen and Roscoe, in their photo-chemical researches, and is based on the principle that, between sufficiently extended limits, the equal products of the luminous intensity by the duration of the insolation correspond to equal darkenings on chloride of silver paper. As applied by M. Vogel, the investigation consisted in obtaining a scale of photographic tints, due to the same intensity, with differing durations of insolation, and then comparing with these tints those of a photographic image of the sun on the same chloride of silver paper.

Designating by I_0 and I_1 the intensities of the two points of the sun, t the duration of insolation, i the intensity of light acting on the scale, t_1 and t_2 the duration of insolations corresponding to the two tints on the scale found to be equal to those of the two points on the sun: according to the above principle, the formulas $I_0\, t - it_1$ and $I_1 t - it_2$, are derived, whence the ratio of the intensities, I_0 and I_1, is given by that of the duration, t_1 and t_2. Numerically, from these it is found that the ray, being 12, and the intensity at the center 100, at the distances 4, 8, 10, and 12, the intensities are 96, 77, 51, and 13.

HORTON'S IMPROVED CHUCK JAW.

It is a well known experience, in case-hardening jaws, that the relative positions of the metallic particles change more or less, so that it is almost impossible, without grinding, to hold work perfectly true. To overcome this difficulty, the new patent jaw, herewith illustrated, has been devised, the principal peculiarity of wh'ch is a raised seat A, which is formed on the face of the jaw on which the work rests while turning. Grooves or recesses are cut at the corner of the bite and face of the jaw, rounding the said corner, and thus allowing of the use of a Tanite or other emery wheel, by which the raised seat may be accurately ground. The work, therefore, rests upon the seat, A, and the bite of the jaw only assumes, it is claimed, a perfectly true position thereon as an equal pressure is exerted on the same. Another advantage of the groove is that a grinding wheel without a perfect corner is enabled to work accurately, as the edge of the wheel projects beyond the raised part into the recess formed by the groove. The improved jaw is used in the Horton lathe chuck, and appears to be a useful and valuable device.



Patented August 20, 1873. For further particulars address the E. Horton & Son Company, Windsor Locks, Conn.

New Mode of Noting the Direction of the Wind at any Altitude.

M. Waldner, professor of mathematics at Osthofen, Germany, while engaged in examining the solar spots some years ago, had his attention attracted to an immense number of small white particles which suddenly came into view on a casual change in the position of his telescope. He at once began investigations, in order to discover their nature; and after continuing his researches for some three years, he found that the bodies appeared like snow flakes which floated, like the clouds, in aerial currents, and existed at differing altitudes. He finally determined them to be ice crystals which were driven by the winds at the same velocity as the cirrous clouds.

Mr. J. Francis Anderson has recently devoted his studies to this subject, and he explains the presence of the particles by the fact that the vapor of water tends to rise in the atmosphere. As it ascends it meets cold strata of air, condenses into water, and then freezes into solid bodies which are simply snow flakes. In the lower portions of our atmosphere, however, there are other luminous corpuscles which principally consist of organic material. These are easily observable by allowing a beam of sunlight to enter a darkened room, or may be seen out of doors by simply cutting off the disk of the sun with an opaque object. By means of these bodies in the inferior strata, and the snow crystals in the upper regions of air, Mr. Anderson considers that the direction of the wind may be determined at any altitude, even during a cloudless day. He proposes simply to adjust a telescope so as to give distinct vision at two, three, or more thousand feet, and to note the direction and rapidity of the particles, which will then be clearly seen as they cross the field of view. This will give the direction of the current which carries them along, and its approximate velocity for whatever altitude the instrument may be adjusted for.

Private Fish Culture.

A writer in the New York *Tribune* says that one of the principal causes why fish culture is not undertaken by persons of moderate means is the supposition that large ponds or rivers are necessary to a successful business. A farm, however, of fifteen or twenty acres, with a small pond or two, natural or artificial, supplied with water from a river or from perennial springs, would be all that could be desired. Many kinds of fish, and especially leeches, may be raised with considerable profit. Of leeches we now import nearly two millions annually from Europe, at a cost of about $100,000. One locality, especially well adapted by Nature for the business, is on the east side of the Passaic river, opposite the Newark water works, on land sloping to the river. Besides dwellings, outhouses, barns, orchards, etc., there are two ponds supplied with never-failing springs of sweet water, and the bottom is the right kind for trout, crayfish, or leeches. The Passaic river would furnish food in abundance for the young fish. A place having so many natural advantages will probably be utilized.

One reason for mentioning the subject of raising leeches is that the supply from all parts of Europe, except Brittany, is gradually failing because of the draining of the marshes of the Danube in Sclavonia and European Turkey, all native places of the leech.

Muscarin.

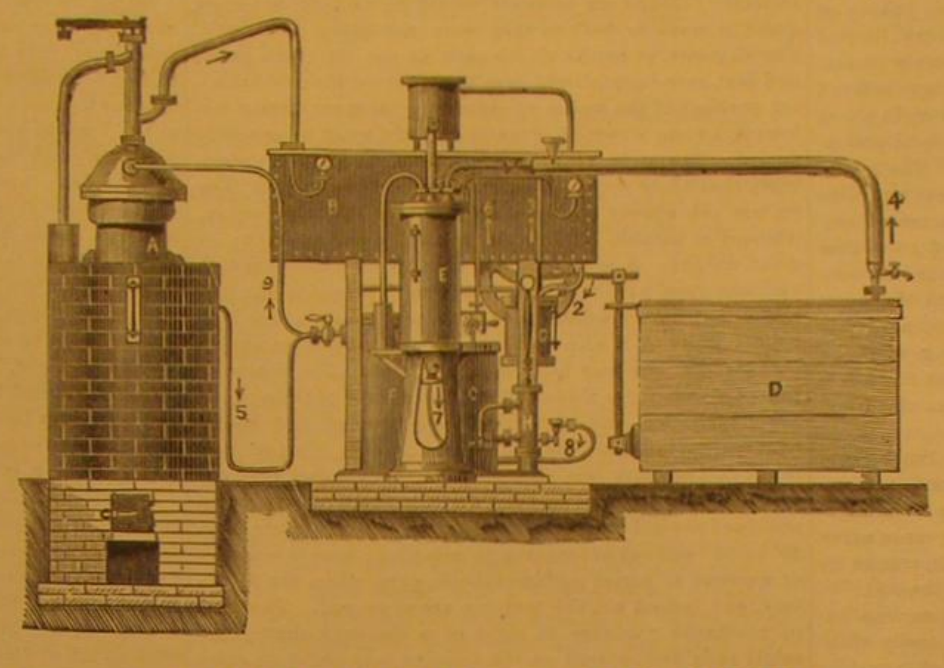
Muscarin is a poisonous alkaloid, extracted by alcohol from a species of mushroom (*amanita muscaria*). The most interesting feature of muscarin is its antagonism to atropin. These alkaloids neutralize each other's action on the system so perfectly that each can be used as an antidote in case of poisoning by the other. The pupil of the eye, enlarged by atropin, is contracted by muscarin. The depression of temperature caused by muscarin, injected beneath the skin, is counteracted by a similar application of atropin; and the heart of a frog, that has ceased to beat from half an hour to an hour, under the influence of muscarin, has been restored to activity by atropin. Possibly quinine sustains a similar relation to the poison inducing intermittent fever that atropin does to muscarin.

THE AMMONIA ICE-MAKING PROCESS.

We present herewith an engraving of an apparatus for making ice and producing cold, exhibited by Messrs. Vaas and Littmann at the Vienna Exposition, in which, as in the well known system of Carré, the vapor of ammonia is the congealing agent. The normal volatility of ammonia, in both machines, is increased by removing the vapor as quickly as it forms. The apparatus consists of the boiler, *a*, condenser, *b*, gasholder, *c*, ice box, *d*, the absorption cylinder, *e*, the temperature exchanger, *f*, the cooler, *g*, and the pump, *h*. The boiler, *a*, is first half filled with solution of ammonia, which is caused to evaporate by the application of heat, and the gas thus formed is forced through the pipe, *i*, into the worm pipe of the condenser, *b*, and from there through the pipe, 2, into the gasholder, *c*. From the gasholder the gas is conducted by the pipe, 3, to the valve on the top of the ice box, *d*, which is in connection with the worm pipe inside the ice box.

At the commencement of the operation this valve is kept shut; but as soon as the gas has attained a pressure of eight to ten atmospheres, it is slightly opened. The gas, on its passage through the worm pipes of the condenser (which are always surrounded by cold water), is condensed, and the liquid passes through the valve to the worm pipes in the ice box, where it again commences to evaporate, taking up at the same time heat from the solution of chloride of calcium, in which the worm pipes in the ice box are submerged. This absorption of heat so lowers the temperature of the solution of chloride of calcium as to render it capable of turning the fresh water contained in the ice cases to ice.

The ammonia, which has been volatilized again in the pipes of the ice box, passes through the pipes, 4, to the absorption cylinder, E, and, at the same time, the weak solution of ammonia, which has lost the gas by heat, passes out of the boiler by the pipe, 5, into the exchanger *f*, through the cooler, *g*, into the absorption cylinder, *e*, where it absorbs the gas which comes from the ice box, and from these it is pumped back by the pump, 7, into the boiler to be again heated. When the machine is working the valve on the ice box must be opened just sufficiently far to allow the gas to escape, but not to allow the pressure to fall, and the valve between the cooler and the absorption cylinder must be so regulated as to admit the proper quantity of the weak solution from the boiler as will absorb the gas from the ice box. A machine for making 200 lbs. of ice per hour requires a two horse engine to drive it.—*Iron.*



IMPROVED AMMONIA ICE-MAKING MACHINE.

IMPROVED STEAM PUMP.

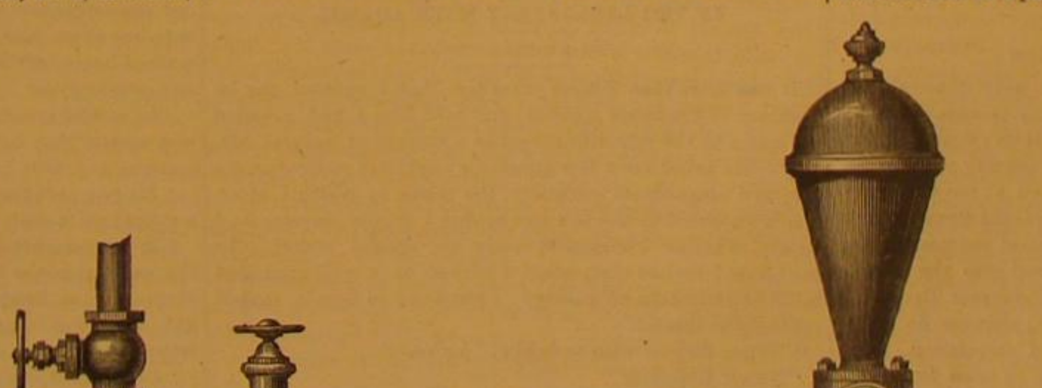
The many and diversified uses of the Niagara pump are so well known that is hardly necessary to allude to them in any detail. Briefly, the machine will pump water—hot, cold, fresh, salt, clean, or muddy—sirups, beer, acids, molasses, or other heavy fluid. It is especially adapted to the feeding of steam boilers and supplying of tanks, and is useful in sugar refineries, tanneries, oil works, and manufactories generally. Finally, it is well suited for the drainage of mines, quarries, low lands, and for wrecking purposes.

The main feature of the improved form of the machine, as represented in our engraving, is the simple steam valve. This appliance, as formerly used in the pump, consisted of an auxiliary slide valve and steam cylinder, and a slide valve operated by the latter. At present this has been simplified so that only one circular balanced valve is employed, working on centers packed with rings, and operated directly from a tappet on the main piston rod. The apparatus can be run so slow that the motion of the piston rod will be hardly perceptible, and then again as swift as desired, without fear of having the piston strike the heads of the cylinder.

By a simple device, the steam operates the valve when running slow; and when working fast, the momentum of the piston opens and closes the valve; so that at any speed there will be invariably a full port of steam for the return stroke before the piston arrives at the end of its course, the connection between piston and valve being direct.

The parts are cast separate to provide for the replacing of breakages, which may occur by accident or frost, at small expense, and the makers add that the fewness of the various portions enables them to furnish a machine of excellent material and the best possible workmanship at a low figure.

For further particulars address Messrs. Hubbard & Aller, 93 to 97 Pearl street, Brooklyn, N. Y.



THE JOHN HARDICK NIAGARA STEAM PUMP.

DR. BROWN SEQUARD ON NERVE FORCE.

Dr. Brown Séquard has recently concluded the admirable series of lectures which he has been delivering in Boston. Some weeks since we gave a *resume* of the initiatory discourses, on the subject of nerve force; and we continue our abstracts, with reference to the very curious and instructive topic of

NERVE DERANGEMENTS.

A great many disorders in our system, says Dr. Séquard, may result from the stoppage or arrest of the activity of certain cells of gray matter. Tetanus or lock jaw is a convulsive affection which can be checked immediately by certain influences coming from certain parts of the system. When produced by strychnin, insufflating air into the lungs stops the convulsions; a similar result is caused by carbonic acid or a current of galvanism. In brief the mechanism of the arrest of convulsions in tetanus is just the same as the mechanism of the arrest of the heart in the case of galvanization of the *par vagum* of the neck. Similarly an irritation of almost any part of the skin may prevent epilepsy. In the case of anaura starting from a limb, a ligature around the latter (by irritating the nerves of the skin and sending a current toward the brain, changing the state of the cells there) serves to prevent an attack. There are many cases of epilepsy that have been cured by accidental injury.

Another kind of stoppage or arrest of the activity of cells consists in the arrest of the morbid activity of the brain. In cases of insanity, a large number of patients have been cured suddenly by means of irritation of the skin, that was either accidental or employed by a physician. A patient in a lunatic asylum met another one who struck his head and broke the cranium on the right side. The brain oozed out; a good deal of it was lost, and the patient was cured of his insanity and epilepsy. Other affections of the brain, such as amaurosis or paralysis, may be cured suddenly, sometimes without any cause that we can find, but with good ground certainly to believe that an irritation has acted which has produced a change in the cells of the brain and dismissed their morbid activity. For there are clear cases in which those affections have been cured by such irritation. Those alterations of cells that were producing an arrest of the power of sight or paralysis have been submitted to an irritation of parts of the skin or of some viscus, and the irritation, going to the morbid part and producing a change in the activity of those cells, has cured the disease.

Referring to paralysis, the lecturer said that the malady is considered to result from a cessation of activity of a part of the brain from disease, destroying some particular portion. According to this view the destruction of the part of the *crura cerebri* or *pons varolii* necessarily should produce a paralysis in some muscles of one half of the body: but such is not the case, for the paralysis may exist in the same side of the body where the disease is or on the opposite side, or the *pons varolii* may be destroyed without any paralysis at all supervening. Paralysis really appears only from an irritation which starts from a place where the disease is and acts upon parts at a distance so as to modify them.

THE DOUBLE BRAIN.

One half of the brain is sufficient for all the functions of the two halves of the organ. There is no question that it is our habit of making use of only one side of the body that consigns to one half of the brain—the right side—the faculty of expressing ideas by speech. If we develope both sides of our body equally, not only would there be the benefit that we could write or work with the left hand as well as with the right, but we should have two brains instead of one, and would not be deprived of the power of speech through disease of one side of the brain.

The nervous system is not essential to the existence of muscular contraction or irritability. Professor Bernard, of Paris, has found that woorari poison affects the motor nerves in muscles so that the conductors which unite the brain with the muscles become paralyzed while the muscles remain active. Dr. Séquard, however, doubts that the woorari acts upon the parts within the sheath of the muscular fibers, and hence nerve power may possibly remain therein.

SEPARATION OF A NERVE.

It is well known that, if a nerve has been divided, after four days it loses its power. The muscles, however, remain perfectly active, and we can produce contraction in them. Unfortunately, here, also, there is an element of nerve tissue which is inside of the nerve sheath, and it is not known whether it has lost its power or not. In the case of two decapitated men, the lecturer said that he had made an experiment of cutting off the arms. He found, after thirteen and a half hours in one case and fourteen hours in the other case, that all signs of life in the limbs had disappeared. Up to that time, either galvanism or a shock produced by a blow with his arm or a paper cutter caused the muscles to respond to the irritation. He then injected the blood of a man into one of those arms, and the blood of a dog into another. In both cases local life was restored in those arms. The muscles became irritable again, and the strength of contraction was extremely powerful. Indeed, in the arm in which the blood of the man had been injected, the power was immense. It was greater certainly than during life. There was therefore a return of muscular irritability after it had disappeared and nervous excitability had not come. The nerves remained quite dead. Therefore it seemed quite clear that the muscular irritability depended upon nutrition by blood and the oxygen in it. The blood injected was richly charged with oxygen and that was the reason why the muscular irritation became so great.

Long ago, said the speaker, I had discovered that light can affect the iris of the eye, even when it has been removed from the body. The eye of an eel had been removed from the body for sixteen days and kept at a temperature of about 36° to 40° Fah. But he found that, although the eye was in almost complete putrefaction, the light still acted as an irritant of muscular fibers. There it was impossible to admit that there was nervous action. The muscular fibers themselves were considerably altered. Still they acted.

THE HEART AND THE NERVOUS SYSTEM.

It has been questioned whether the thermical movements, such as that of the heart, depend upon the nervous system. It has been found that, 48 hours after the heart has been separated from the chest of a dog, it continued to beat. There is recorded the case of a man at Rouen in whom the heart

was found to beat for thirty-six hours after the death of the body by decapitation. There is therefore a possibility of long persistence of life in those organs. And the great cause why we see those organs stop at death so quickly is that the phenomena of arrest of their activity have taken place at the time of death.

MOTION WITHOUT NERVE FORCE.

A very singular fact is that movements, voluntary in appearance, can exist without nerve force, and Dr. Séquard related the following remarkable case:

"I was called," he says, "to see a patient who was indeed no more a patient; he had died before I reached him. I was told that he was making certain movements, and his family and friends all thought him alive. I examined him and found that he was certainly dead without any chance of returning to life, at least according to our very limited knowledge. I found that he was performing slowly movements that he had been performing with great vigor before I came. He would lift up his two arms at full length above his face, knit the fingers together as in the attitude of prayer, then drop the arms again and separate them. The movements were repeated a good many times with less and less force, until at last they ceased. There was no trace of sensibility anywhere, no reaction to the operation of galvanism or burning anywhere, as I had to make use of these means to satisfy the family. A needle was pushed into the heart as there was no danger from this experiment, a certain physiologist having, for the mere sake of showing what the Japanese had done that way, introduced one many times into his heart. The needle introduced showed that the heart of my cholera patient did not beat."

Dr. Dowler of New Orleans has amputated limbs from cholera patients after death, and has found that the members amputated continued to move after having been separated from the nervous centers; so that, if there were nerve force acting, then it was nerve force existing in trunks or nerves and not the nerve force that comes from the will.

The lecturer then proceeded to give several curious instances of movements apparently voluntary but really without the control of the person. One case was of a young lady in Paris who every Sunday at ten o'clock ascended a bed, and, putting her back on the top of the edge or border of the bed, took an attitude of prayer and began to address prayers to the Virgin Mary. She continued in that attitude, fixed like a statue, except that her chest continued to move and her heart to beat; her lips were giving utterance to sounds. All the other parts of the body were absolutely motionless. This was a feat that you could not perform on level ground. Standing rigidly on tiptoe, even without shoes, is an utter impossibility, beyond a short time. Sometimes a movement forward is made, sometimes backward, and often rotary motions take place. Two cases of the last mentioned class happened in persons who exhibited their strange contortions standing on their heads. A girl who had received a severe blow on the head had a rotary movement on that account. She knew well what was the matter with her, and had come to be able to prevent any bad effect of it. If she wanted to go in a contrary direction, she turned herself in a direction almost at right angles to it, and the irregularity of her movement brought her to the right place.

Passing to another branch of his subject, Dr. Séquard proceeded to show that the

CENTRAL NERVOUS SYSTEM

has power to act on all regions of the body through the medium of the vaso-motor system, which is capable of diminishing the size of blood vessels and thus regulating circulation; also, that a suspension of the activity of the vaso motor nerves produces a passive dilatation of the blood vessels with increased afflux of blood. Increased circulation in any part of the body may be due to chemical processes, going on in the tissues, which attract the blood into the vessels supplying the tissues in question. Professor Draper of New York has shown that these chemical changes do cause an increase in the rapidity and amount of circulation. And such chemical force the lecturer believes to arise from a direct transmutation of nervous force. The circulation depends more on the general tissues of the body, and much less on the heart, than is commonly supposed. Indeed it may be said that the heart is formed by the circulation instead of *vice versa*. The curious rapidity with which an engrafted organ will not only grow to its stock, but will show evidence of partaking in its circulation, should be remembered in estimating the causes of the latter. The lecturer told an anecdote of his engrafting a cat's tail on a cock's comb.

Another influence belongs to the nervous system, which is that it regulates the nutrition, secretion, and other functions. It is not essential to nutrition, though it is of great use.

THE POWER OF THE MIND OVER THE BODY

through the nerve force is infinitely greater than most of us can imagine, in extent and variety. Mesmerism, animal magnetism, the Od force, Perkins's tractors,—all these have some ground in Nature, that ground being simply the immense power of the imagination on the body. John Hunter made some curious experiments in willing pain into a part; he failed, however, to will the attacks of his gout into his great toe, though he tried to do it. Swedenborg, though subject to illusions and hallucinations, had an equally clear view of the way in which the brain can convey various kinds of sensation, etc., into any part of the body. Bennett of Edinburgh tells of a man whose sleeve was caught in a hook; the man, thinking his arm was pierced, suffered excruciating pain until he was extricated. As for mesmerism, the senses are exquisitely exalted; but the feat of reading a watch placed out of sight may be (perhaps) explained by the obscure faculty we possess of estimating the lapse of time, even in sleep. The *convulsionnaires* of St. Médard suffered themselves to be trampled under foot in the most shocking way without feeling pain; this is one instance of the suppression of feeling by mental influence, of which the mesmeric anæsthesia is another example.

The secretions are arrested or made active by nerve influence. Nursing mothers who give way to anger or other emotions poison their own milk, whereby the infant's health is often injured for life, if he be not killed outright. The bowels are purged by bread pill (as was once proved on a large scale by the Emperor Nicholas) provided people are told they are to be purged; eighty out of one hundred hospital patients have been vomited by a neutral remedy, when told "there had been a mistake made and they had all taken emetics." Much sea sickness would be avoided if people could be made to believe they were not going to have it. The stigmata, or marks of the nails on the Saviour's hands and feet, have been plainly seen to appear on the corresponding portions of the bodies of certain of his more devout followers, among whom St. Francis of Assisi must be specially named. Yet ought we not to lose from our sight the possibility that these occurrences, however unquestionable they be, are yet simply owing to an action of the imagination, whereof a notable instance is related upon authority of great weight: A mother saw a window sash descend with violence upon her little child's fingers, whereupon she herself was instantly seized with extreme pains in her own fingers which did afterwards swell and inflame in such a manner that she was long in being cured. The fakirs of India are sometimes able to divest themselves of the signs of life—respiration and circulation being stopped and bodily temperature lowered—for months continually. This well attested fact becomes less strange in view of the fact, once observed by the lecturer in his own laboratory, where a dog remained several months after death in a temperature from 40° to 60° without undergoing putrefaction; here is evidence of a power to arrest metamorphosis, even when the voluntary, and indeed all, the motions are at an end. The pain of toothache vanishes at sight of a dentist's chair; neuralgia once disappeared as the lecturer was about to enter on an operation for its relief; most functional, and even some organic, affections (as dropsy) may be cured by giving a patient the idea that he is to be cured! and the well attested list of modern miracles is in the same category of facts.

Nervous force is generated through the blood; it results in this case from a transmutation of chemical force. It is accumulated by rest, but too prolonged rest stops its production, and an anæmic condition, with degeneration, occurs. Too prolonged action of a part or organ does the reverse, in producing congestion and the diseases incident to congestion. The principal rule of hygiene is deducible from these principles: It is not to draw blood by exertion to one part of the nervous system alone, exclusive of the rest.

We may not despise the doctors, but must attend to certain cautions, which are summed up in one, as follows: We ought not to spend more than our means allow. We ought also to use all of our organs pretty equally. Regularity in the time of meals, sleep and exercise must be acquired; if it is not natural to us, it must be gained by habit.

IN THE LABORATORY WITH AGASSIZ.

BY A FORMER PUPIL.

It was more than fifteen years ago that I entered the laboratory of Professor Agassiz, and told him I had enrolled my name in the scientific school as a student of natural history. He asked me a few questions about my object in coming, my antecedents generally, the mode in which I afterwards proposed to use the knowledge I might acquire, and finally, whether I wished to study any special branch. To the latter I replied that, while I wished to be well grounded in all departments of zoölogy, I purposed to devote myself specially to insects.

"When do you wish to begin?" he asked.

"Now," I replied.

This seemed to please him, and with an energetic "very well," he reached from a shelf a huge jar of specimens in yellow alcohol.

"Take this fish," said he, "and look at it; we call it a hæmulon; by and by I will ask what you have seen."

With that he left me, but in a moment returned with explicit instructions as to the care of the object entrusted to me.

"No man is fit to be a naturalist," said he, "who does not know how to take care of specimens."

I was to keep the fish before me in a tin tray, and occasionally moisten the surface with alcohol from the jar, always taking care to replace the stopper tightly. Those were not the days of ground glass stoppers and elegantly shaped exhibition jars; all the old students will recall the huge neckless glass bottles with their leaky, wax-besmeared corks, half eaten by insects and begrimed with cellar dust. Entomology was a cleaner science than ichthyology, but the example of the Professor, who had unhesitatingly plunged to the bottom of the jar to produce the fish, was infectious; and though this alcohol had "a very ancient and fishlike smell," I really dared not show any aversion within these sacred precincts, and treated the alcohol as though it were pure water. Still I was conscious of a passing feeling of disappointment, for gazing at a fish did not commend itself to an ardent entomologist. My friends at home, too, were annoyed, when they discovered that no amount of *eau de Cologne* would drown the perfume which haunted me like a shadow.

In ten minutes I had seen all that could be seen in that fish, and started in search of the Professor who had however left the museum; and when I returned, after lingering over some of the odd animals stored in the upper apartment, my specimen was dry all over. I dashed the fluid over the fish as if to resuscitate the beast from a fainting fit, and looked with anxiety for a return of the normal sloppy appearance. This little excitement over, nothing was to be done but to return to a steadfast gaze at my mute companion. Half an hour passed,—an hour,—another hour; the fish began to look loathsome. I turned it over and around; looked it in the face,—ghastly; from behind, beneath above, sideways, at a three quarters' view, just as ghastly. I was in despair; at an early hour I concluded that lunch was necessary; so, with infinite relief, the fish was carefully replaced in the jar, and for an hour I was free.

On my return, I learned that Professor Agassiz had been at the museum, but had gone and would not return for several hours. My fellow students were too busy to be disturbed by continued conversation. Slowly I drew forth that hideous fish, and with a feeling of desperation again looked at it. I might not use a magnifying glass; instruments of all kinds were interdicted. My two hands, my two eyes, and the fish: it seemed a most limited field. I pushed my finger down its throat to feel how sharp the teeth were. I began to count the scales in the different rows, until I was convinced that that was nonsense. At last a happy thought struck me—I would draw the fish; and now with surprise I began to discover new features in the creature. Just then the Professor returned.

"That is right," said he "a pencil is one of the best of eyes. I am glad to notice, too, that you keep your specimen wet and your bottle corked."

With these encouraging words, he added:

"Well, what is it like?"

He listened attentively to my brief rehearsal of the structure of parts whose names were still unknown to me: the fringed gill arches and movable operculum; the pores of the head, fleshy lips and lidless eyes; the lateral line, the spinous fins and forked tail; the compressed and arched body. When I had finished, he waited as if expecting more, and then, with an air of disappointment:

"You have not looked very carefully; why," he continued more earnestly, "you haven't even seen one of the most conspicuous features of the animal, which is as plainly before your eyes as the fish itself; look again, look again!" and he left me to my misery.

I was piqued; I was mortified. Still more of that wretched fish! But now I set myself to my task with a will, and discovered one new thing after another, until I saw how just the Professor's criticism had been. The afternoon passed quickly; and when towards its close, the professor inquired:

"Do you see it yet?"

"No," I replied, "I am certain I do not, but I see how little I saw before."

"That is next best," said he, earnestly, "but I won't hear you now; put away your fish and go home; perhaps you will be ready with a better answer in the morning. I will examine you before you look at the fish."

This was disconcerting; not only must I think of my fish all night, studying, without the object before me, what this unknown but most visible feature might be: but also, without reviewing my new discoveries, I must give an exact account of them the next day. I had a bad memory; so I walked home by Charles River in a distracted state, with my two perplexities.

The cordial greeting from the Professor the next morning was reassuring; here was a man who seemed to be quite as anxious as I, that I should see for myself what he saw.

"Do you perhaps mean," I asked, "that the fish has symmetrical sides with paired organs?"

His thoroughly pleased "of course! of course!" repaid the wakeful hours of the previous night. After he had discoursed most happily and enthusiastically—as he always did—upon the importance of this point, I ventured to ask what I should do next.

"Oh, look at your fish!" he said, and left me again to my own devices. In a little more than an hour he returned and heard my new catalogue.

"That is good, that is good!" he repeated; "but that is not all; go on;" and so for three long days he placed that fish before my eyes, forbidding me to look at anything else, or to use any artificial aid. "Look, look, look," was his repeated injunction.

This was the best entomological lesson I ever had,—a lesson whose influence has extended to the details of every subsequent study; a legacy the Professor has left to me, as he has left it to many others, of inestimable value, which we could not buy, with which we cannot part.

A year afterward, some of us were amusing ourselves with chalking outlandish beasts on the museum blackboard. We drew prancing starfishes; frogs in mortal combat; hydra-headed worms, stately crawfishes, standing on their tails, bearing aloft umbrellas; and grotesque fishes with gaping mouths and staring eyes. The Professor came in shortly after, and was as amused as any at our experiments. He looked at the fishes.

"Hæmulons, every one of them," he said; "Mr. —— drew them."

True; and to this day, if I attempt a fish, I can draw nothing but hæmulons.

The fourth day, a second fish of the same group was placed beside the first, and I was bidden to point out the resemblances and differences between the two; another and another followed, until the entire family lay before me, and a whole legion of jars covered the table and surrounding shelves; the odor had become a pleasant perfume; and even

now, the sight of an old, six inch, worm-eaten cork brings fragrant memories.

The whole group of hæmulons was thus brought in review; and, whether engaged upon the dissection of the internal organs, the preparation and examination of the bony framework, or the description of the various parts, Agassiz' training in the method of observing facts and their orderly arrangement was ever accompanied by the urgent exhortation not to be content with them.

"Facts are stupid things," he would say, "until brought into connection with some general law."

At the end of eight months, it was almost with reluctance that I left these friends and turned to insects; but what I had gained by this outside experience has been of greater value than years of later investigation in my favorite groups.—*Every Saturday.*

Correspondence.

The Screw Propeller.

To the Editor of the Scientific American:

Having been intimately connected with the introduction of screw propulsion in the United States, the biographical notice of Sir Francis Pettit Smith, in your issue of March 7, 1874, induces me to present the following statement:

Francis P. Smith obtained a patent in England, dated May 31, 1836, for a propeller consisting of a continuous screw, formed and applied as shown by the engraving which accompanies your biographical sketch referred to. John Ericsson obtained a patent in England, dated July 13, 1836, for a propeller consisting of several blades or segments of a screw, the twist of which was determined in accordance with the principle now universally adopted in the construction of screw propellers.

That Ericsson carried his invention into practice immediately after having obtained a patent in England will be seen from the following notice in the London *Mechanics' Magazine*, June 3, 1837, vol. xxvii., p. 130, relating to the screw steamer Francis B. Ogden;

"*Captain Ericsson's New Propeller.*—The American packet ship Toronto, of 630 tuns burden, and drawing 14 feet 6 inches water, was on Saturday last towed down the Thames at the rate of full 4½ knots an hour, against wind and tide, by an experimental steamboat called the Francis B. Ogden. We subjoin a copy, with which we were favored, of the certificate given by the pilot and mate of the Toronto, of the performance of the Francis B. Ogden on this occasion:

"'Packet ship Toronto, in the Thames, May 28, 1837:

"'We feel pleasure in certifying that your experimental steamboat, the Francis B. Ogden, has this morning towed our ship at the rate of 4½ knots an hour through the water, and against the tide.

(Signed) "E. Nashby, Pilot.
"H. R. Hovey, Mate.

"To Captain Ericsson."

Bennett Woodcroft, in his celebrated work on steam navigation, published in London, 1848, thus notices the Robert F. Stockton, the second vessel built in England propelled by Ericsson's screw propeller:

"On the 7th of July, 1838, a new iron vessel, built by Messrs. Laird & Co., of Birkenhead, and fitted with a screw propeller, was launched into the Mersey. This vessel was constructed for Captain Stockton, of the American navy, who has been already mentioned, and consequently received the name of Robert F. Stockton. To the kindness of Mr. John Laird I am indebted for the drawing of this vessel, as she was rigged for her first voyage across the Atlantic; and from one of the scientific journals already quoted the following particulars: Several experiments have been made with her (the Robert F. Stockton), the results of which appear very satisfactory, both in relation to the application of the propellers to inland and to ocean navigation; and these experiments derive additional weight from the fact of their having been performed and approved of in Liverpool, the great emporium of shipping and commerce.

"The Robert F. Stockton left England for the United States in the beginning of April, 1839, under the command of Captain Crane, of the American merchant service, a most intrepid sailor. His crew consisted of four men and a boy

"Captain Crane made a forty days' passage, under sail only; and for his daring in thus crossing the Atlantic in this small vessel, he was presented with the freedom of the city of New York.

"Prior to Captain Ericsson leaving this country for America, he had built, for Mr. John Thomas Woodhouse, an iron screw propeller vessel to run as a passenger boat on the Ashby de la Zouch canal.

"She was named the Enterprize; her length is about 70 feet, beam 7 feet, and her engines about 14 horse power; her speed, where the water is wide and deep, is from 9 to 10 miles an hour.

"She was delivered and commenced to run on that canal in the middle of the month of August, 1839; and having run during a season without being profitable, she was then used as a steam tug on the Trent and Mersey, for a certain coal traffic, with great success."

Mr. Woodcroft adds (see p. 102 of the work referred to): "It will thus be seen that Captain Ericsson accomplished for the screw propeller in America and in England what Fulton did for the paddle wheel in the former and Bell in the latter country, namely, its practical introduction."

The history of the introduction of steam navigation in the United States shows that, several years before screw propulsion had assumed any commercial importance in England, the carrying trade on our lakes was, to a great extent, conducted by screw vessels. Already in 1843, the Ericsson line of screw steamers was in full operation between Philadelphia and Baltimore, running through the Delaware and Chesapeake canal, seriously damaging the freight business of the Philadelphia and Baltimore Railroad Company.

Permit me to add that the sum which you mention in your biographical notice, as having been awarded to Sir Francis P. Smith, was paid at a recent period, and divided, in various proportions, among several (I believe seven) patentees who had in the meantime obtained patents for modifications of detail which the Admiralty desired to avail itself of. It is scarcely necessary to mention that Captain Ericsson received a fraction of the sum paid by the British Government. C. H. DELAMATER.

New York city.

The Attraction of the Sun and the Earth.

To the Editor of the Scientific American:

It appears that some of your correspondents are still in doubt about the exactness of the data in regard to the size and density of the sun and earth, and their consequent relative attractions, as established by astronomy. I made some remarks on this subject in your issue of February 7 (page 84, current volume) wherein I pointed out the impracticability of the proposition of Mr. Slaughter, who wished to find by the balance how much a few tuns weight would increase or diminish in gravity at certain hours, and I mentioned Herschel's method of illustrating the variation of terrestrial attraction from the equator to the poles by a spring balance. After this communication, a correspondent (Captain Ericsson) communicates that he has constructed an apparatus for measuring these changes, consisting of a heavy iron globe floating in mercury, and Mr. Slaughter now proposes a spring balance with a mirror attached. In regard to the first contrivance, I must remark that a floating object is identical with a lever scale, as the liquid balances the floating body, and any change in the gravitation will equally affect both; so that such an apparatus would show no change whatsoever, even when transported to the moon or to Jupiter. It is, therefore, not in the least surprising that Captain Ericsson, according to his own showing, had no results. In regard to a spring balance with a mirror, this might show differences of attraction, but could not possibly be delicate and reliable enough for purposes of measurement, being affected so strongly by other causes as to be unfit for such delicate measurements as the minute changes in gravitation in question.

The best method is with the pendulum, by watching the changes in the periods of its oscillations at different hours of the day and night; but with what standard can we compare it, as all pendulums will be equally affected? Fortunately we have an equivalent instrument, of which the oscillations are not affected by gravity, and which is thus independent of changes in the same. I refer to a good, well compensated chronometer, in which the mass of the balance wheel and the elasticity of the spiral spring are substituted for the weight of the pendulum and its gravitating tendency. If therefore a criterion of the solar and lunar attraction is judged desirable, all we have to do is to compare the oscillations of the pendulum of a regulator with those of the balance of a chronometer, at different hours of the day and night. At those hours when gravitation is less by solar or lunar attraction, that is, when the sun or the moon crosses the meridian, the pendulum clock must be found to move more slowly, making the seconds longer, going behind the chronometer, and indicating less than 3,600 seconds for the hour as recorded by the chronometer. When the sun or moon is in the meridian of the antipodes, the opposite effect must be observed. These results differ from the ocean tides, which rise equally at the two periods.

I intend making these observations shortly on an astronomical pendulum clock driven by electricity, of which the weight attached to the pendulum is unusually large. I will communicate the results, if any are obtained worthy of notice. P. H. VANDER WEYDE.

New York city.

Calming the Sea by Means of Oil.

To the Editor of the Scientific American:

The communication on page 212 of the current volume of your journal interested me very much. I have read of a whale ship in distress being lightened of a part of her cargo of oil by pouring it overboard, and the sea, for some distance around the vessel, became comparatively smooth. The writer when a boy, living on a farm in Vermont, remembers that, in making maple sugar (by boiling the sap in deep cast iron kettles, as the custom then was), we had a small piece of fat pork, held in the end of a stick; and whenever the sirup foamed and would be in danger of boiling over, we dipped the pork in the sirup, and the foaming would cease instantly. Some years ago we owned a small hoisting engine that we could do no work with on account of foaming in the boiler. By advice of a boiler maker we forced a small quantity of lard oil in it and the cure was complete. It was only necessary to force in about two tablespoonfuls once or twice a day to keep things perfectly quiet inside.

Hartford, Conn. JOHN MCCLAY.

The Electro-Capillary Machine.

To the Editor of the Scientific American:

La Nature erroneously describes this motor, illustrated on page 195 of your current volume, as a French invention. The original description of the machine may be found in *Poggendorff's Annalen*, 1873, vol. 149, pp. 546 to 561. The machine was invented by Gabriel Lippmann, student in the laboratory at Heidelberg; and it was built by the instrument maker Jung, at Heidelberg.

This very interesting machine works economically with feeble currents. It ran once continuously five days and nights by the current of one single Daniell. The power of any electro-capillary motor is independent of its volume, being proportional to the variation of the surface of contact of the two liquids. If S be the variation of the surface (in square meters) of contact under one Daniell, then the work of the machine will be ($S \div 100$) kilogrammeters for each stroke.

Iowa City, Iowa. G. HINRICHS.

The Beech Blight.

To the Editor of the Scientific American:

In your issue of March 28, Mr. Jacob Stauffer calls attention to an article in the *Science Record* for 1874, on the blight recently observed on beech trees in Westphalia, and states that he had noticed the same thing as early as the summer of 1857. I can go farther back still. In the fall of 1838, I noticed the same white cotton-looking insect on beech trees in Lapeer county, Mich., presenting the wavy undulating motion mentioned by your correspondent. I asked one of the native Indians, who was present at the time, what they were; and he said that they were called "*me mes.*"

New York city. EDWIN LEACH.

The Emerald Mines of Muzo.

Within four days' journey from Bogota, a French company has been enjoying a monopoly for the last ten years of all the emeralds found in the neighboring mines, and indeed of all the emeralds found in Columbia. The lease expires shortly, and the government think they can get better terms in the open market for a fresh contract, than by granting a renewal to the present leaseholders. The annual payment now is 14,700 dollars, for which the government bound themselves to prohibit the working of any other mines, existing in the territory of the Union.

The mines were known and worked long before the discovery of America and the conquest of New Granada by the Spaniards. When an expedition arrived in that part of the country, about 1553, to reduce the tribe Los Muzos to the Spanish rule, these Indians were found to possess a large quantity of emeralds. It is, however, not easy to see how they worked the mines, as they had no tools of iron. It is supposed that they found the stones in the beds of the mountain torrents; for it sometimes occurs that the winter rains produce great land slides which lay bare large veins of emeralds, in which they are washed out by the waters. But report speaks unfavorably of the quality of these gems; they resemble those which are still found in the Indian burial places, or in the lakes into which the Indians used to throw their relics during their struggle with the Spaniards. Let, however, this be as it may, the mines of Muzo were worked soon after the arrival of the Spaniards on a large scale, both in the open air and by means of subterranean galleries; but about the middle of the eighteenth century, the mines were abandoned no one knows why. And it was not until the war of independence and the expulsion of the Spaniards that working operations were again resumed. The mines were naturally taken possession of by the Republic, and let out to individuals and companies.

The principal mine now in work is pierced in every direction by galleries made by the Spaniards. Since 1825 it has been worked in the open air. An immense number of gems have been found, many of them of great value. After this mine shall have been exhausted, which will not be for many years, not a thousandth part of the ground containing emeralds will have been touched.

About two days' journey from Muzo there is another mine called Lasquez, which was just touched by the Spaniards, and is evidently very rich. All this ground, including Lasquez, bears traces of the presence of the Spaniards; and as the geological formation is the same in the whole neighborhood, it is clear that the day is far distant before these mountains will be exhausted.

The mountains of Muzo belong to the lower formation of chalk. The emeralds are found in two distinct layers; the first or upper one composed of a calcareous bitumen, but hard and compact. These two layers are generally separated from each other by a distance of from seventeen to twenty-two yards. In the open layers are found the veins which yield the "nests" of emeralds—that is to say, a number of these gems massed together. But after one of these nests the vein disappears, being crossed by others of a different kind, which run in a different direction to those containing the emeralds. These latter veins are called "ceniceros" from their ashy color; they are generally horizontal, while the emerald veins are perpendicular. They all run from N.E. to S W. The veins of the lower layer are more regular, and are followed for fifty or sixty yards, and even more. "Nests" of emeralds are seldom found in them, but they are more easy of extraction. When veins of fluor spar, well crystallized, are met with, the emerald is not far off; the presence of rock crystal is also a good sign, as likewise that of a pretty pyramidally shaped stone, of the color of honey.—*Iron.*

IT is hardly possible to introduce successfully an improvement in machinery of any class without the aid of a good engraving. It not only serves to show at a glance the valuable features of the machine, more effectually than the longest verbal description can do, but it also constitutes the very best method of advertising an invention, its attractive appearance securing the attention of the reader, while a column of reading matter, without illustration, might be overlooked.—*National Car Builder.*

IMPROVED PLANE GUIDE.

The invention herewith illustrated is an improved plane guide, by which the plane is steadied in squaring or beveling to any desired angle without the use of either try square or bevel. It is claimed that, with the aid of the device, any beginner or inexperienced workman can do better work and in less time than the ablest hand in the ordinary way without the attachment. Our engravings represent the apparatus applied to the plane, Fig. 1, and also separately, Fig. 2.

The yoke, A, is attached to the plane by means of a clamp screw, B, at one side, and a flanged extension at the other, C is the guide strip, which is applied to a connecting piece, D, which, by its semicircular portion, is pivoted to the outward projecting end of the yoke, A. The semicircular and straight portion of D is cast in a single piece, and the former part is beveled along its circumference, and divided into degrees. It may be rigidly set at any angle to the plane by a curved wedge piece, E, which is tightly secured, by a set screw between D and a small beveled projection on the yoke, at the outer end of the latter. The piece, D, extending from its semicircular portion, is slotted, and slides in a recess of the guide strip, C, so that the latter may be carried up to the base of the plane and firmly secured by the set screw and washer, F. A small projection on the yoke serves as an index to the degrees marked on the semicircular portion of D.

When the plane is to be used with the guide, for squaring, beveling, or jointing boards, veneers, etc., the yoke is firmly arranged in such a position that the center of the semicircular part shall be slightly below the base of the plane. The set screw at the edge of the arc is then loosened, which allows the swinging of the guide strip to any desired angle. If the latter is oblique, the set screw, in the slotted part of D, is loosened to give greater play to the guide. When the guide is in position, the set screw and wedge at the arc are tightened, and the guide is raised up until it touches the base of the plane. The set screw of the guide is then tightened, and the apparatus is ready for work.

Fig. 1

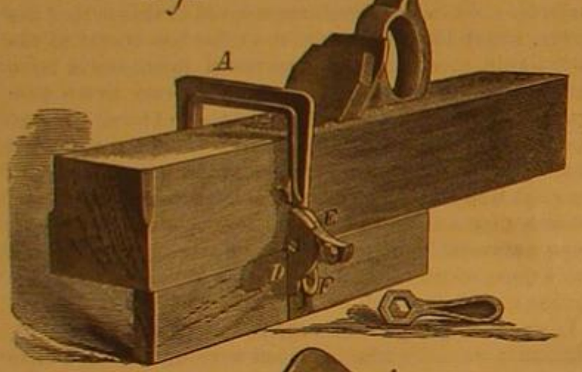
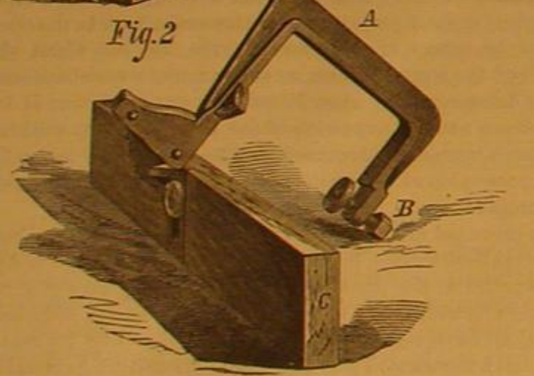


Fig. 2



By fixing the plane (with guide attached) in the vise, small work can, it is stated, be squared or beveled without the annoyance of frequently picking up and laying down a heavy plane, try square, or bevel, several times for each piece, and the trouble of fastening each piece in the vise. This work can be done perfectly, with the attachment, where the light would be insufficient for the ordinary mode of operation.

Having an equal pressure on both sides of the board, long and thin stuff, we are informed, can be beveled without the board springing from the bit and riding the ends of the plane.

Patented through the Scientific American Patent Agency, January 6, 1874. For further particulars address Walter S. Shipe, Minerva, Stark county, Ohio.

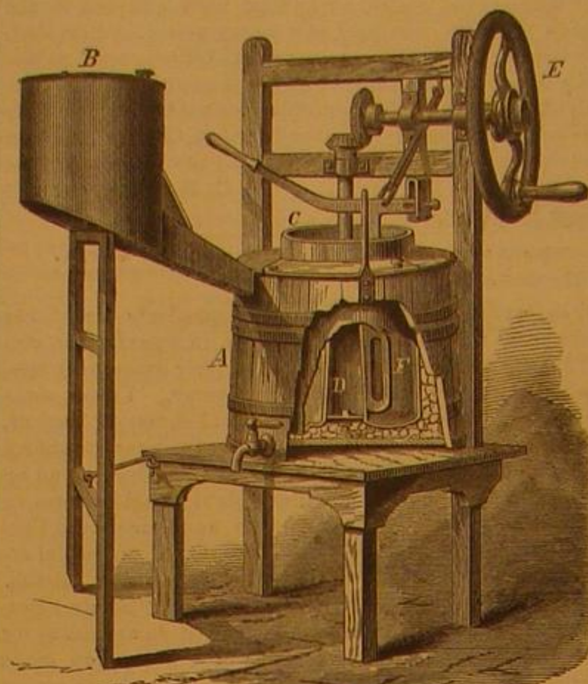
A Hill Full of Pyrites and a Widow Thrown In.

An extremely sharp and intelligent American gentleman from the West once walked into the office of Dr. C. T. Jackson, the chemist. "Dr. Jackson, I presume?" "Yes, sir." "May I lock the door?" And he did so. Then having looked behind the sofa, and satisfied himself that no one else was in the room, he placed a large bundle, done up in a yellow handkerchief, on the table, and opened it. "There, doctor, look at that!" "Well," said the doctor, "I see it." "What do you call that, doctor?" "I call it iron pyrites." "What!" said the man; "isn't that stuff gold?" "No," said the doctor, "it's good for nothing: it's pyrites." And putting some over the fire in a shovel, it soon evaporated up the chimney. "Well" said the gentlemanly man, with a woe-begone look, "there's a widow up in our town has a whole hill full of that, and I've been and married her."

[It is almost a daily occurrence at this office to receive specimens of the substance which was brought to Dr. Jackson. We have not heard that any of our correspondents have suffered to the degree of chagrin or from the cause as did the interviewer of the above distinguished chemist; but we have observed great disappointment upon the countenances of some persons, who have brought their specimens to us from a long distance, on being told that their gold was worthless pyrites. —Eds]

LUCETTI'S ITALIAN ICE CREAM FREEZER.

Confectioners, and others whose business includes the manufacture of large quantities of ice cream, water ice, and



similar delicacies, will doubtless find, in the device represented in our engraving, a convenient and timely apparatus for use during the coming summer months. It is said to freeze the cream with great rapidity, and to require much less labor in its manipulation than the machinery commonly employed. It is constructed as follows:

The tub, A, of the freezer, connects with a reservoir, B, which is kept filled with ice. A suitable gate is arranged in the spout, forming the two receptacles by which supply can be admitted to the former from the latter at will. The cream receiver, C, is constructed of such dimensions as to afford sufficient space for the freezing materials between its outer surface and the tub, A; and it incloses a tube, D, which is open at the bottom, and passes up through its center. The object of this last mentioned portion is to allow the cold air from the ice to pass to the middle part of the receiver so as to freeze the adjoining portion of the cream as quickly as the outer parts. Bars cross the lower end of the tube, D, and carry a pivot, which, setting in a socket in the tube, A, serves as a support for the receiver. The upper extremity of the same tube is secured to a vertical shaft which carries on its top a a bevel pinion, forming a portion of a bevel gear by which motion is communicated to the shaft, and thence to the receiver by the crank wheel, E. The tub, A, is provided with a ring cover. The receiver has also a cover which has a hole in its center for the passage of the shaft, and a slot to receive a spatula, F. The construction of the lower part of the latter is clearly shown in the engraving, and it is operated so as to scrape against either the tube or the inner surface of the receiver by means of simple detachable mechanism, the operation of which needs no special explanation.

In using the freezer, the receiver is rotated by turning the crank, E, with the right hand, while the spatula is controlled by the left. The apparatus is also so arranged that the gate for admitting the ice is readily governed by the left hand of the operator.

Patented through the Scientific American Patent Agency, July 22, 1873. For further particulars regarding sale of rights, etc., address the inventor, Mr. Antonio Lucetti, at 125 White street, near Center, New York city, where the device may be seen.

MAGNIFYING INSECT CASE.

This is a simple device, by means of which living insects can be conveniently disposed under a lens, and thus kept for a lengthened period for purposes of examination. In entomological studies, the invention might be found quite a useful auxiliary, and would doubtless prove interesting and instructive considered merely as a source of amusement. It consists of a shallow tray of suitable dimensions, having its

longitudinal sides higher than its transverse ones, in order to receive a glass cover. The center of the latter is thickened into lenticular form at A, in order to afford the necessary magnifying power. B is a small platform, which is provided with a front piece set at right angles, and a knob, by which it may be pushed in and out of the box through a square aperture at C, in the same manner as a drawer. On this the insect is placed. The glass is firmly held by two small set screws or bolts at D.

Patented through the Scientific American Patent Agency, February 17, 1874. The inventor desires to sell the patent to the highest bidder. Further particulars may be obtained by addressing G. N., Box 73, Station D, New York city.

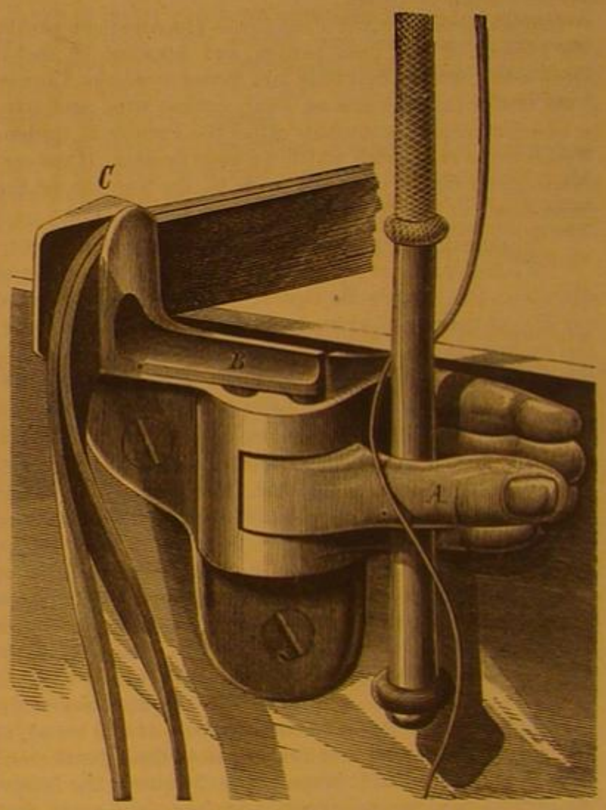
An Odd Use for Hammers.

"I remember," says a correspondent of the *Medical and Surgical Journal*, "that when I was very young, they used to raise blisters with boiled hammers. Old Dr. Twitchell of Keene (peace to his ashes!) once wanted to blister some one in a farm house, far from home. He had nothing with him to do it with. He asked the wife to find him a hammer. The article was brought out, put in a tea kettle over the fire, and, after the water steamed and bubbled well, he lifted it out and gently touched it to his patient, in half a dozen spots, over the seat of pain, with very positive effect. Boiled hammers were, for many years, used in that neighborhood for pleurisy: and every old lady knew nothing was equal to a hammer; and there was a long dispute whether it should be a claw hammer or not. I think the yeas finally conquered."

MATSON'S SAFETY COMBINED WHIP AND REIN HOLDER

This is a useful device, simple in construction and readily applied to any carriage. Its object, as indicated by its title, is to hold the whip or the reins, and to this end it is attached to any convenient place on the dash board.

As shown in the annexed engraving, it consists of a metal box provided with flanges for the securing screws. In the enlarged circular portion, it carries the shafts of two arms, one of which, A, is made thumb-shaped, and grasps the whip, while the other, B, in connection with a projection, C, firmly holds the reins. Both arms are provided with strong springs inside the box, which cause them, after they are drawn back and the whip or reins inserted, to clutch the same tightly. In inserting the reins, the driver drops them between the jaws from above, and pulls them back as far as he chooses. They are immediately securely held, as any



dragging upon them by the horse only wedges the clutch tighter. The apparatus is made of malleable iron, is quite strong and durable, and, it is claimed, cannot become out of order.

Patented through the Scientific American Patent Agency. Messrs. Matson & Brothers, of Moline, Rock Island county Ill., are the inventors and manufacturers, of whom inquire for further particulars regarding sale of rights, etc.

Gain in Weight by Combustion.

At a recent lecture before the Franklin Institute, Mr. Theodore D. Rand showed a simple and satisfactory experiment to demonstrate the increase in weight of burning bodies, caused by their absorption of oxygen. About an ounce of fine turnings of zinc, produced in the spinning of that metal, were loosely wrapped with iron wire and suspended from the arm of a balance. The pan on the other arm having been weighed to counterbalance the zinc, the latter was ignited with a match. At first the combustion was rapid, and much oxide escaped in fumes, causing the zinc end of the balance to rise. Soon, however, the combustion became a mere glow, the absorption of oxygen taking place without fumes. In a minute the beam began to descend and soon very decidedly outweighed the counterbalance.

The only precaution necessary is to have the zinc moderately but not too compact. If too loose, it burns too rapidly; if too compact, it will not burn.

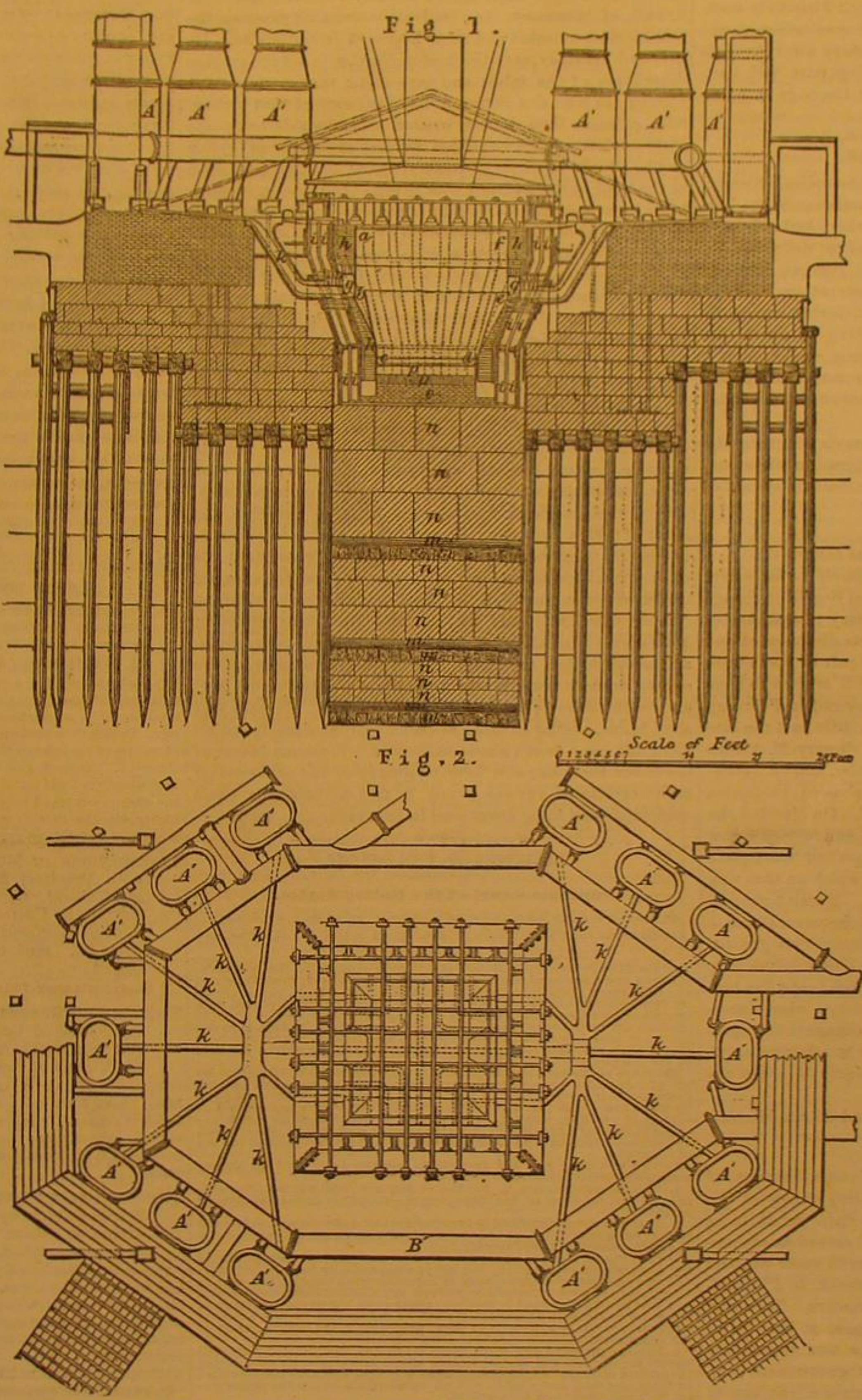
Somewhat Condensed.—A French chemist is said to have condensed the body of his wife into the space of an ordinary seal, and had her highly polished and set in a ring. He made a nice income by betting, with lapidaries and others, that they could not tell the material of the set in three guesses, and, after pocketing the money, would burst into tears, and say: "It is my dear, dead wife. I wear her on my finger to keep alive pleasant remembrances of her."

CASTING A FIVE HUNDRED TUN ANVIL.

At Perm, a town situated on the banks of the river Kama, in the northeastern part of Russia, there is a gun factory, belonging to the Russian government and erected for the purpose of manufacturing cast steel guns of large caliber. Owing to the increasing requirements of the work carried on, it was found necessary to substitute for the 15 tun hammer ordinarily employed, a large double-acting 50 tun machine, calculated, when using top steam, to be equal in effect to a single-acting 100 tun hammer. To form the anvil block, the molding of a solid mass of iron, 500 tuns in weight, was necessitated, and the annexed engravings and following description, condensed from *Engineering*, explains how the operation was performed.

The geological characteristics of the ground selected for the erection of the hammer were first examined, and after passing through various strata of clay, sand, and boulders, a dense slate, capable of resisting a pressure of 680 lbs. to the inch, was reached. This was selected as a foundation, and the excavation was performed by the aid of a watertight caisson and compressed air. After the slate had been penetrated to a depth of 7 feet, two cross layers of heavy larch beams were laid and covered with tar and felt. Then came three courses of sandstone masonry laid in cement, *n n*, Fig. 1, each block weighing from 16 to 19 tuns. This change of wood and masonry was repeated twice, and the whole ultimately covered with a double course of larch beams, upon which the anvil block was to be placed. The construction of the hammer building (a tower-like edifice, consisting of an iron roof supported by four iron pillars) and of the adjoining structures was next finished, and the preparation for the casting of the great block were begun.

The latter has the form of a prism with a base 16½ feet square and 5 feet high, joining a pyramid 9 feet high, with a top 9 feet 8 inches square. The cubical contents of the mass are, therefore, 2,700 feet. To compress the iron on the top of the anvil block, it was decided to cast the same upside down, and hence two trunnions, *g g*, were provided, upon which it could be turned to its proper place after having cooled, and which also served as inlets for the molten iron. The block was cast on the top of its definitive foundation; and after the casting pit had been well dried and warmed, the molding itself commenced. First a framework, *i i*, of vertical cast iron beams covered with iron plates, and strongly braced, was erected at the sides of the pit. The hollow space in this structure was filled with molding sand. Four layers of common brick, provided with flues for the escape of gases, were placed at the bottom of the mold, then four courses of fire brick, *p*, the three upper layers forming an inverted arch. A mixture of fire clay and quartz served as filling material. Lastly came three more courses of large fire brick, the space between the latter and the iron framing being rammed with molder's sand. The pinions and channels for the liquid iron were similarly molded.



THE GREAT ANVIL AT PERM, RUSSIA—PLAN AND SECTION.

While this operation was progressing, fourteen Mackenzie cupolas, A', were erected around the mold and to supply them with the necessary blast of 4,000 cubic feet of air per minute, anthracite coal being mainly used, three blowing engines were used, of different construction, having, however, cylinders respectively 6½ feet, 6 feet, and 7½ feet in diameter, and making from 21 to 28 revolutions per minute; and 255,360 lbs. of fuel and 1,786,400 lbs. of pig iron were prepared. Within an hour after the cupolas were lighted, the three blasts being turned on during that period successively, the iron began to melt, and the first tapping took place. The work began at 3:45 A. M., and by 3 P. M. 880,000 lbs. of iron had entered the mold, reaching a hight of 10 feet from the bottom. By 7:21 in the morning of the following day, the whole operation was over, the cupolas having been cleansed and filled three times, and only ten of them being used toward the end.

After a lapse of two days, a thin crust appeared on the surface, and the iron underneath was found to be under a state of compression by the contraction of the cooling surface, so that, instead of forming the well known phenomena of hollows, the iron came bubbling up through the pierced holes. After the lapse of two months, the mass was cool enough not to affect zinc, while it melted lead inserted in drilled holes. According to trials of temperature, it was found that the heat diminished at the rate of 72° Fah. per day at the outset, then at the rate of 54°, and, toward the end of the cooling, at the rate of 32° per day.

The entire work cost about $48,400, or some $96 per tun.

The difficult operation of turning the anvil block was successfully accomplished in the month of October last by Mr. Woronzow, the engineer in charge of the factory. The great mass was revolved on its journals, by two steam engines, within two hours and a half.

To Make Paper Transparent.

The best kind of paper is the class known as wove, not laid, paper. A varnish formed of Canadian balsam dissolved in turpentine supplies an excellent means of making paper transparent. The mode by which we succeeded best was to apply a pretty thin coating of this varnish to the paper, so as to permeate it thoroughly, and then give it a good coating on both sides with a much thicker sample. Keep the paper warm by performing the operation before a hot fire, and apply a third or even a fourth coating until the texture of the paper is seen to merge into a homogeneous translucency. Paper prepared in this way has come nearer than any other to our ideal of perfection in transparent paper.—*British Journal of Photography.*

THE SOLAR COUNTER.

A curious invention, the device of Abbé Allegret, has recently been introduced in the *Jardin d'Acclimation*, in Paris. It is an instrument which indicates how long the sun shines (months, days, hours, or minutes), during any given period. The machinery operates only when the sun is visible, and transmits its movement to three dials which, connected together in a simple manner, show months, days, hours, and fractions of the latter.

The essential part of the apparatus is two balls, one of which is black and the other yellow, fastened on opposite arms of a lever, which is sustained by a central pivot. When the sun shines the black ball absorbs more heat than the yellow one, and hence the vapor of the liquid contained in the former is elevated to a higher temperature than that in the latter; consequently the fluid travels through the lever from the first ball to the second, which, becoming heavier, overbalances the equilibrium, and in so doing sets free a weight attached to clockwork mechanism connected with a pendulum. When the sun is obscured, the liquid resumes its normal position, and the arms of the lever once more balance, arresting the fall of the weight.

In addition to the three dials above noted, there is a fourth, which is combined with mechanism which shows how many clouds pass before the sun, how frequently, and the exact time they take in making the transit. This consists of a narrow band of paper extended on a light circular frame established around the face of a clock. The latter is actuated by the ordinary machinery. Its single hour hand carries a pencil. When the sun shines, the paper, on its movable frame, is carried up to the pencil through mechanism connecting with the motor already described. The leaden point then traces a portion of the circumference corresponding to the divisions on the face of the clock passed over by the hand. If, however, a cloud passes before the sun, the movement of the lever, regaining its balance, withdraws the paper circle from the pencil, leaving a blank, the length of which shows the time during which the sun was screened. A single band of paper will last for a month or more, as the hour hand is made in two parts, screwed together, and so combined that, at every revolution, the outer portion passes under a fixed rack so that the screw head is slightly turned, thus elongating the arm and causing the pencil to begin its mark on a fresh portion of the paper.

In connection with the apparatus the inventor has established a sun dial which strikes the hours, a paradoxical operation accomplished as follows: At every hour mark on the dial plate is fixed one of the ball and lever mechanisms that we have above described. When the shadow of the style arrives at any hour, one ball is shaded, the lever tilts, and clockwork mechanism, of simple construction, strikes the hour on a gong.

We should imagine that the solar counter might be of considerable use in extended meteorological observations. A large superficies of territory, for instance, might be provided with a number of these instruments distributed at equal distances apart, from which telegraphic communication might be established to a central station, and thus, say every twenty-four hours, the period of sunshine, for all the points of observation, might be known. From this could be ascertained the course of the atmospheric currents; and further, by noting the amount that the sun has warmed the soil and atmosphere of countries more or less temperate than our own, we might be able to predict either milder or colder weather, through the effect of the condensation or dilatation of the atmosphere in such regions, and the consequent effect of such upon that of our immediate territory. The knowledge of the direction and number of clouds (which exercise a notable influence upon the temperature), coupled with that of the direction of the wind currents, would also offer new elements of observation of considerable practical value. Finally, as the autumn is warmer in proportion as the sun has shone more or less during the summer, transmitting more or less heat to the soil, the solar counter would serve to indicate approximately the yield of fruit and other crops to be expected.

An Hotel on Wheels.

The American carriage and wagon builders have a worldwide reputation for light work, says the *Carriage Monthly*; and as our cousins across the water have repeatedly stated that we carry this idea of lightness to extremes, we are now prepared to inform them that we can build also an occasional heavy vehicle. To Philadelphia, justly celebrated for light work, please remember to give the credit for building the heaviest heavy carriage on record. The following dimensions will be sufficiently startling, but we can vouch for their correctness, inasmuch as we have seen the drawing and copied the sizes.

DIMENSIONS OF BODY.—Length: 50 feet; width: 20 feet; hight: 16 feet. The carriagebody is two stories high. The first story is 8 feet in the clear, and the second story 7 feet exclusive of the arch of the roof, which at the center gives 8 feet head room. Entrance is provided for at the front and back ends. The roof has ventilators similar to a street car. There

are 16 arch top windows, on each side, 8 below and 8 above. Those in the first story are 2 feet 6 inches wide, and 4 feet 9 inches high, and in the second story, 2 feet 6 inches wide, and 4 feet high. They have each two sashes, which are arranged to be raised and lowered. Those in the first story are divided into four lights each, and those above into two lights each. The upper windows are provided with shutters or blinds. The immense body or house, whichever you please to call it, will be hung upon platform springs, which will be of in all sufficient strength to support 25 tuns weight. The wheels will be 3 feet 2 inches and 4 feet 4 inch es in diameter respectively. Hub: 18 inches in diameter; felloes: 9 inches on the tread, and 6 inches deep. The Brobdignagian wagon is intended for hotel purposes during the Centennial Exhibition. The first story will be used as a dining saloon, and the second story will contain 16 state rooms, with 2 berths in each. It is proposed to place this portable hotel somewhere on the exhibition grounds, there to remain stationary until the close of the exhibition. The gearing or carriage part will have no other labor to perform than to support the body in going to and from the exhibition grounds.

ASTRONOMICAL NOTES.

At a recent meeting of the Royal Astronomical Society, Mr. Burton, who was for two years an assistant to the Earl of Rosse, stated that, during that period, there had only been three hours of what might be called excellent definition for the great six-foot reflecting telescope. In general, they had to use the three-foot reflector for their observations.

With this instrument, on one occasion, during exceptionally fine weather, he had been able distinctly to detect that the fine markings on the planet Mars were composed of a texture resembling the stippling of a mezzotint engraving. On no other evening had the definition been sufficiently good to recognize the same details.

We hope that our Washington astronomers will turn the great refractor towards the planet when occasion offers, and let us know how the markings which Mr. Burton speaks of appear in that instrument.

Spots on the Sun.

The students of Vassar College report as follows:

Our record is from February 17 to March 14 inclusive. The period has been marked by an unusual degree of change in the spots. Between the noon of February 17 and that of February 18, two small ones near the center disappeared and a new one appeared. On February 20 a pair of spots were seen, a little to the east of the center, which seemed to have been formed by the division of one spot noticed on February 18. A new small one had also appeared, a little past the center. The next observation was made on February 26, when a good sized group was seen east of the center, and on February 28 the largest member of this group showed an umbra of peculiar shape, resembling a palm leaf. On March 2 the stem of the leaf had apparently separated and formed a new spot close to the first. Considerable changes had taken place since February 28. One circular spot, which on that day was on the eastern limb, had disappeared. March 3 showed a new spot to the west of the center, and between March 3 and 4 there was a still more decided change. Two groups, which on the 3rd were small, had resolved themselves into several spots, and a new group had appeared below the center. On the 4th two photographs were taken eleven minutes apart, and there were indications of change in the spots even in that short time. Owing to cloudy weather no observations were made after March 5 until March 14, when the spots were unusually large.

Faculæ were noticed February 17, 18, and 20, and March 5.

Joseph Harrison.

We hear, with regret, of the death of Joseph Harrison, of Philadelphia, Pa., well known in engineering circles as one of the greatest American mechanics. Born in 1810, he showed proficiency at a very early age, and served as apprentice, journeyman, and foreman till he was 25 years old, and was then in the employ of Garrett & Eastwick, in Philadelphia, where he designed and built a locomotive. This was in the year 1835, and the business increased so fast (after the then unworted achievement) that he was taken into partnership. Some agents of the Russian government soon afterwards suggested to Eastwick and Harrison that one of them should go to Russia, where the government was about to invite proposals for the whole of the rolling stock for the great railway, 400 miles in length, from St. Petersburgh to Moscow. Mr. Harrison went to St. Petersburgh, arriving there in 1843, with the remainder of $500 in his pocket, Mr. Thomas Winons, of Baltimore, who had gone there to superintend the working of a locomotive, uniting with Mr. Harrison in making proposals. The contracts were ultimately awarded to them, under the firm of Harrison, Eastwick & Winans. They constructed 162 twenty-five tun locomotives; 2,000 eight-wheel cars; 500 eight-wheel platform cars; 70 eight-wheel passenger cars on the American plan; 6 eight-wheel post cars; the total of the contract amounting to $3,000,000. All this work was constructed in government shops, at St. Petersburgh, by Russian workmen, and was completed in five years. Mr. Harrison's high personal character obtained for him the means of carrying out this large contract on his very small capital; and after this great success and many others, he returned to Philadelphia in 1852, since when his greatest work has been the production of the Harrison boiler, one of the most highly esteemed of several inventions which defeat the danger by explosion of boilers by building them in sections.

He also introduced into Europe the American drop bottom cupola, for iron smelting, the smelters having previously, at the end of the heat, pulled the slag, etc., from a small door or the tap hole, instead of dropping the bottom as is now done. He patented the equalizing beam for distributing equally the weight of the locomotive on the drivers, and the Harrison stub end (without keys) for the connecting rods. He designed and first used the tool for boring both the crank pin holes at right angles at the same time, thus doing the work mechanically correct as well as much cheaper.

The integrity and moral courage of this eminent man laid the foundation of his success and his great fortune; and those who knew him, whether as a husband, father, son, friend, or citizen, will sincerely mourn his death.

Shell Heaps in Maine.

At a meeting of the New England Historic-Genealogical Society, held a few days ago in Boston, Professor Rufus K. Sewall, of Wiscasset, Me., read an interesting paper on the ethnological remains and shell heaps at Damariscotta. He prefaced his essay, says the Boston *Globe*, with a very graphic description of the inlets and bays along the coast in that vicinity, as well as a review of the discovery of that region, with extracts from letters written at various dates by the early explorers. He exhibited several specimens of oyster shells, as well as pieces of pottery, found in large quantities at the head of the Damariscotta River. The shells, he said, must have been piled there by a people who lived previous to any period of history referred to by documentary or traditional testimony. Skeletons were found at various points along the seaboard; but while several fragments of utensils for the performance of household work were found, no darts or spears seem to have been discovered. From the data at his disposal, the lecturer deduced the following conclusions: First, that there were oysters along the coast of Maine in the early ages of this country, and the shell heaps were piled up by human hands; secondly, the site of these huge deposits was the home of a primitive population; thirdly, these inhabitants were a domestic people, they cooked their food in a manner which bespoke civilization; fourthly, they had clear perceptions of the utility of mechanical appliances; fifthly, there were successive races in these localities, the latter of which were more nomadic than their predecessors, and lastly, these settlers came from eastern countries. He cited several additional facts in support of these theories, and closed with a summary of the proofs adduced, from which he claimed that it was clear that the aboriginal inhabitants of Maine came from the East, and brought with them the civilization which then prevailed. Mr. Kidder, a member of the society, made a few remarks in which he controverted several of the theories advanced by Mr. Sewall. He said that shell heaps, similar to those at Damariscotta, were found all along the coast from Canada to Florida. Professor Morse, of the Essex Institute, also bore testimony to the existence of such deposits at various points in this country, the exact counterparts of some discovered in Denmark.

DECISIONS OF THE COURTS.

Supreme Court of the United States.

GLYCERIN PATENT.—ROLAND G. MITCHELL *vs.* RICHARD A. TILGHMAN.

[Appeal from the Circuit Court of the United States for the Southern District of New York.—October Term, 1873.]

On the 3d of October, 1854, letters patent were granted to the complainant for a new and useful improvement in processes for purifying fatty and oily substances of animal and vegetable origin, and which contain glycerin (glyceryl) as their base. His invention, as the patentee states, consists of a new and improved mode of treating such substances in order to produce fat acids and solution of glycerin, which, as he says, was not known or used before his application, and the recital of the patent is that it shall take effect from the 9th day of January preceding the date of the instrument.

By virtue of the said letters patent, as the complainant alleges in his bill of complaint, he acquired the exclusive right to make and use the described improvement, and to vend the same to others to be used; and he also alleges that the respondent, prior to the time when the bill of complaint was filed, without his licence and in violation of his rights, engaged in making and using his patented process, and that he, the respondent, intends to continue to make and use the same, as set forth in the bill of complaint.

Service was made and the respondent appeared and filed an answer setting up several defences, as follows:

1. That the complainant, on the 9th of January, 1854, was not the original and first inventor of the improvement described in the said letters patent.

2. That the result described in the specification and claims of the patent cannot be accomplished, so as to be practically useful, by the method and apparatus described in the specification.

3. That the respondent never practiced or used the patented process of the complainant as charged in the bill of complaint, or in any other manner. He admits that he is engaged in manufacturing candles, and that in manufacturing such articles he uses water and steam at high temperature, and that he also uses such pressure as arises from the expansive force of hot water or steam in a close vessel; but he denies that he uses any such method, process, or apparatus as those described in the letters patent of the complainant.

4. That the patented processes described in the specification were well known to chemists and men of science and to manufacturers long before the alleged invention of the complainant, and were also used and practiced by them, and were described in printed publications before the complainant filed his application for a patent.

5. That the use of a close vessel of sufficient strength to resist the pressure of water when heated, or any pressure needed when using water to decompose other substances, was known to, and practiced by, men of science and manufacturers in this country and elsewhere long before the alleged invention; that highly heated water, when used as described, is an elementary principle open and free to all, and that such a principle is not one that is subject to a patent; that a prior knowledge of the alleged invention was possessed by many other persons, and that the same was described in many printed publications, as fully set forth in the answer.

On the 23d of November, 1867, the patent of the complainant was extended for seven years from the expiration of the fourteen years for which the original patent was granted. Subsequently, to wit, on the 6th of March, 1871, the complainant instituted a second suit against the respondent, founded upon the extended patent, which is No. 310 on the calendar. Both cases were heard at the same time. Suffice it to say, in respect to the latter, that the pleadings, issues, and proofs in the two cases are substantially the same, and that the latter must be disposed of in the same way as the preceding case.

Decrees were entered in these cases, respectively, in the circuit court in favor of the complainant, each of which must be reversed.

The decree in each case is reversed, with costs, and the cases are, respectively, remanded, with direction to dismiss the respective bills of complaint.

The Court held substantially as follows:

The claim in every patent must be construed to be limited to the method or process described in the specification.

A claim in these words, "The manufacturing of fat acids and glycerin from fatty bodies by the action of water at a high temperature and pressure," interpreted on reference to the specification to mean a process for decomposing fats, and converting them into oleate, margarate, and stearate, and a solution of glycerin, by, among other measures, mixing the fat thoroughly with one half or one third as much water by means of a perforated piston forced through the mixture back and forth, and by subjecting it for ten minutes to the temperature of from 510° to 612° Fah., in a close vessel capable of resisting the consequent pressure, and which is filled by the mixture, and into which nothing else is admitted.

Thus interpreted, the claim is not infringed by a process consisting of mixing melted fat and water by forcing the water up through the mixture, and spraying it over the top whence it settles through, and by subjecting the mixture for several hours in a close vessel to such a heat that the pressure equals that of from ten to twenty atmospheres.

Dictum. A newly discovered principle or property of matter may be patented provided a new and useful result has been obtained from the application of it, and the specification describes how the result is to be obtained.

Dictum. A patent is invalid if the result which is predicted cannot be obtained by the means described.

Dictum. Or, if the process cannot be performed without [illegible] to the operator.

HOW SHALL I INTRODUCE MY INVENTION?

This inquiry comes to us from all over the land. Our answer is: Adopt such means as every good business man uses in selling his merchandise or in establishing any business. Make your invention known, and if it possesses any merit, somebody will want it. Advertise what you have for sale in such papers as circulate among the largest class of persons likely to be interested in the article. Send illustrated circulars describing the merits of the machine or implement to manufacturers and dealers in the special article, all over the country. The names and addresses of persons in different trades may be obtained from State directories or commercial registers. If the invention is meritorious, and if with its utility it possesses novelty and is attractive to the eye, so much the more likely it is to find a purchaser. Inventors, patentees, and constructors of new and useful machines, implements, and contrivances of novelty can have their inventions illustrated and described in the columns of the SCIENTIFIC AMERICAN. Civil and mechanical engineering enterprises, such as bridges, docks, foundries, rolling mills, architecture, and new industrial enterprises of all kinds possessing interest can find a place in these columns. The publishers are prepared to execute illustrations, in the best style of the engraving art, for this paper only. They may be copied from good photographs or well executed drawings, and artists will be sent to any part of the country to make the necessary sketches. The furnishing of photographs drawings, or models is the least expensive, and we recommend that course as preferable. The examination of either enables us to determine if it is a subject we would like to publish, and to state the cost of engraving in advance of its execution, so that parties may decline the conditions without incurring much expense. The advantage to manufacturers, patentees, and contractors of having their machines, inventions, or engineering works illustrated in a paper of such large circulation as the SCIENTIFIC AMERICAN is obvious. Every issue now exceeds 42,000 and will soon reach 50,000, and the extent of its circulation is limited by no boundary. There is not a country or a large city on the face of the globe where the paper does not circulate. We have the best authority for stating that some of the largest orders for machinery and patented articles from abroad have come to our manufacturers through the medium of the SCIENTIFIC AMERICAN, the parties ordering having seen the article illustrated or advertised in these columns. Address

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

NEW BOOKS AND PUBLICATIONS.

THE PRINCIPLES OF CHEMISTRY AND MOLECULAR MECHANICS. By Dr. Gustavus Hinrichs, Professor of Physical Science in the State University of Iowa, etc. New York: B. Westermann & Co.

It has been stated by a modern savant that the science of mechanics is universal, ultimate, and all-including, and that chemical action is as certainly a matter of mechanical arrangement as are light, heat, and electricity. To this view modern research is constantly tending, and the current literature of the schools is beginning to recognize recent progress in this direction. The book now before us is a compendium of what has already been discovered and laid down in the form of general laws according with the above mentioned theory, and is a most valuable contribution to our higher scientific literature, which we cordially commend to our readers as worthy of attentive study, and as a most excellent text book.

INSTRUCTIONS IN MODERN AMERICAN BRIDGE BUILDING, with Practical Applications and Examples, Estimates, and Tables. By G. B. N. Tower, formerly Chief Engineer in the United States Navy, and Chandler Instructor in Civil Engineering at Dartmouth College. Illustrated. Price $2. Boston: A. Williams & Co., 135 Washington street.

A handy little book, full of information clearly and concisely expressed.

THE UNITED STATES LAW DIRECTORY FOR 1874, containing the Names of One or More Reliable Law Firms, Banks, and Real Estate Agents in each of the Principal Cities and Towns of the United States and Canada.

We have here a portly volume, compiled with great care and considerable labor. Each State has a section of the work devoted to it, which is preceded by a digest of the laws and court calendar. The work is revised and reissued annually, and deserves the attention of the legal profession on account of the information it contains concerning all parts of the United States.

THE SECTORIAN SYSTEM OF RAND RAILING, Elucidating the Whole Subject by Fifteen Plates. By William Forbes, Architect. Price $5. New York: A. J. Bicknell & Co., 27 Warren street.

This work exemplifies a new method of laying out stair and other railings, by the use of a sector, which the author describes as "a mathematical instrument founded on Euclid I. 6, and adapted to this system." The tool can be readily made by any workman; and the system, admirably illustrated and described in the book before us, will, no doubt, soon be put to a practical test.

Inventions Patented in England by Americans.

(Compiled from the Commissioners of Patents' Journal.)

From March 10 to March 12, 1874, inclusive.

BREECH LOADING FIRE ARMS.—B. Burton, Brooklyn, N. Y.
DRYING BONE BLACK.—P. Farley, New York city.
GAS MANUFACTURE.—D. Davison, New York city.
GRIPPING TOOL, ETC.—D. L. Kennedy, New York city.
HOISTING DOOR, ETC.—J. W. Meaker, Detroit, Mich.
HOSE COUPLING, ETC.—D. Ashworth, Wappinger's Falls, N. Y.
ICE MANUFACTURE, ETC.—S. B. Martin, San Francisco, Cal.
METAL BOOT SOLE.—J. A. Punderford, New York city.
ORDNANCE.—N. Wiard, Washington, D. C.
ORGAN STOP.—T. Winans, Baltimore, Md.
PROPELLING BOATS AND CARS.—T. J. O'Toole, Brooklyn, N. Y.
PUMP.—W. J. Silver *et al.*, Salt Lake City, Utah.
STEAM GENERATOR.—W. E. Kelly, New Brunswick, N. J.

Recent American and Foreign Patents.

Improved Millstone Driver.

Moor Holden, Cincinnati, O.—This invention relates to an improved form of sockets and bushings in one piece or casting which are embedded permanently in the eye of the runner, and which operate to balance and drive the same, while serving as an inlet for the grain. The improvements are designed to combine in the most perfect manner the advantages of easy and certain feed with a firm yet delicate poise of the runner, whereby the latter is enabled to readily accommodate itself to the face of the bedstone without binding or raking, and, consequently, without loss of power or the liability to overgrind, scorch, or "kill" the flour.

Improved Fertilizer.

George T. Popplein, Baltimore, Md.—This invention consists in a fertilizer made of phosphate of lime and powdered tripoli in mechanical mixture.

Improved Machine for Canceling Stamps.

Charles J. Goff and Elmer B. Hursy, Clarksburg, West Va.—This invention relates to mechanical means whereby stamped letter envelopes and unstamped circular envelopes in the Post Office Department may be conveniently and rapidly canceled. The invention consists in a series of improvements by which a single person will, in a short space of time, do all the canceling required at any post office, thereby not only securing uniformity and thoroughness in the work, but great economy of time and cost.

Improved Volute Spring.

Charles T. Schoen, Wilmington, Del.—This improvement relates to that class of springs known as volute springs, and the object of the improvement is to render the action throughout the different coils more equable while under pressure, and at the same time to reduce the weight and cost of the spring by a saving of material. The spring is made from a plate or bar of steel which is of uniform thickness from end to end, but tapering in width from near the end which forms the base of the spring to the opposite end. This plate is coiled so that the width of spring increases with the diameter of the coils, whereby the elastic action of the spring is extended equably throughout all the coils except the coils which form the top and bottom.

Improved Horse Hay Rake.

Lyman Litchfield, Gouverneur, N. Y.—This invention relates particularly to the mode of placing the end tooth of a horse rake in a fixed relation to the one next adjacent, so as to prevent the lateral escape and waste of the hay or straw that is being raked up.

Improved Hay and Cotton Press.

John A. McBryde, Laurinburg, N. C.—This invention relates to and consists in means for *hanging* and operating the follower of a hay or cotton press, so that it will always center itself upon the hay or cotton to make a bale of rectangular shape easily moved off from the top of the press box to allow convenient access to the latter.

Improved Expanding Pulley.

William C. Margedant, Hamilton, O.—This invention consists in rendering a drive pulley expansible by making it of two disks and two semicircular spaces, the former receiving the latter, and one disk being movable, so that one pair of spacers can be removed and a thicker or thinner pair substituted. By this means the speed of the pulley can be readily graduated to any required velocity.

Improved Horse Hay Fork.

Edger N. McKimm and John R. Gearhart, Lathrop, Mo.—This invention consists in combining two sets of forks, one sliding within the other and the inner one provided with key catches, which enable the main fork to hold the hay until it is lifted to the desired elevation.

Improved Table.

Eli B. Francis, Windsor, Conn.—This invention pertains to a folding or hinged leaf table, and consists in the construction and manner of conjoining two bars or cross pieces which form the fixed and movable portions of the table frame for the purpose of adapting the parts to fold together, and thus economizing space when the table is not in use.

Improved Steam Boiler.

James L. Spink and Albert L. Holland, Minneapolis, Minn.—This invention consists in a novel mode of combining, in a boiler, steam-generating sections composed of heating tubes and connecting coils connected by piping with the heating tube and bottom of boiler.

Portable Toy Race Track for Field and Parlor Amusement.

Jacob D. Spang, Dayton, O.—This invention consists in a mimic race course, inclosed, and having starting station, rows of transverse posts, cross hurdles, stables, and a final goal.

Improved Circular Swing.

Madison L. Reynolds, Flint, Ill.—There is a vertical revolving center post having radial arms. Seats are supported and revolved by said arms The latter are jointed so they can swing up and down, and mounted, by a roller for each, on a circular undulating track, so that the seats will have an up-and-down motion, something like the motion of a galloping horse at the same time that they revolve.

Improved Paper Hanging Machine.

Russell H. Miner, Rouseville, Pa.—A box is made of tin, sufficiently long to receive a roll of paper, and of a depth and breadth sufficient to contain the paste roller and the desired quantity of paste, the case being nearly square. The paste roller revolves on pivots in the ends of the case. The paper, which is dropped into the case, rests on an inclined hinged flap, and bears on the paste roller. Before the paper is placed in the case a metal rod is inserted in the center to give the paper additional weight to keep it steady and in place. An adjustable head bears against the end of the roll of paper, to prevent longitudinal motion. The paste roller revolves in the paste, the friction against the paper being sufficient to cause it to revolve when the paper is drawn out. A pressure roller, which may be covered with felt, receives the face side of the paper. The paper is placed in the case, and its end is hooked into the bent. In hanging, the machine is raised to near the ceiling by means of a handle, and pressed against the wall. The paper releases itself from the hooks, and, as the machine is brought down, the roller presses the paper to the wall. The machine is used for papering overhead, and for putting on strips or bordering, in a similar manner. By this invention the tedious operations of unrolling, cutting up the paper, and spreading the paste are obviated, and the result is a very great saving of time.

Improved Windmill.

George A. Myers and Charles F. Myers, Schoolcraft, Mich.—The object of this invention is to produce for windmills a simple and effective regulating device, by which the main vane and wheel is turned sidewise when the wind is blowing too strongly, so that its effect on the wheel is reduced, and a uniform motion of the same obtained at the speed desired. When the force of the wind, bearing against the upright regulating vane is sufficient to overcome the weight, the vane will be pressed backward carrying at the same time the main vane around toward the wheel. When the main vane is thus brought round toward the wheel and receives a less force of wind than the wheel, the latter moves round with the socket to a corresponding position. Thus, however great and changeable the wind may be, the same force may be exerted, and a uniform velocity secured. The decreasing velocity of the wind allows the weight to carry the regulating vane into its upright position, drawing with it the main vane into its original place, keeping then the wheel to the wind in the usual manner.

Improved Spark Arrester.

Wesley Phillips, Morrisania, N. Y.—This is a spark arrester more especially designed for locomotive boilers, but adapted to stationary and marine boilers, and consists of a sectional flare pipe inside of a lower screen pipe formed of wire gauze or wire cloth, and in a wire gauze, or screen or pipe, which rests on the bottom of the smoke box, and in another tube or pipe of wire netting at or near the top of the smoke stack. By this construction a direct open exhaust is obtained. The smoke and gaseous products of combustion are separated at the base or in the smoke box, while the sparks are delivered at the base of the smoke stack, whence they are readily removed.

Improved Suspension Staple for Tanning Reels.

Alvin S. Riggs, Chesterville, Me.—This invention is an improved staple for suspending hides, skins, or leather from the slats of a tanning reel, and which is designed to take the place of the pins, brads, and tenter hooks now used for that purpose. It is made of iron, brass, or other composition The wire is cut into pieces of suitable length, which are then bent in the middle, and the arms pressed nearly together. The ends of the bent wire may be left a little apart, so that the spring of the wire may prevent the staples from being drawn out of the holes into which they may be driven. The bend of the staple is then beveled off upon both sides, to form an edge to enable the staple to cut a hole for itself in the hide or skin to be suspended when it is pressed against the said staple. The advantage is that [illegible] better retained as the reel revolves, and, also, that a workman can load and unload more readily and in less time than with the ordinary devices.

Preparation of Wool for Spinning and Apparatus Therefor.

Frederick Wilkinson, Manchester, England.—This invention relates to means of preparing wool for spinning purposes without the use of oil by mixing with the fiber a certain proportion of powdered French chalk or kaolin.

Improved Feather Renovator.

Charles Seaman, St. Joseph, Mo.—This invention relates to certain improvements in that class of feather renovators which are provided with a feather chamber, drying chamber, and steam supply chamber; and it consists in providing the steam supply chamber with a series of nozzles for admitting the steam into the feather chamber; said nozzles being combined with surrounding chambers or jackets to prevent the open ends of the steam nozzles from clogging. The invention further consists in the provision of waste passages for conducting liquid substances from the feather chamber, the upper ends of said passages being partially closed by hinges or movable covering plates, which, while permitting the escape of liquids, will prevent solid matter and feathers from entering the waste passages.

Improved Combined Blind and Sash Fastener.

This is a combined fastening for blinds or shutters and for window sashes, consisting of an adjustable fastening bar attached to the blind, a stationary hook in the casing, and a hinged hook attached to the sash. As the sash is lowered, the hook catches into the stationary hook automatically, and securely fastens the sash down.

Improved Detachable Shoe Tip and Sole Preserver.

Morris H., Louis, and A. H., Levett, New York city.—The edges of a plate are bent over so as to clasp the edges of the sole in the hollow, and the rear part of the plate is bent outward to lie along the breast of the heel, to which it is secured. The plate has an extension to cover the bottom of the heel and protect it from wear, and may be removed by slipping it forward to the narrower part of the sole. Another plate, which is so formed as to fit upon the forward part of the sole, has attached to it a tip to fit over the toe of the shoe. The rear part of the plate extends back over the forward part of the first plate, and has a short slot formed in it to receive a button. With this construction the second plate and tip can be readily detached when desired, so that they may be taken off when in the house, and put on when going out of doors.

Improved Paper Pulp Digester.

Hector J. Lahousse, Prague, Bohemia.—The boiler is mounted in its transverse axis upon hollow trunnions, with pipe connections for the admission of steam and water, and contains perforated plates and pipes for distributing the steam and water when applied. It also has one of its heads arranged so as to be readily removed, and is placed under the steep chest to receive the stock directly therefrom, and is provided at the lower end with a large cock for drawing off the stock. Besides the steep chest and the boiler there is also a tank above the steep chest for containing the alkaline solution, so arranged that the said solution can be let into the steep chest directly from it.

Improved Running Gear.

William H. Hathaway, East Claridon, O.—This is an improved draft attachment for platform wagons, which is so constructed that the line of draft may be in a straight line from the horses' collars to the axle. The forward ends of the draft rods meet and are securely welded to each other, and to a clevis to which a doubletree is pivoted when two horses are used, and the whiffletree when one horse is used. The doubletree and the forward ends of the draft rods are supported by a swing bar, the middle part of which passes beneath the upper arm of the clevis, and is secured to the said clevis and to the doubletree by the bolt that pivots said doubletree to the said clevis. The end parts of the swing rod curve upward and outward, and the ends rest against the under side of the front bar of the platform, and pass through eyebolts attached to said platform bar, forming a joint, to allow the double tree to move forward and back relatively to the front bar of the platform, as the said platform moves upon and down upon its springs. By means of other mechanism, should the wheels drop into a hole or rut, the tendency of the draft will be to lift, and not to draw downward.

Improved Tyre Bending Machine.

Samuel Hoobler, Minersville, Mo.—By this invention it is claimed that tyres of various degrees of thickness may be accurately bent without side twist, and easily detached from the rollers, which are also quickly and nicely set to the required degree of bending. The device consists of a central roller, placed in movable spring bearings, which are applied by strong stirrups and levers, and made detachable from the supporting frame. The tyre is placed below the central roller; after one end is bent by hand to the felly, the side rollers are firmly adjusted against it, the rims set to its width and the tyre then passed through the rollers by turning the central roller and one of the side rollers by means of suitable cranks.

Improved Spoon Engraving Chuck.

John S. Fifield and Frank W. Brainerd, Westerly, R. I.—In order to adapt the machine in common use for holding spoons, forks, etc., and for holding rings also, jaws are provided with a projection on the heads, and radial slots are made in the plate, also the short circular slots near the center, into which the jaws can be readily swung from slots to bring the heads sufficiently close together to hold rings, or can be shifted back readily to hold spoons, etc. At the center is arranged a little rest on which the ring is to be clamped. The said rest is removable, so that it will not interfere with the holding of the spoons. The screw is elevated sufficiently to cause the jaws to project as much as needed for holding the rings. As it is desirable that the rings be clamped at three points about equidistant from each other, the jaws are made to curve outward, so that they bear in the right proportion to cause the jaw heads to approach each other in the same measure that they are moved toward the rest when clamping the ring, and recede from each other in the same way when raised.

Improved Can for Cooling Milk during Transportation.

George W. Fluke, Mount Pleasant, Iowa.—This invention is a milk can by which the milk can be kept cool during its delivery, even in the hottest days. Connected with the side of a milk can is an ice vessel extending around the same to about one fourth its circumference. The bottom is inclined to the outside for collecting the melted water, and provided with a perforation, through which the water passes. A false movable bottom is placed in the ice receptacle, and forms, by a vertical segmental flange, a suitable downward inclination toward the wall of the milk can. The lumps of ice which are put into a receptacle are thereby continually carried toward the wall of the can, and produce an uninterrupted contact with the same, and thus the cooling off of the milk therein.

Improved Addressing Machine.

Lewis Bailey, Aurora, Ill.—This invention consists of a little hand instrument, intended especially for newspaper wrappers, in which a paper roll, pasting trough, pasting rollers, and shears are combined and arranged so that the operator can turn the pasting rollers and draw the printed slip of paper from which the slips are to be cut through the pasting apparatus to the shears by the thumb and finger, while the hand retains its hold on the handle of the shears. The shears are then worked to cut off the slip when the strip has been fed along sufficiently, without releasing the feeding or turning apparatus.

Improved Window Guard.

Christian F. Röschmann, Davenport, Iowa.—To the side posts of the window frames are pivoted a number of horizontal bars. With these are combined vertical pieces, so that two separate frames or gratings are formed, which meet in the middle of the sash. The horizontal bars turning on their pivots allow these frames to be swung upwards and to close together into small space. When the frames are down, suitable locks and catches are provided to secure them together and so form a barred grating to the window.

Improved Medical Compound or Hair Restorative.

Philippina Prass and Louis Prass, New York city.—This is a compound for restoring the hair, to produce a more vigorous growth of the same. It consists of a decoction of equal quantities of plantain and tansy, which is thoroughly mixed with glycerin, alcohol, and some odorifer [illegible]

Improved Guide Frame for Saws.

Darwin J. Parmele, Chicago, Ill.—This invention is a simple and convenient guide frame for adjusting hand saws for cutting at various depths, and consists in a slotted frame with suitable handles, into which the saw blade is set, adjusted so as to project at the required depth below the bottom part, and firmly clamped by strong tightening screws.

Improved Derrick and Platform.

Charles A. Campbell, Chelsea, Mass.—The derrick is pivoted to shoes, and is connected by pulley and rope to a windlass, so that it may be let down into inclined position or be drawn back, resting in vertical position against a frame. It is also connected by ropes with the front part of a movable platform. The rear part of the platform may run by means of rollers in the top rails of the frame, so that the platform may be easily carried forward and backward simultaneously with the derrick. It projects at such suitable distance beyond the front part of the frame that a bucket, which is applied in the usual manner to the top piece of the derrick, is vertically above the place of unloading, and may, on hoisting, be discharged directly into the receptacle placed at the front part of the platform.

Improved Door Spring.

Ashbel A. Stimson, Montpelier, Vt.—This invention is a door spring pulley wheel having its groove formed of curved lugs, placed on one side thereof, so as not only to answer the ordinary purposes of a groove, but to allow the tension of the spring to be adjusted by passing the cord over a different number of lugs. There is a bent pin or catch, combined with a door spring wheel, having notches at or near the periphery to hold it while the tension of the spring is being adjusted.

Improved Machine for Dressing Slate Frames.

Thomas W. Parry, Slatington, Pa.—A common mode of finishing the frames of school and other slates is to round the corners or to cut them to a circle, and to dress the entire edge of the frame, so as to leave it either beaded or rounded in cross section. The present invention is a machine to be driven by steam or other motive power to facilitate this work, consisting of an adjustable table with a flange guide, and in a vibrating adjustable spider. The spider consists of a crooked arm, attached to an upright shaft, which arm is provided with lugs which enter curved openings of the table. The shaft and spider are raised, so that the lugs project above the table, when the slate frame is laid thereon for rounding the corner, by means of a foot lever. When the pressure of the foot is removed, the spider drops by its own gravity. To round the corners of the frame, the slate is laid upon the ends of the lugs, with the corner in contact with the cutter, and is carried round with the spider about one fourth of a revolution. The spider turns on a true circle, and a weight draws it back when it has described the quarter circle. When this has been done, the frame is moved laterally against a guide to dress the edges.

Improved Chain for Necklaces, etc.

Shubael Cottle, New York city, assignor to Mulford, Hale and Cottle, of same place.—This is a chain for necklaces, etc., formed of the usual round closed links and open spiral links of peculiar construction, alternately arranged, each alternate link being polished or colored. It is so constructed that the links may all be finished separately, and then put together to form the chain, thus avoiding the necessity of coloring the whole chain, and then polishing the alternate links. The chain is formed from the finished links by springing the closed links into the open spiral ones until a necklace of the required length is made.

Improved Governor for Furnace Doors.

Alvin C. Norcross, Boston, Mass.—An expansible bar, which acts through a head and by means of an end-pointed rod on a pivoted lever, operates the furnace damper. The head is provided with a spring that acts on a different side of the fulcrum of the lever, and tends to open the damper to the prescribed limit. Inside the hollow expansible bar is placed a non-expansible bar, so as to bear directly upon the rod, and at the top is a base piece on which is a dial whereon is centered an adjusting screw having a pointer head. The expander, of course, acts in the usual way to close the damper more and more as the heat intensifies, while, by means of the device added thereto, the exact opening of the damper is adjusted at first, and before the furnace is heated up or afterward, the degree of adjustment being plainly visible on the dial plate.

Improved Rope Clamp.

Jonas P. Smith, Parker's City, Pa.—This invention relates to apparatus used in boring artesian and other wells, and consists of a self-acting hinged fastener for clamping and holding the rope. The device is composed of two parts, hinged on a pin, having handles and provided with a box apertured centrally. The operator bears down upon the handles, which throws up the central portion and enlarges the hole or throat to the size of the rope. When the cable is attached and the parts allowed to drop, the communication is complete.

Improved Wooden Scoop Shovel.

John N. Valley, North East, Pa.—This invention consists of a wooden scoop shovel, the bowl of which is composed of a bottom and two sides, of thin, tough wood, and a triangular stiffening block or head piece, to which and the bottom a socket for the handle is secured by an angle iron, the bottom being in concave form in the direction of its length and the sides flaring outwardly.

Improved Farm Gate.

George Van Riper, La Grange, Mich.—This gate may be thrown open in either direction, and adjusted in an elevated position, so that it will swing over snow drifts, or allow smaller stock, as pigs or sheep, to pass under it, without interfering with its working. The invention consists in hanging the gate to a pintle or vertical rod which turns in rings of the gate post, and providing the rod with an adjustable cam wheel, with inverted V flanges which flanges are grooved at their lower ends, so as to retain the gate, in connection with a friction roller of the gate post, in open or closed position.

Improved Gun Lock.

Abel Spaulding, Swanton, Ohio, assignor to himself and Benoni T. Geer, same place.—This invention consists in providing, in place of the feather spring in use, a a second mainspring in the rear part of the lock, which is connected with the tumbler and sear. The two springs are alike in construction, and act jointly with greater precision and with less strain upon the latter.

Improved Lamp Chimney Holder.

Henry T. Sanford, Nicholville, N. Y.—This invention consists in an arrangement of springs and hooked wires to a lamp burner, for the purpose of holding glass chimneys securely. The wires are retained in position and set to the side of the chimney by screwing their lower ends through lugs of the burner, clasping thereby the chimney. A solid band, encircling the burner around the base of the chimney, secures a steady light, as no air can enter the chimney.

Improved Three Wheel Riding Plow.

William Snow, Waverly, Ill.—By suitable construction, the forward end of the tongue has a free up and down but no lateral movement, and thus relieves the horses' necks from having to support any more weight than the weight of the forward end of the tongue, and at the same time enables the plow to be accurately guided. When the fore wheels are inclined in turning, the rear wheel will be inclined to the same extent in the opposite direction, so that the machine may be turned in a very small space. The land wheel may be lowered, so that the machine may be level when moving from place to place, and raised when the machine is at work to run upon the unplowed land while the rear wheel runs in the furrow in the rear of the plow, and the other fore wheel runs in the furrow plowed in the previous round. By operating a lever, the plow may be raised away from the ground for convenience in passing from place to place, or lowered to work at any desired depth.

Improved Window Frame.

Samuel Hare, Martinsburg, W. Va.—This invention consists in making the box frame, with its dividing strips, of one piece. The sash guiding piece is also made laterally of one piece to cover the box frame, but divided into an upper and lower section, so that on detaching the lower section, and bringing the sashes down, they may be easily taken out for repairs.

Business and Personal.

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

Dry Steam, dries green lumber in 2 days, and warms houses. Circulars free. H. G. Bulkley, Cleveland, Ohio.

Air Compressors—Manufacturers will please send Circulars to National Mining and Exploring Co., Helena, M. T.

Marine Glue—Wanted by the National Mining and Exploring Co. S. J. Jones, Supt., Helena, M. T.

The most Perfect Power Hammer—Exclusive Right for sale, or built on Royalty. Particulars of Samuel Pennock, Kennett Square, Pa.

Cannon's Patent Dumb Waiter for Dining purposes is admirable. Will remain stationary at any point, loaded or empty, without being fastened. Can be operated from any floor with which it communicates. Price, $45 to $80. A. Cannon, Jr., Poughkeepsie, N. Y.

Wanted—A first class 2d hand Screw Cutting Lathe, 6 or 8 ft. bed, 16 or 18 in. swing. A. L. Henderer & Co., Wilmington, Del.

A Sample of the Combined Whip and Rein Holder, illustrated in another page, will be mailed by the patentee on receipt of 75 cents.

The Fleetwood Scroll Saw for Amateurs, Wood Carvers, Jewelers, Model Makers, &c. See advertisement page 252. Trump Bros., Wilmington, Del.

Pattern Letters and Figures, to put on patterns of castings, all sizes. H. W. Knight, Seneca Falls, N.Y.

Wanted—A cheap, simple Boiler, ½ H.P., with fixtures complete, to carry from 20 to 30 lbs. of steam;—adapted for use in water mills for steaming wheat. Address P. B. Hunt, Council Bluffs, Iowa, Patentee and Manf'r of Hunt's Pat. Wheat Steamer & Dryer.

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

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

Brown's Coalyard Quarry & Contractor's Apparatus for hoisting and conveying materials by iron cable. W. D. Andrews & Bro., 414 Water St., New York.

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

Lathes, Planers, Drills, Milling and Index Machines. Geo. S. Lincoln & Co., Hartford, Conn.

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

Temples & Oilcans. Draper, Hopedale, Mass.

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

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

Small Tools and Gear Wheels for Models. List free. Goodnow & Wightman, 23 Cornhill, Boston, Ms.

To Rent—46x146 feet in one room, easy of access and constant power for manufacturing. Within 10 rods R.R. Depot and Erie Canal. Penfield & Tarbox, Lockport, N. Y.

Wanted—Hand Stave Jointer. Address J. Stoney Porcher, Bonneau's Depot, S. C.

Newcastle Grindstones for Locomotive Work. J. E. Mitchell, Philadelphia, Pa.

"The Best Book on Elementary Mechanics." The Apprentice, or First Book for Mechanics, Machinists, and Engineers. By Oliver Byrne. 71 Engravings. 12mo., cloth. $1.50. Sent post paid, by A. J. Fisher, 98 Nassau St., New York.

Steptoe, McFarlan & Co., No. 212 to 220 West 2d St., Cincinnati, Ohio, manufacturers of Wood-working Machinery and Machinists' Tools. Send for circulars.

The French Files of Limet & Co. are pronounced superior to all other brands by all who use them. Decided excellence and moderate cost have made these goods popular. Homer Foot & Co., Sole Agents for America, 20 Platt Street, New York.

A. P. Morris, Northfield, Minn., wishes the address of Geo. Kirchhöffer, patentee of machine for Purifying Butter, which was recently illustrated in this paper.

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

Two 50 H. P. Tubular Boilers for Sale (Miller's patent) very low, if applied for soon. Will be sold separately or together. Complete connections and pump. Holske Machine Co., 279 Cherry Street, New York.

Lovell's Family Washing Machine, Price $5. A perfect success. Warranted for five years. Agents wanted. Address M. N. Lovell, Erie, Pa.

To Capitalists—To be sold, one half of patent Steam Street Car. Will put a car on the road for the benefit of all concerned. For particulars, address W. W. Crane, Auburn, N. Y.

Brass Castings of superior quality. Send your patterns to Bailey, Farrell & Co., Pittsburgh, Pa.

Notice to Inventors—Our Guide Book for the sale of Patents explains new and improved methods for disposing of rights. Send stamp for circular and synopsis of contents. S. S. Mann & Co., cor. Linden Av. and Hoffman St., Baltimore, Md.

Buy Boult's Paneling, Moulding, and Dovetailing Machine. Send for circular and sample of work. B. C. Mach'y Co., Battle Creek, Mich., Box 227.

Emerson's Patent Inserted Toothed Saws, and Saw Swage. See occasional advertisement on outside page. Send Postal Card for Circular and Price List. Emerson, Ford & Co., Beaver Falls, Pa.

Spools, Button Molds, and all small turned goods made by H. H. Frary, Jonesville, Vt.

Wanted—A first class Machine, known among Hinge Makers as a Slitting Machine. Address Wheeling Hinge Company, Wheeling, W. Va.

Steam Fire Engines—Philadelphia Hydraulic Works, Philadelphia, Pa.

Bone Mills and Portable Grist Mills.—Send for Catalogue to Tully & Wilde, 20 Platt St., New York.

Waterproof Enameled Papers—all colors—for packing Lard and other oily substances, Chloride of Lime, Soda and similar Chemicals, Cartridges, Shoe Linings, Wrapping Soaps, Smoked or Dried Meats, and Desiccated Vegetables, Shelf Papers, and all applications where absorption is to be resisted. Samples on application. Crump's Label Press, 75 Fulton St., New York.

Amateur Astronomers can be furnished with good Telescopes at reasonable prices. For particulars, address L. W. Sutton, Optician, Box 218, Jersey City, N. J.

For descriptive circulars, and terms to Agents of new and saleable mechanical novelties, address James H. White, Newark, N. J., Manufacturer of Sheet and Cast Metal Small Wares.

Paragon Gold Quill-Pens—The best in use. C. M. Fisher & Co., 102 Fulton Street, New York.

Price only three dollars—The Tom Thumb Electric Telegraph. A compact working Telegraph apparatus, for sending messages, making magnets, the electric light, giving alarms, and various other purposes. Can be put in operation by any lad. Includes battery, key and wires. Neatly packed and sent to all parts of the world on receipt of price. F. C. Beach & Co., 260 Broadway, cor. Warren St., New York.

Self-Cleaning Lard and Butter Cutter. Sample 50c. Agents wanted. Wm. M. Bleakley, Verplanck, Westchester County, N. Y.

Engines, Boilers, Pumps, Portable Engines (new & 2d hand). I. H. Shearman, 45 Cortlandt St., N.Y.

Automatic Wire Rope R. R. conveys Coal Ore, &c., without Trestle Work. No. 61 Broadway, N.Y.

A. F. Havens Lights Towns, Factories, Hotels, and Dwellings with Gas. 61 Broadway, New York.

Best Philadelphia Oak Belting and Monitor Stitched. C. W. Arny, Manufacturer, 301 & 303 Cherry St., Philadelphia, Pa. Send for circular.

Pat. Double Eccentric Cornice Brake, m'f'd by Thomas & Robinson, Cinn., O. Send for Circular.

Rue's "Little Giant" Injectors, Cheapest and Best Boiler Feeder in the market. W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

A Superior Printing Telegraph Instrument (the Selden Patent), for private and short lines—awarded the First Premium (a Silver Medal) at Cincinnati Exposition, 1871, for "Best Telegraph Instrument for private use"—is offered for sale by the Mercht's M'f'g and Construction Co., 50 Broad St., New York. P. O. Box 496.

Woolen and Cotton Machinery of every description for Sale by Tully & Wilde, 20 Platt St., N.Y.

Dean's Steam Pumps, for all purposes; Engines, Boilers, Iron and Wood Working Machinery of all descriptions. W. L. Chase & Co., 93, 95, 97 Liberty Street, New York.

Parties needing estimates for Machinery of any kind, call on, or address, W. L. Chase & Co., 93, 95 97 Liberty Street, New York.

Machinery for making Gas Fixtures.—Makers of machines used in the manufacture of Gas Fixtures, for tapping, drilling, cock-making, &c., &c. may find a purchaser by sending circulars, with descriptions and prices, to L. L. D., Station C., Philadelphia, Pa.

By touching different buttons on the desk of the manager, he can communicate with any person in the establishment without leaving his seat. The Miniature Electric Telegraph—Splendid for offices, factories, shops, dwellings, etc. Price only $5, with battery, etc., complete for working. Made by F. C. Beach & Co., 260 Broadway, corner Warren St., New York. The Scientific American establishment, New York, is fitted with these instruments.

Steam Boiler and Pipe Covering—Economy, Safety, and Durability. Saves from ten to twenty per cent. Chalmers Spence Company, foot East 9th St., N.Y.

Diamond Carbon, of all sizes and shapes, for drilling rock, sawing stone, and turning emery wheels; also Glaziers' Diamonds. J. Dickinson, 64 Nassau St. N.Y.

Engines 2 to 8 H.P. N. Twiss, New Haven, Ct.

Answers to Correspondents

F. N. will find recipes for jeweler's white enamel on p. 107, vol. 30. This enamel can be colored to taste.—C. T. S. We have no information as to the marble roof of Girard College, Philadelphia, Pa.—F. L.'s queries are not sufficiently explicit.—D. W. can clean his coins by following the instructions on p. 217, vol. 26.—T. H. D.'s query as to the evaporation of ice is incomprehensible.

C. B. H. asks: How can I make imitation pearls? A. These are hollow spheres of very thin glass. A small portion of a pearly substance, found at the base of the scales of the bleak and other fishes, is introduced into each, and is spread over the surface. The sphere is then filled up with white wax or gum arabic.

C. H. G. asks: 1. What substance is most sensitive to atmospheric changes, and will, by expansion and contraction, most readily indicate damp or dry weather? A. A delicate human hair, properly cleaned and arranged. This is used in De Saussure's hygrometer, as improved by Régnault, for measuring atmospheric changes. Animal membranes, vegetable fibers, and pieces of whalebone are sometimes employed. 2. What material is most affected by actual contact with water? A. The chlorides of nickel and cobalt completely change their color.

J. K. asks: 1. In using steel bars instead of bells, how large and of what shape should a bar be to make as much sound as a bell weighing 1,000 lbs.? How should it be suspended? How large a hammer would it need? A. In a properly constructed bell, the cavity of the bell reinforces the fundamental note and greatly increases its sonority. Moreover, the material is so distributed as to get the largest possible sounding surface. For these reasons a bar should be of large size to give as great an amount of sound as a bell weighing 1,000 lbs. How large it and the hammer should be must be determined by experiment. The bar should be firmly secured at one end.

J. C. F. asks: What is the best preparation to preserve the skins of stuffed birds? Is anything better than arsenic? A. Carbolic acid answers well for temporary purposes, but arsenic is the best permanent preservative. 2. What is the best treatise on the art of stuffing birds? A. The best treatise is in the form of instructions published by the Smithsonian Institution for the guidance of collectors on exploring expeditions. Apply to Professor Baird, at Washington, D. C.

Z. B. asks: Has the first link of a train of cars the whole pull or weight of cars on it? A. Yes. 2. If a link of 1 square inch section will pull 30 cars, will a link one hundredth part of an inch section pull 1 car? A. Yes.

A. T. says: 1. Please give me a recipe for transparent cement, not soluble by dampness? A. Use powdered mastic and heat. 2. What is the difference in the heat of a room heated by steam pipes, and one heated by a wood or coal fire? Is not the heat from steam pipes more searching and dry than heat from either a wood or a coal fire? If so, why is it? A. Steam pipes give a mild, diffused heat, but at the same time arrangements must be made to supply moisture to prevent dryness. This is sometimes effected by attaching small escape cocks to allow a little steam to enter the room. 3. What is the thermometric difference in heat radiating from a steam pipe with 70 lbs. pressure per square inch and one with 10 lbs. pressure per square inch? Will it be nearly the difference in the temperature of steam at 10 lbs. pressure and at 70 lbs. pressure? A. No. It would be proportional to the more rapid flow of steam through the pipes at the greater pressure.

G. W. E.—Write to John Casey, 24 Beekman street, New York city, for the article.

H. C. P. says: A belt traveling at a certain speed, size of both pulleys being given, how can I find the size of pulleys to cause the belt to run at any other specified speed, either faster or slower? A. The circumference of either pulley, multiplied by the number of revolutions per minute, gives the speed of the belt; and if the number of revolutions remains constant, the speed of the belt can readily be changed by changing the size of the pulley. For instance, if the pulley is to make 60 revolutions per minute, and the belt is to have a speed of 1,000 feet a minute, the circumference of the pulley is found by dividing 1,000 by 60, or it will be 16 2-3 feet.

F. E. C. says: 1. We are making a steam engine, the size of the cylinder is ⅝ inch diameter, 2½ inches stroke; about what power would it have? A. Multiply pressure on piston in pounds by speed of piston in feet per minute, and divide the product by 33,000. 2. We have an old fire extinguisher for a boiler; will it be safe? How can we test it? A. Fill the boiler with cold water, and heat it, until the expansion of the water produces the desired pressure. 3. Are there any small steam gages that would do for it? A. Yes.

J. M. asks: Where was the first railroad bridge built across the Mississippi river? How many railroad bridges are there now over it, and how many were there in the year 1859, and where are they situated? A. The first bridge was at Rock Island. There were no others erected previous to 1859. There are now 10 bridges over the Mississippi, at the following places: Winona, Dubuque, Clinton, Rock Island, Burlington, Keokuk, Quincy, Hannibal, Hastings, St. Louis.

H. C. D. asks: If a person should fasten a stick to a smooth board large enough, when placed at some convenient spot, for the light of the sun to make a shadow of the stick on said board for the space of one year, if pencil marks should be made on the board parallel with the shadows, once a month for one year, at the rising or setting of the sun: would not the earth in its orbital yearly motion produce shadows diverging from the center all around like the spokes to a wheel? A. The different shadows would diverge from the center, but not all around like the spokes of a wheel, but between the limits of earliest and latest sunrise on one side, and earliest and latest sunset on the other. In this latitude, there is a little more than 3 hours difference between earliest and latest sunrise, and the same difference between earliest and latest sunset.

B. asks: Do the winds always blow in an exact horizontal line? If not, what inclination do they assume? A. They do not. The direction varies, but in general follows the outline of the earth's surface.

W. W. W. asks: 1. What must be the diameter of a spherical balloon which, when filled with hydrogen, will have an ascensional force of 80 kilogrammes, the balloon itself weighing 30 kilogrammes? A. Make it so that the weight of the balloon and gas is 80 kilogrammes less than that of an equal volume of air. 2. How much zinc and sulphuric acid are required to produce hydrogen to fill a cylinder 2 feet long x 9 inches in diameter? A. A trifling amount. You can calculate from the reaction. $H^2SO^4+Zn^2=Zn^2SO^4+H^2$. 3. Please give me the prescription to make yellow, bronze, and golden ink. A. See p. 130, vol. 32.

N. J. asks: 1. How many pounds can a horse of average strength pull, I mean to lift by pulling? A. It is generally considered that a horse of average strength, moving at the rate of 2½ miles an hour, can exert a tractile force of 100 pounds for 10 hours of a day. 2. Can you give a simple explanation of the question: Which runs faster, the top or bottom of a wheel of a wagon? A. You will find this explained, by means of a diagram, on p. 362, vol. 28.

R. M. asks: Can I melt iron in a crucible on a blacksmith's forge, to mold plow points in plaster of Paris? Will a crucible last any length of time, so that it would pay to melt iron in it? A. To both the questions, yes.

G. J. asks: What, in your extended experience, is the nearest approach to perpetual motion ever accomplished by an inventor? Is there anything on record in the Patent Office, that is, has any person yet manufactured or arranged a machine, or invented any mechanical object, that would operate from a propelling power inherent in itself, without springs, steam, or other motor known to mechanics, for a basis? If so, did it prove to be of any force or power, or did it promise anything useful? Please inform a reader of your paper and a well wisher to the American inventive faculty. A. The nearest approach to perpetual motion is the example of the man who placed himself within a tub and, by a steady upward pull on the handles, expected to rise in the air. But he found that the tub was pushed down by his feet just as much as it was pulled up by his hands, or, in other words, that action and reaction are equal, and therefore he failed to ascend. He has had many successors, who have aimed to overcome the difficulty by interposing levers or cogged wheels, arranged either to pull against each other, or placed between the hands of the operator and the handles of the tub. The principle is the same in all such cases, consequently the thing won't work. The simple tub is the nearest approach to success because it is attended with less friction. The interposition of wheels or levers wastes a portion of the force. The jet of a fountain, for example, will most nearly reach the level of its supply if allowed to rise in the air unobstructed. If the jet is compelled to turn a wheel or operate a lever, its hight is of course diminished.

J. K. asks: 1. What is meant by a high pressure and a low pressure engine, and by a low pressure engine and boiler? A. Non-condensing and condensing. 2. What is meant by link motion, and what by valve motion? A. The mechanism for operating the valve. 3. If I boil away one cubic inch of water, in a box of one foot cube, will I have any pressure in the box? A. Yes. 4. Will I get any by further heating it? A. Yes. 5. Can I explode the box? A. It depends upon the strength of the box.

E. M. C. asks: 1. Is plating with aluminum successfully practiced? Why would it not be, for many ornamental purposes, superior to nickel, and (as the metal may be derived direct from clay) possibly cheaper? A. The cost of extracting aluminum from clay is still too great. 2. Can you tell me of any way in which magnesium can be used (without too expensive apparatus) for making signals at sea? The wire or ribbon will not burn continuously, and requires the aid of an alcohol flame to insure continuous combustion, even where not exposed to drafts. If burnt in a lantern, the glass is soon coated with the condensed magnesia; and if not thus protected, the wind blows the whole thing out. Is there any way of using it (simple or combined with other materials) in torches to burn from one to three minutes, and which would not blow out or drop sparks? A. There is a magnesium lamp which can be successfully used for illumination and lanterns, which is constructed to remedy these defects. 3. What would be the most convenient way of generating electricity for the electric light in a compact machine, easily portable? What amount of power is necessary for a light visible five miles? A. The most convenient way to obtain the effect desired would be to use 40 flat Bunsen cells and an electric lamp. 4. Would the electrical machines used for medical purposes have sufficient power? A. No.

D. Y. H. asks: Which is the most economical steam engine, (1) one in which the cut-off is at ½ or ¾ of the stroke, and the momentum is obtained by the governor and throttle valve, or (2) one in which the cut-off is regulated by the governor, and the regular momentum is obtained by large and small expansion? Which is the most economical, (3) high pressure and large expansion, or (4) low pressure and small expansion, if all other things are equal, with well covered cylinders, pipes, etc.? A. As we understand your questions, the second and third cases will be more economical than the others.

D. M. asks: What is the material to use to prevent a hardened polished steel plow from rusting and allow it still to retain its luster? I have been using clear varnish, but it is not effectual. A. It will be necessary to keep it covered with oil, when not in use.

"Sufferer."—In reply to this correspondent, who asked how knock knees may be cured, Dr. Chapman, of New Haven, Conn., says: After growth has ceased, there is no remedy. The chances of recovery diminish in exact proportion to the age up to the period when full growth is reached, that is, the younger the patient, the better the chance of recovery. The cause is not, as generally supposed in the majority of cases, accident or natural deformity, but an impoverished state of the system in very early life, brought on by disease or improper food. The treatment varies according to the extent of the trouble. If the legs are too weak and the joints too loose to bear the weight of the body, the recumbent posture must be maintained for months; at the same time the legs may be bandaged in such a way as to keep them in the straight position; tonics, such as iron, quinia, and cod liver oil must be taken in one form or another, and electricity may be used to excite the weakened muscles. In cases not so severe as this, or in such cases after the preceding treatment has conditioned up the legs, a different method is followed. The tonics are given and the electricity used, but instead of lying in bed the patient must be up and about like other people; but the legs must still be bandaged in a peculiar way. A stiff and straight iron rod, flattened at each end and padded, of the length of the leg, is fastened to the outer side of the leg. It will touch at two points, on the hip and ankle, and a bandage is placed around the knee and rod, drawing them together or towards each other, and thus keeping the leg in a nearly straight position. For a few minutes every day the rod should be removed so as to allow the weight of the body to fall naturally on the knee. This is the best known treatment: but patience, skill, and good nursing are requisite, for the disease at best is a troublesome and long protracted one.

G. A. D. asks: 1. How can I make the cheapest and simplest battery? I have been trying to construct a galvanic battery, but have not succeeded. I constructed it on the Bunsen plan, but it would not work. A. Use pieces of zinc for one plate of the battery and pieces of gas coke for the other, and charge with dilute oil of vitriol. 2. What is the principle of the kaleidoscope? A. It depends on the repeated reflection of any object, placed between two small mirrors which are at an angle to one another. The pattern and the number of reflections depend upon the angle between the mirrors. 3. To what hight can a balloon ascend? A. To such a hight that its weight is just equal to the weight of that amount of air which it displaces.

P. and other correspondents ask what is put in starch to give the shirt bosoms a gloss. A. A piece of paraffin or white wax, about the size of a hickory nut, in each bowl of starch. The managers of one large shirt factory, however, assure us that they produce the polish by the skillful use of the sad iron only.

J. W. G. asks: How can melted glue be kept liquid when cold? A. Take best pale glue 2 lbs., soft water 1 quart, dissolve in a warm bath; after cooling add (slowly) 7 ozs. nitric acid. When cold, bottle off.

C. R. asks: Is there any way of removing from a steel engraving spots (both in the margin and on the print) caused by the gum in the back boards of the frame in which it is hung? A. No. Such engravings are printed on unsized paper, which absorbs moisture so intimately that its effects cannot be got rid of.

L. H. S. says: In your reply to the question of M. M. in regard to the advantage of raising himself by a rope over a fixed pulley, you say that you think that the friend of M. M. is right, when he says it has no advantage over a single rope. Are you not hasty in your conclusion, and ought not scientific men to be able to give definite answers to questions which admit of proof by experiment or mathematical calculations? I am inclined to believe that M. M. is right when he claims an advantage of nearly one half. And in the same number, in reply to the geometrical question of W. C. L., whose teacher claims that an infinite circle is coincident with a straight line, you show from their equations that this cannot be so; the straight line being of one order, and the circle of another, they cannot coincide. That is all well enough so far as the mathematical discussion is concerned, but do you consider the mind of man to be capable of conceiving of infinity? If an infinite straight line can be conceived of, may not a circle be conceived of also, of which the straight line shall be diameter or chord, and *vice versa*? When the difference between a straight line and a circle becomes infinitely small, do they coincide? I claim that the mind is incapable of conceiving of infinity, and just so soon as men begin to discuss a proposition which cannot be conceived of, they are over their heads, and utterly at a mental loss. Everything infinite coincides. A. Without going into the metaphysical question that you have raised, we may say that the mathematical demonstration has the advantage, in giving the results without requiring a vivid conception of infinity. The question about the rope is considered on p. 219 of our current volume.

J. T. W. asks: How can I clean silver plate? A. Use prepared chalk in cold water; apply with a plate brush, chamois leather, or soft woolen rags.

W. M. W.—You appear to have both legs of the siphon of the same length. The size of your pipe answers well enough, but it is necessary that the end of the siphon that discharges the liquid should be on a lower level than the end into which it is drawn.

W. H. H. says: We have a steam engine rated at 15 horse power, and a muley saw. With 150 lbs. steam, we cannot run through a 30 inch log, the saw making 200 revolutions per minute. I would like to increase the heating surface. At present we have only got an inch and a quarter pipe running through a heater 20 inches long. Suppose I turn the exhaust through the tank, will it deduct anything from the power of the engine? A. It will increase the back pressure slightly. We do not answer questions of the character of your other queries for obvious reasons.

J. W. G. asks: How can I make bronze and blue writing inks? A. For blue, use 2 ozs. Chinese blue, boiling water 1 quart, acetic acid 1 oz. Dissolve the blue in the water, add the acid, and it is ready for use. For bronze, use the common blue ink of the shops in a steel pen; it will turn bronze by the action of the metal.

J. H. P. says: It is generally believed that a railroad bridge is less liable to give way when the passing train moves slowly than when under full speed. Is this correct? Boys sliding or skating over thin ice rightly judge their safety to depend in a great measure upon the celerity of their movement. Grant that a bridge has one weak place, one place weaker than any other of the same bridge; and that a train has one car or combination of cars heavier than any other car or combination of cars of the same train; and further that there is one point (center of gravity) in that heavy car or combination of cars where the strain or gravity is greater than at any other point. Now, as it is the last straw that breaks the camel's back, so by parity of reasoning it is that point of greatest strain or gravity that causes the bridge to give way at the weakest place. Again, grant that a bridge never falls to pieces all at once, but that in the order of time one part—pin, brace, or beam—breaks first, then another part, then another, till the final smash, each break occupying, succeeding, and being succeeded by an appreciable moment of time; and further, the more rapidly the train moves, the more evenly the greatest strain will be distributed over the bridge and the less time it will have to act upon the weak point; and it follows, other considerations being out of the question: That the more rapidly the train passes over the bridge, the less liable will be the bridge to fall. Is this correct? A. This theory would be correct, if a train passed over the track as a boy glides over the ice on skates. But the train, on account of inequalities in the track and uneven speed, is continually striking blows as it moves along; and the faster moves, the more rapid and violent are the blows.

G. T. D. asks: How is the crystalline appearance of galvanized sheet iron produced? A. We believe that it is produced by the crystallization which takes place in the cooling of the zinc surface on withdrawing the iron plate from the bath of molten metal.

J. K. R. asks: At what temperature will plumbago fuse, or what degree of heat will it sustain without fusing? A. It will not fuse at, and should sustain, the highest heat of a wind furnace.

W. C. K. asks: How can I prepare common cotton sheeting, so that it will be sufficiently close to use for a sail? Without some preparation it will not hold the wind. A. Try a thin solution of India rubber in bisulphide of carbon.

A. E. G. asks: Will you give me a test for the presence of alcohol in solutions? A. Pure alcohol must completely volatilize, and ought not to leave the least smell of fusel oil when rubbed between the hands nor should it redden litmus paper. When kindled, it must burn with a faint bluish, scarcely perceptible flame.

G. O. S. says: I am building a small pleasure steamer to draw 2 feet of water. What tunnage will she carry? Her length is 47 feet, beam 4 feet, with flat bottom? A. Calculate the displacement, in cubic feet, for any draft, and divide by the number of cubic feet in a tun of water.

G. H. asks: 1. What will rust iron the most and in the least time? A. A solution of sal ammoniac will answer. 2. What is the wax which the barbers use for blacking the moustache composed of? A. It generally contains a solution of nitrate of silver.

J. W. M. asks: 1. What is the rule for placing boiler rivets, and for the size of rivets to get the greatest strength in different thicknesses of iron? A. It is usual, in single riveted joints, to make the diameter of the rivets from twice to once and a half the thickness of the plate. The distance between the centers of rivet holes may be found by adding the diameter of the rivet to 0·7854 times the quotient of the square of the diameter of the rivet divided by the thickness of the plate. 2. If we use a common horse power, run a lever 50 feet from center, and lay a 3 feet endless railroad 100 feet diameter, would it do for such heavy work as a 3 run flour mill? We should use a small locomotive for power. Would it be economical or not? A. We do not see anything of special merit in the plan. 3. What is the size of the largest locomotive driving wheels, and on what railroad are they used? A. The largest of which we have seen an account are on some locomotives in the Great Western Railway in England. They are 8 feet in diameter.

T. C. S.—The solution on p. 300, vol. 29, seems to be correct. The relation between the power and weight was required for a definite position of the machine; and though this relation is continually varying, it can be found, for any particular point very reliably. You will find the subject treated in any good work on mechanics, showing how to deduce general formulæ, by which the relation between the power and weight at any point can be determined.

T. F. asks: 1. What work on logarithms explains them in the plainest way, without regard to cost? A. We can recommend Law's "Treatise on Logarithms," published in Weale's series. 2. Is there any work in which the shafting and pulleys for quarter twist belts are illustrated? A. You will find this illustrated in nearly any book on mill work. 3. Which French scientific periodical is most like the SCIENTIFIC AMERICAN? A. The *Revue Industrielle*. 4. Is there any one devoted to the flour milling interests? A. We think not.

C. A. asks: 1. What is the best speed for a foot power circular saw, as proved by practice, the saw being 5 inches in diameter? A. As fast as possible. 2. Would it not require too much power to run the saw at 9,000 feet per minute, to saw one inch stuff? A. Yes. 3. Can you furnish the *Science Record* for the years 1873 and 1874? A. Yes.

B. H. asks: What is the greatest speed that has been attained by a locomotive? A. The fastest time that we know of from personal observation is 63 miles an hour. We have seen statements, on apparently good authority, that a speed of 90 miles an hour is often attained on many railroads in this country.

W. H. B. asks: 1. What is meant by the term sea level, and how can I determine the sea level of any city? A. The sea level is the hight of the ocean, at mean low tide, in reference to any place whose elevation is to be determined. 2. What is the meaning and derivation of the term O. K.? A. We have been told that it originated from the endorsement put upon a package by a distinguished but illiterate personage. Being asked what he meant by "O. K.," he took a piece of chalk and wrote down "Orl Korrect."

H. T. G. asks: Can air be so confined as to be used as a power? For instance, could it be applied to running a locomotive, provided a constant supply could be obtained? Has there ever been an air engine in operation? A. Air compressing machines, and the use of compressed air for motors, are quite common. You can get full particulars from the manufacturers.

S. asks: Can the best turbine water wheel, geared to the best pump made, raise the quantity of water used by the wheel to ½ the hight of the fall? A. According to some of the best results given in tests of turbine wheels and pumps, the quantity of water raised would be 0·55 the hight of the fall with a centrifugal pump, and 0·45 with a direct acting pump.

M. A. V. asks: How much water ought to be evaporated into steam of 60 lbs. per square inch pressure, by 1 lb. of coke, using cold water to feed the boiler? A. About 7½ lbs., if the boiler is well designed.

J. H. asks: 1. Does the power of the ram increase as the square of the fall increases? A. No. 2. Is the power the result of the impetus acquired by the discharge? A. Yes. 3. Would it be practicable to work a ram under a head of twenty feet? A. Yes.

C. S. A. asks: 1. If a pipe is forty feet high and filled with water, what will be the pressure to the square inch on the base? What is the rule for telling the pressure of water on the base, the tube being of a specified hight? A. Multiply the hight in feet by 0·433. In the example given, the pressure per square inch on the base is $40 \times 0{\cdot}433 = 17{\cdot}32$ pounds. 2. When the steam gage registers 60 lbs., does that mean that there is 60 lbs. pressure to the square inch of surface of the boiler? A. Yes. 3. How many gallons of water does an ordinary locomotive carry in its tender? A. From 1,500 to 2,000. 4. How is the expansion and contraction provided for in the bridge at St. Louis? Will wire rope work over six inch pulleys subjected to heavy pressure stand the pressure and wear as well as the ordinary cable? A. See answers to C. B. A., p. 34, vol. 30.

A. M. Y. asks: Can you recommend me any works on armored vessels? A. It will be necessary for you to look over periodical literature. You will find some matter of considerable value in "Our Iron-Clad Ships," by E. J. Reed.

M. asks: 1. Is there any difference between one square foot and one foot square? A. No. 2. Is it correct to say that one square foot is equal to four feet square? A. No. 3. A contends that one foot square and one square foot are equal, and that four feet square contains sixteen square feet. A. The statement is correct.

R. asks: How can I get at the exact latitude of a place in the vicinity of Lake Connecticut, N. H.? A. It is most readily calculated from observations of the meridian altitude of the sun or a star. It can be ascertained, with sufficient accuracy for many purposes, by the inspection of a good map.

C. V. H. asks: 1. Will nickel coating disturb the temper of steel wire? A. No. 2. Will coiling the wire for springs injure the nickel coating? A. Yes. 3. What is the expense of nickeling steel wire compared to the market value of the same? A. From 25 to 100 per cent, according to size and quality.

J. H. W. asks: What is the nature and amount of friction on a ship propelled through the water by steam or wind? A. You will find the subject treated in Bourne's "Handbook of the Steam Engine." Its discussion would occupy too much space for insertion in these columns.

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

T. J. M.—No salts of any kind, nor any sizing, have been used in the manufacture of this article. It appears to owe its character to the way in which vegetable fibers like hemp have been worked together.

H. H. H.—Your specimens are iron pyrites found in coal; one of them is pyrites submitted to heat, and sand from drilling.

J. F.—It would be necessary to have some of the black substance from the needle gun cartridge in order to pronounce what it is.

W. S. B.—It is limonite, and contains about 80 per cent of oxide of iron.

W. J. C.—The samples sent appear like good specimens of lithographic stone; but in order to determine its value, practically, a specimen about 12 inches long x 6 inches wide is necessary.

T. B. G.—The mineral sent is mica slate, composed essentially of mica and quartz. The folia of mica are sometimes so small that they are hardly discernible by the eye, as in this specimen. It can sometimes be split into tabular masses and employed for many common purposes. It is very difficult to fuse, and has been used in constructing the hearths and sides of furnaces for melting iron, etc.

P. J. K.—An analysis of the powder revealed the presence of oxide of iron, silica, clay, carbonate of lime, chloride of potassium, chloride of sodium, and some organic matters. But it is not possible to tell with certainty, from such residues, whether or not the drinking water is injurious. The water itself must be analyzed. We should, however, in this case suspect some contamination. The mode of remedying it could only be indicated after the completer examination spoken of above.

S. H.—Yellow calcite or carbonate of lime, of no particular value.

C. H. F.—Galena, sulphide of ead.

N. W. W.—Lenticular argillaceous oxide of iron. In this species, the oxide of iron is united by mixture or combination with clay. It ordinarily melts with ease, affording from 30 to 50 per cent of iron.

A. S. T.—Your specimen is neither isinglass nor silica. It is gypsum, and, by burning, will yield excellent plaster of Paris.

R. W. F.—The shining particles in the black rock are iron pyrites, and are of no value.

J. A. D.—1. Impure limestone. 2. Sulphide of zinc, containing 67 per cent zinc.

J. N. S.—Iron pyrites, of no value at present.

G. W. H.—Your specimens of ore contain iron. If you wish an analysis, it will cost $10.

R. H. W.—The blue mineral in the rock is silicate of copper, and contains about 45 per cent of oxide of copper. The yellow is sulphide of copper, containing about 35 per cent of copper.

W. C. C. & Co.—The material sent seems to be of the nature of Portland cement. An analysis will cost $10.

T. C. H.—The shining metallic looking substance is iron pyrites.

S. E. G. C.—These specimens consist of indurated clay or shale, and the action on the piece of iron shown was due to the free silica forming a slag with the oxide of iron and leaving a clean metallic surface.

R. W. F.—This is galena; but to determine the amount of silver in it, if any, will require an analysis, costing $10.

F. A. B.—This specimen is hornblende, a compound of silica, alumina, lime, magnesia, oxide of iron, and sometimes manganese.

J. E. S.—In order to determine the value of lithographic stone, we require a sample about 12 inches long, 6 inches wide and 2 inches thick. Your specimens look promising. Send us, if possible, a sample of the size mentioned. Lithographic stone is a fine grained limestone; and when of good quality is of a yellowish gray color and uniform throughout. It is free from veins, fibers, and spots; a steel point makes an impression on it with difficulty, and the splinters broken off by a hammer show a conchoidal fracture.

H. L. C. asks: How can I paint tin so as to give it a fine glossy appearance? Can japanning be done without heat?—D. L. B. asks: How is wine made from cultivated grapes?—G. M. S. asks: What kind of paint will adhere best to articles of brass or copper? I want a bright vermilion color, and it is to be exposed to water.—W. V. asks for a recipe for plating gold without a battery.—J. F. J. G. asks: What substance is there which, combined with glycerin, will render leather perfectly waterproof?—V. E. Jr. asks: How many pianofortes are annually manufactured in the United States?—B. W. C. asks: How can I remove green beech and cherry stumps in the most speedy and effectual manner without digging them up? I have heard that oil of vitriol placed in them will rot them out in a short time. Will it do it? If so, how much should be used?—W. C. L. asks: Can any one give me a rule for setting iron axles?—J. H. P. asks for a cure for gapes in chickens. The disease generally makes its appearance about two or three weeks after the chickens are hatched, and continues for from four to six weeks. It is supposed that the parent insect lays its eggs upon the nostrils of the chick, which soon hatch into worms and crawl down into the *trachea*, make their way again into the open air and burrow in the earth to undergo transformation.

COMMUNICATIONS RECEIVED.

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

On the Use of Both Hands. By J. D. B.
On the Torpedo. By ——.
On Kepler's Third Law. By G. E. W.
On Cotton Planting. By W. D. H.
On Light Steam Rams. By S. S.
On Two Problems. By G. W. E.
On the Attraction of the Sun and Earth. By D. E. G.
On a New System of Telegraphy. By E. E. W. B.
On Nerve Force. By I. R.
On the Pons Asinorum. By F. S.
On the Detroit Tunnel. By A. H.
On the Transfusion of Blood. By X. Y. Z.

Also enquiries and answers from the following:

O. G.—R. S.—F. McC.—I. M. W.—E. S.—E. N. K.—D. P. W.

Correspondents in different parts of the country ask: Who makes small oscillating steam engines for running sewing machines? Who makes machinery for making paper pulp from wood? Who sells revolving bolts for dressing middlings? Who builds lime kilns of the most approved pattern? Who makes a hub boring and mortise machine, to go by hand power? Who sells the best clothes mangle? Who deals in old coins? Makers of the above articles will probably promote their interests by advertising, in reply, in the SCIENTIFIC AMERICAN.

Several correspondents request us to publish replies to their enquiries about the patentability of their inventions, etc. Such enquiries will only be answered by letter, and the parties should give their addresses.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

March 17, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Air and gas, carbureting, B. Sloper	148,579
Alarm and circuit, fire, J. H. Guest	148,608
Animal shoes, making, W. Hamilton	148,694
Bag holder, E. D. Hix	148,702
Basket, R. W. Van Ornum	148,784
Bed bottom, spring, D. Kellogg	148,710
Bed bottom, spring, D. Kellogg	148,711
Bedstead, sofa, T. Lucik	148,722
Bee hive, C. T. Elliston	148,554
Blasting squib, S. H. Daddow	148,674
Blind catch, O. S. Garretson	148,688
Blinds, wiring, B. C. Davis	148,552
Boat, collapsible, J. E. Browne	148,661
Boiler furnace attachment, T. Hall	148,693
Boilers with air, feeding, M. E. Bollinger	148,658
Bolt heading machine, F. B. Prindle	148,75
Bolt and strap for trunks, R. Hilton	148,700
Box turning machine, E. L. Comley	148,599
Brush handles, driving, J. Ames, Jr.	148,642
Bung for casks, R. Pentlarge	148,747
Burner, lamp, S. R. Wilmot	148,794
Butterine, making, B. Smith	148,767
Calves from sucking, preventing, W. B. Todd	148,631
Can, milk, H. N. Wickoff	148,638
Can for paint, etc., G. W. Bentley	148,588
Capstan, J. Gardner	148,605
Car axle, A. Hunter	148,705
Car coupling, S. J. Adams	148,543
Car coupling, P. N. Ramsey	148,756
Car coupling, S. Tweedie	148,782
Car coupling, W. M. Wiswell	148,639
Car passenger register, W. A. Wier	148,791
Car spring, W. P. Hansell	148,695
Car starter, W. T. Beekman	148,654
Car, street, S. H. Little (r)	5,791
Car, street, S. H. Little (r)	5,792
Car wheel, W. J. Cochran	148,669
Cars, step for railroad, H. Albert	148,587
Carbon black pigment, A. H. Tait	148,778
Carbureting apparatus, Fisher & Darby	148,602
Carbureting apparatus bellows, Fisher & Darby	148,603
Carriage canopy, W. P. Ferguson	148,555
Carriage spring, E. P. McCarthy	148,618
Carriage step pads, forging, H. M. Beecher	148,589
Carriage top varnish, J. Townsend	148,582
Casting mold boards, J. Oliver (r)	5,801
Chair, barber's and dentist's, G. W. Archer	148,644
Chair, folding, J. J. Baer	148,648
Chronometric motion, transmitting, H. J. Wenzel	148,637
Clothes horse, folding, E. Kimball	148,713
Clothes pounder, C. Vanwie	148,634
Coal pocket, A. C. Buchanan	148,663
Comb, W. Mullee	148,738
Confectionery, making, C. Cornwall	148,671
Corn, etc., preserving, Merrill & Soule (r)	5,797
Cultivator, W. S. Wier	148,787
Desk, school, N. S. Ketchum	148,712
Desk, wall, A. W. Stewart	148,776
Door securer, R. C. Mowbray	148,574
Door, vestibule, B. J. Williams	148,793
Dough, sheeting, J. H. Shrote (r)	5,794
Drilling machine, metal, W. Gleason	148,691
Drilling machine, metal, W. Kuck	148,716
Ear tube, H. B. Auchincloss	148,647
Egg tester, H. Mitsch	148,572
Electrolytic apparatus, Casselberry & Edgerton	148,667
Engine balanced valve, Hain & Wais	148,692
Engine governor, J. C. Hoadley	148,560
Engine regulator, Collins & Donaldson	148,670
Engine valve gear, Jones & Pauly	148,565
Envelope machine, E. E. & C. P. Packer	148,743
Equalizer spring, S. Elliott	148,681
Explosive compound, A. Nobel (r)	5,799
Feed cutting machine, H. U. Upjohn	148,633
Filter, A. Hollings	148,561
Filter, water, A. Fox	148,686
Fire arm, breech loading, G. Michelena	148,571
Fire arm, magazine, J. W. Keene	148,614
Fire arm, revolving, W. Orr	148,742
Flat iron heater, Stouffer & Masten	148,777
Fire kindler, D. M. Mefford	148,734
Food for birds, E. A. Tompkins	148,631
Forge, D. C. Baxter	148,652
Fork, horse hay, McKimm & Gearhart	148,731
Fruit packet, sealing, D. M. Mefford	148,733
Fuel, manufacture of peat into, A. Pope	148,753
Furnace, hot air, M. Gates	148,690
Gage, registering steam, G. H. Crosby	148,673
Garden sprinkler, N. D. Clark	148,596
Gas holder, R. W. Prosser	148,755
Generator, carbonic acid gas, H. Ryffel	148,627
Generator, sectional steam, J. A. Reed	148,757
Generator, steam, J. H. Mills	148,736
Grading apparatus, O. Matson	148,728
Grading and leveling instrument, B. F. Sitton	148,628
Griddles, etc., shelf for, S. R. Stevens	148,580
Griping and cutting tool, D. Kennedy	148,566
Hame, W. A. Hearn	148,610
Hammock or lounge, E. R. Wethered	148,586
Harness for sailors and firemen, M. Parent	148,744
Harness saddle tree, W. Reilly	148,758
Harrow, J. M. Bone	148,591
Harrow, rotary, J. F. Morse	148,619
Harvester, M. L. & J. M. Kellar	148,709
Harvester dropper, C. Wheeler, Jr.	148,790
Harvester, supporting bail, W. G. Hudspeth	148,612
Hat pouncing machine, R. Eickemeyer	148,680
Hatch, operating, W. S. Harris	148,697
Heating apparatus, W. G. Kendrick	148,567
Hoof trimmer, Booker & Tosh	148,659
Hook and pin, combined, G. O. Yeiser	148,797
Hook, back band, J. B. Gathright	148,606
Hook, snap, P. Burns	148,665
Horseshoe, W. D. Harris	148,696
Hose and pipe coupling, D. Ashworth	148,645
Hose, hydraulic, T. A. Dodge	148,677
Hub boring machine, Duncan & Talbot	148,679
Hydrant, D. T. Perkins	148,749
Ice machine, F. V. De Coppet	148,675
Ice machine, T. F. Peterson	148,751
Insect destroyer, Ellis & Brown	148,682
Insole, E. W. Stanton	148,770
Iron and steel, coating, E. Wood	148,795
Jack, lifting, H. H. Lawrence	148,570
Jeweler's kit, A. L. Hosmer	148,704
Journal bearing composition, H. Kurth	148,615
Knotter plates, repairing, A. Annandale, Jr.	148,643
Ladder, step, G. Higman	148,699
Lamp, B. Fanta	148,683
Lantern, I. Kanrich	148,708
Latch, knob, W. Varah	148,785
Latch, reversible knob, S. A. Wilford	148,792
Latches, adjustable catch for, G. W. Burr	148,662
Lathe chuck, metal, J. J. Grant	148,607
Lathe chuck, metal, J. H. Westcott	148,788
Lathe cutters, adjusting, J. N. Bodine	148,657
Lubricating compound, King & Hill	148,368
Lubricator, J. E. Lonergan (r)	148,796
Marble, artificial, W. Humphrey	148,613
Mattresses, stuffing, E. H. Norton	148,621
Mechanical movement, W. Cox	148,551
Meter, liquid, J. Jonson	148,707
Milk carrier, Clawson & Dennis	148,508
Milk, supplying cities with, F. T. Newbery	148,620
Mill, smut, H. A. Barnard (r)	5,795
Nail, J. Lowensohn	148,721
Nitro-glycerin, exploding, A. Nobel (r)	5,800
Nitro-glycerin, exploding, A. Nobel (r)	5,798
Nut lock, J. B. Atwood	148,646
Nuts, making, metallic, Reynolds *et al.*	148,656
Ore and coal, separator for, G. B. Markle	148,727
Ore crusher, A. Alexander	148,641
Ore crusher, A. J. O'Day	148,741
Ore stamp feeder, T. A. Cochrane	148,597
Ore washer, E. Paul	148,622
Ores, flux for reducing, M. S. Foote	148,556
Organ coupler, C. W. Fossler	148,685

Overskirt and mantle, combined, J. McNeven.... 148,782
Paper box machine, E. B. Beecher.... 148,653
Paper, making cylinders of, A. Ball.... 148,544
Parquetry, Newhouse & Allen.... 148,739
Pasteboards, machine for cutting, Z. Breed.... 148,546
Pen, J. S. Dunlap.... 148,601
Pencil cases, pearl shell for, J. T. Van Houten.. 148,783
Photograph background frame, F. C. Lussenhop 148,723
Pianoforte action, Dolge & Gleitz.... 148,678
Plane, metallic bench, J. A. Baines.... 148,649
Planter, corn, G. W. Brown.... 148,592
Planter, seed, S. Smith, Jr.... 148,766
Plastering walls, P. G. Hubert.... 148,562
Plow, E. Walter.... 148,786
Plow, corn, J. H. Trout.... 148,781
Plow and harrow, sulky, G. W. Van Gorder.... 148,585
Polishing and grinding wheel, Bannister *et al.*... 148,545
Press, hay and cotton, J. A. McBryde.... 148,780
Press, tobacco, J. R. Harris.... 148,609
Privies, removing soil from, Gillespie *et al.*.... 148,557
Propellers, raising and lowering, R. Tyson.... 148,584
Pump valve, P. C. Goble.... 148,558
Pump valve, E. Steward.... 148,775
Punches, actuating, W. Lyon.... 148,724
Radiator, steam, W. J. Baldwin.... 148,651
Rail, metallic hand, M. M. and R. P. Manly.... 148,725
Railroad gate, S. Wright.... 148,796
Railroad switch, H. H. Potter.... 148,623
Rake, E. Brown.... 148,660
Range chimney bottom plate, H. C. Garwood... 148,689
Rein driving, G. W. Cook.... 148,550
Rice hulling machine, H. B. Stevens.... 148,774
Sad iron stand, S. T. Inesly.... 148,706
Sash fastener, W. T. Fry.... 148,604
Sash holder, G. N. Scrivener.... 148,578
Saw arbor, E. Hutson.... 148,563
Saw filing machine, R. Hayes.... 148,701
Saw mill dog, E. H. Stearns.... 148,771
Saw, scroll, C. T. Ford.... 148,684
Saw set, W. Reite.... 148,576
Sawing machine, hand, Cannon & Crawford.... 148,595
Scraper, road, W. D. Mayfield.... 148,729
Screen, dust protecting, L. E. Ladd.... 148,569
Sawing machine cam slide, Aird *et al.*.... 148,640
Sewing machine cutter, etc., S. W. Shorey.... 148,765
Sewing machine embroiderer, R. M. Rose.... 148,761
Sewing machine ruffler, L. Schultz (r).... 5,793
Sewing machine thread control, W. I. Stetson... 148,773
Sewing machine treadle, Reynolds & Jacobie.... 148,759
Shank laster, E. Campbell.... 148,666
Sheet metal, etc., stamping, G. H. Perkins.... 148,748
Ships, construction of, A. J. Bell.... 148,655
Shoe peg, wooden, J. H. Oliver.... 148,575
Shoemaker's shoulder tool, W. L. Peters.... 148,750
Sifter, ash, J. F. Baldwin.... 148,650
Sky rocker, J. J. Detwiller.... 148,553
Slate and blackboard rubber, C. J. Higgins.... 148,698
Sled, G. A. Lockwood.... 148,719
Smoke house, S. Long.... 148,720
Spectacle case, C. C. Cole.... 148,549
Spike extractor, E. Buell.... 148,664
Spinning bolster, G. Richardson.... 148,675
Staples, making, B. H. Brooks.... 148,547
Steam condenser, T. L. Jones.... 148,561
Steam, superheater, G. W. Coffee.... 148,598
Steel, annealing, etc., J. A. Bidwell.... 148,590
Stock feeder, L. P. Cox.... 148,672
Stone, artificial, G. Steinemann.... 148,772
Stove, heating, W. Chelius.... 148,668
Stove, heating, W. H. Teeling.... 148,779
Straps, etc., trimming, J. Lott.... 148,617
Suspenders, J. W. Wattles.... 148,635
Swine, device for ringing, E. Blair.... 148,656
Table, folding, G. W. Horton.... 148,611
Tank for hot water apparatus, C. H. Buck.... 148,593
Telegraph, printing, J. E. Smith.... 148,768
Time piece, alarm, H. J. Wenzel.... 148,686
Tin from scrap, separating, P. D. Rickets.... 148,760
Tobacco cutter, G. W. Campbell.... 148,594
Tobacco dryer, J. C. Millner.... 148,737
Tool holder, F. Funk.... 148,687
Trap, stench, F. B. Lawrence.... 148,616
Truss, A. Lethert.... 148,718
Tripod base, J. W. Donn.... 148,600
Tube welding machine, J. R. Lemen.... 148,717
Type, space for, B. B. Ray.... 148,624
Umbrella case, S. M. Moschcowitz.... 148,573
Valve, variable exhaust, D. H. Seamon.... 148,763
Vault and cell, iron, W. B. Scaife.... 148,762
Vegetable slicer, H. E. Nittinger.... 148,740
Vehicle wheel, B. and H. W. Pearson.... 148,745
Vehicles, dash board for, W. C. Peel.... 148,746
Vehicles, fender for, A. Sperry.... 148,719
Vehicles, spring equalizer for, S. Elliott.... 148,681
Vehicles, top prop block for, F. M. Shepard.... 148,764
Vessel propelled by steam, A. Thomson.... 148,780
Vessels, center board for, J. Mansir.... 148,726
Vessels, apparatus for raising sunken, H.F.Knapp 148,715
Vessels, etc., means for raising sunken, H.F.Knapp 148,714
Washer and wringer, combined, J. H. Swan.... 148,581
Washing machine, J. Q. Whartnaby.... 148,789
Washing woolen fabrics, A. S. Hopkins.... 148,703
Watchmaker's tray, L. P. Milliken.... 148,735
Water wheels, gate for turbine, Risdon *et al.*.... 148,577
Weather strip, S. D. Tuttle.... 148,583
Wind wheel, J. N. Deitz.... 148,676
Window screen, J. Hancock, Jr.... 148,559
Wood, apparatus for preserving, J. C. Stead.... 148,630
Wood for bending, process of treating, L. Pine... 148,752
Wrench, bung bush, J. B. Smith.... 148,629

APPLICATIONS FOR EXTENSION.

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:

28,726.—Pitcher Spout and Lid.—D. Baker. June 3.
28,725.—Portfolio Paper File.—J. N. Jacobs. June 3.
28,928.—Nail Cutter.—W. Wickersheim. June 10.

EXTENSIONS GRANTED.

27,545.—Fitting Sinks.—J. Ingram.
27,594.—Sewing Machine.—L. W. Langdon.

DISCLAIMER.

27,594.—Sewing Machine.—L. W. Langdon.

DESIGNS PATENTED.

7,243.—Suspender Ends.—T. J. Flagg, New York city.
7,244.—Shutter Hook.—O. F. Fogelstrand, Kensington Conn.
7,245.—Door Hinge.—E. J. Steel, New Haven, Conn.
7,246 and 7,247.—Paper Files.—O. F. Fogelstrand, Kensington, Conn.
7,248.—Paper Weight.—O. F. Fogelstrand, Kensington Conn.
7,249.—Type.—W. H. Page, Norwich, Conn.
7,250.—Spoon and Fork Handles.—G. Wilkinson, Providence, R. I.

TRADE MARKS REGISTERED.

1,670.—Paints.—Enamel Paint Co., Crescent, N. Y.
1,671.—Cough Lozenges.—C. L. Gunn, New York city.
1,672.—Disinfectant.—J. A. Heckelmann, St. Louis, Mo.
1,673.—Axes.—Hubbard & Co., Pittsburgh, Pa.
1,674.—Stomach Bitters.—E. C. Jürgensen, Portland, Or.
1,675.—Whisky.—G. W. Kidd & Co., New York city.
1,676.—Castings.—Arcade Malleable Iron Co., Worcester, Mass.
1,677.—Moth Powder.—Hall *et al.*, New York city.
1,678.—Terra Alba.—J. Pettit & Co., New York city.
1,679.—Games.—E. G. Selchow, New York city.
1,680.—Canned Goods.—Sleeper *et al.*, Burlington, N. J.
1,681.—Essential Oils.—Young *et al.*, New York city.

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 application for Design (7 years)	$15
On application for Design (14 years)	$30

CANADIAN PATENTS.

List of Patents Granted in Canada.

March 8 to March 23, 1874.

3,206.—I. C. Wands, Nashville, Davidson county, Tenn Improvements on car roofs, called "Wand's Car Roof." March 18, 1874.

3,207.—I. Y. Smith, Pittsburgh, Alleghany county, Penn. Improvements on car brakes, called "Smith's Vacuum Car Brake." March 18, 1874.

3,208.—G. S. Tiffany, London, Middlesex county, Ont. Improvements in a machine for making brick, called "Tiffany's Brick Machine." March 18, 1874.

3,209.—I. W. Post, New York city, U. S. Improvements in carburetting apparatus or lamp, called "Post's Carburetting Lamp." March 18, 1874.

3,210.—William Bryan, Whitby, Ontario county, Ont., assignee of A. Rusland, same place. Improvement in making eave troughs, called "Rusland's Improved Eave Trough Former." March 18, 1874.

3,211.—I. N. Smith, Jersey City, Hudson county, N. J., U. S. Improvements on journal boxes for railway carriages, called "Smith's Rail Car Journal Box." March 18, 1874.

3,212.—W. H. Boyd, Montreal, P. Q. Improvements on creepers, called "Boyd's Improved Creeper." March 18, 1874.

3,213.—I. J. Fitzpatrick, Philadelphia, Philadelphia county, Penn. Improvements in drawers, called "Fitzpatrick's Improved Drawers for Gentlemen and Boys." March 18, 1874.

3,214.—M. Harmon and E. A. Watson, Shilby, Orleans county, N. Y. Improvements on middlings separators called "Harmon & Watson's Middlings Separator." March 18, 1874.

3,215.—I. P. Magoon, St. Johnsbury, Caledonia county, Vt., and C. A. Shaw, Boston, Suffolk county, Mass., U. S. Improvements on the means for preventing cinders from entering the exhaust pipes of locomotive steam engines, called "Magoon's Improved Exhaust Pipe." March 18, 1874.

3,216.—R. Bustin, St. John's, N. B. New and useful fire escape, called "Bustin's Improved Portable Fire Escape." March 18, 1874.

3,217.—H. Gaskell, Hamilton, Wentworth county, Ont. Improvements in fire boxes and coal grates for stoves and furnaces, called "Gaskell's Combined Coal Grate and Fire Box." March 18, 1874.

3,218.—F. Genin, E. Beauvais, I. E. Robidoux, I. A. Perkins, and R. Préfontaine, all of Montreal, P. Q. Improvements on paper machinery and chemical compounds used in treating substances to be converted into paper stock, called "Genin's Pulp Machine." March 18, 1874.

3,219.—D. Aikman, Montreal, P. Q. Improvements on machinery for manufacturing peat fuel, called "Aikman's Improved Peat Machinery." March 18, 1874.

3,220.—W. Petch, Brantford, Brant county, Ont. Improvements on a machine for bolting and purifying flour and middlings, called "Petch's Improved Bolting Reel and Purifier." March 18, 1874.

3,221.—J. C. Wilson, Montreal, P. Q. Improvements on paper bag cutters, called "Wilson's Paper Bag Cutter." March 18, 1874.

3,222.—R. Paradis, St. Hyacinthe, District St. Hyacinthe, P. Q. Améliorations aux brunissoirs de cordonnerie pour les lisses de semelles. "Brunissoir pour Lisses de Semelles." (Improvements on burnishers for the Soles of Boots and Shoes.) March 18, 1874.

3,223.—N. A. Otto, Gamostoren Fabrik-Deutz, at Deutz, German Empire. Improvements on caloric engines, called "Otto's Improved Caloric Engine." March 18, 1874.

3,224.—U. L. Webster, New Haven, New Haven county, Conn., U.S. Improvements on adjustable patterns for cutting garments called "Webster's Adjustable Patterns." March 18, 1874.

3,225.—J. H. Beardsley, Brooklyn, N. Y., assignee of G. A. Crofutt, New York city, U. S. Improvements on apparatus for protecting the eyes and respiratory organs of persons exposed to extreme heat, smoke, noxious gases, dust, etc, called "Crofutt's Eye and Lung Protector." March 19, 1874.

3,226.—F. Dodge, Whiteside county, Ill., U.S. Improvements in the manufacture and preparation of crude peat for fuel, called "Dodge's Improved Peat Machine." March 20, 1874.

3,227.—I. Ruthven, Lévis, Lévis county, P. Q. Improvements on gas machines, called "Ruthven's Gas Machine." March 23, 1874.

Advertisements.

Back Page - - - - - - -	$1.00 a line.
Inside Page - - - - - - -	75 cents a line.

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

BAIRD'S BOOKS FOR PRACTICAL MEN.

My new, revised and enlarged Catalogue of PRACTICAL AND SCIENTIFIC BOOKS—96 pages, 8vo.—will be sent, free of postage, to any one who will favor me with his address.

A New and Important Book on Designing Cotton and Woolen Cloths.

JUST READY.

THE THEORY AND PRACTICE OF THE ART OF DESIGNING FANCY COTTON AND WOOLEN CLOTHS FROM SAMPLE.

Giving Full Instructions for Reducing Drafts, as well as the Methods of Spooling and Marking Out Harness for Cross Drafts and Finding any Required Reed; with Calculation and Tables of Yarn.

BY FREDERICK D. ASHTON, DESIGNER, WEST PITTSFIELD, MASS.

WITH FIFTY-TWO ILLUSTRATIONS.

IN ONE VOLUME, QUARTO, PRICE $10.00
By mail, free of Postage.

H. C. B. can also furnish

Baird's American Cotton Spinner and Manager's and Carder's Guide $1.50
Dyer and Color Maker's Companion . . $1.25
Fairbairn's Principles of Mechanism and Machinery of Transmission $2.50
Foley.—The Cotton Manufacturers' Assistant .... 75c.
Geldard.—Handbook of Cotton Manufacture: a Guide to Machine Building, Spinning and Weaving $2.50
Gibson's American Dyer; 200 Receipts and 91 Samples of Colored Wool and Cotton Waste, &c. $12.50
Gilroy, on Weaving $10.00
Haserick's Secrets of the Art of Dyeing Wool, Cotton, and Linen. *Illustrated by Samples* $25.00
Hyde.—The Science of Cotton Spinning Practically Arranged and Simplified $5.25
Leigh.—The Science of Modern Cotton Spinning. Second edition. Illustrated with 259 Cuts and 29 Plates. 2 vols. folio, cloth $42.00
Leroux' Practical Treatise on the Manufacture of Worsted and Carded Yarns $5.00
Love's Art of Dyeing, Cleaning, Scouring, and Finishing on the most approved English and French Methods $5.00
Macfarlane.—A Practical Treatise on Dyeing and Calico Printing $10.00
Murphy's Treatise on the Art of Weaving $20.00
Moss.—The Cotton Manufacturer's, Manager's, and Spinner's New Pocket Guide .... 75c.
Neste.—The Mule Spinning Process and the Machinery Employed in it. Illustrated $2.00
Napier's System of Chemistry Applied to Dyeing $5.00
O'Neill's Dictionary of Dyeing and Calico Printing $6.00
Reimann's Handbook of Anilines $3.50
Slater's Manual of Colors & Dye Wares. $3.75
Smith's Practical Dyer's Guide; 300 Receipts, with Dyed Patterns to each $25.00
Smith's Dyer's Instructor $3.00
Watson's Theory and Practice of the Art of Weaving by Hand and Power. Illustrated $10.00
White's Practical Treatise on Weaving. $10.00

☞ 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 of postage, to any one who will furnish his address.

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

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.

BUSINESS openings in all sections. A monopoly. $1000 to $5000 capital required. Circulars of F. I. SAGE, Springfield, Mass.

BUTTON-HOLE WORKER.

New and improved. Patented Feb. 8, 1874. It is the most useful invention of the age, and a wonderful triumph of inventive ingenuity and mechanical skill. So simple a child can work more perfect Button-Holes with it than the most experienced hand can without it. Will not get out of order; will last a lifetime. The stitching can be done fine or coarse, and with perfect mechanical accuracy. The arrangement for cutting button-holes is worth more than we ask for the whole. We want Agents (ladies or gentlemen) everywhere. They sell at sight. Profits are immense. We send a sample Button-Hole Worker and Cutter, full directions for use, agent's price list and sample of our entirely new and novel way of canvassing, on receipt of 75 cents. Money letters are registered now ... cts. Satisfaction guaranteed. Mention this paper.
A. W. WEBSTER & CO., M'f'rs, Bridgeport, Conn.

STENCIL DIES For cutting business Stencils, all sizes. Also complete OUTFITS for Clothing Stencils and Key Checks, with which young men are making from $5 to $20 a day. Send for catalogue and samples to S. M. SPENCER, 117 Hanover St., Boston, Mass.

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

Milling Machines.
Of all styles and sizes, from 600 to 10,000 lbs. Universal, Plain, Index. Gear and Cam Cutting. Mill Grinders. Mills made to order. Index Plates drilled. BRAINARD MILLING MACHINE CO., 131 Milk St., Boston. Works at Hyde Park, Mass.

WANTED—A few good 2nd hand Engine Lathes and Drill. WM. LONG, Sherbrooke, Can.

$1500 YEARLY made by agents in their spare moments selling our 82 new articles. Samples for 25c. Catalogues free. AM. NOVELTY CO., 302 Broadway.

WOOD-WORKING MACHINERY.

HAS NO EQUAL FOR VARIETY, QUALITY, AND ECONOMY OF ITS WORK.
For Car Builders, Planing Mills, House Builders, Sash, Door and Blind Makers, Agricultural, Cabinet, Carriage and Wagon Works.
HORIZONTAL AND UPRIGHT BORING MACHINES, SUPERIOR TO ANY IN USE.
PLANING AND MATCHING MACHINES, and other Wood-working Machinery.
Send for Catalogue and Price-List. BENTEL, MARGEDANT & CO., Hamilton, Ohio.

ADVERTISERS! Send twenty-five cents to GEO. P. ROWELL & CO., 41 Park Row, New York, for their *Pamphlet of one hundred pages*, containing lists of 3,000 newspapers, and estimates showing cost of advertising.

MAGNETS—Permanent Steel Magnets of any form or size, made to order by F. C. BEACH & CO., 260 Broadway, New York, corner Warren St. Makers of the celebrated Tom Thumb and Miniature Telegraph Instruments.

PRICES REDUCED—IRON COTTON TIES. The celebrated Arrow Ties will be seven cents per pound on and after March 1, 1874; and further reductions made, if necessary, to prevent large accumulations of Stock from constant arrivals. Ten per cent discount to the trade. Same discount on further reduced prices. Office American Cotton Tie Co.,
New Orleans, Feb. 25, 1874.
BARTLETT & RAYNE, GEN. AGTS.,
No. 48 Carondelet St.

GEO. W. READ & CO., STEAM BAND SAW AND VENEER CUTTING MILL.
186 to 200 LEWIS ST., Foot 5th & 6th Sts, E. R., New York.
ALWAYS ON HAND:
FULL STOCK SEASONED HARD-WOOD LUMBER AND CHOICE FIGURED VENEERS.
The largest Stock.
The greatest Variety.
The lowest prices.
☞ Enclose stamp for Catalogue and Price List.

PATENT COLD ROLLED SHAFTING.
The fact that this shafting has 75 per cent greater strength, a finer finish, and is truer to gage, than any other in use, renders it undoubtedly the most economical. We are also the sole manufacturers of the CELEBRATED COLLINS PAT. COUPLING, and furnish Pulleys, Hangers, etc., of the most approved styles. Price lists mailed on application to JONES & LAUGHLINS,
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., 121 Chambers street, N. Y.
PIERCE & WHALING, Milwaukee, Wis.

WOODBURY'S PATENT
Planing and Matching
and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.
S. A. WOODS, { 91 Liberty street, N. Y.; 67 Sudbury street, Boston.
Send for Circulars.

GLASS MOULDS for Fruit Jars, Lamps, Bottles, Ink Stands, etc., made by H. BROOKE, 15 years COR. WHITE AND CENTER STS., N. Y. For any thing new in glass you will require a mould (or die).
☞ PARTICULAR ATTENTION paid to MOULDS for INVENTORS. Send model or drawing; inclose stamp.

BLAKE'S PATENT
Stone and Ore Breaker

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

1874 and 1875 *Catalogues Free.*
Machinists', Blacksmiths,' Model Makers', Pattern Makers', Organ Builders', Piano Makers', and Tools and Supplies for all classes of Mechanics.
A. J. WILKINSON & CO., Boston, Mass.

BABBITT METAL.
Dealers and Consumers send for prices to the Manufacturers.
VANDUZEN & TIFT, 102 E. 2d St., CINCINNATI.
☞ Please mention this paper.

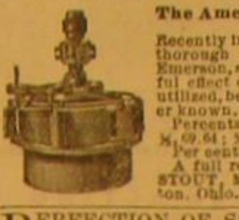
To Electro-Platers.
BATTERIES, CHEMICALS, AND MATERIALS, in sets or single, with books of instruction, manufactured and sold by THOMAS HALL, Manufacturing Electrician, 19 Bromfield Street, Boston, Mass. Illustrated catalogue sent free on application.

G. E. ILLINGWORTH, Neville St. Foundry, Leeds, England, makes a Specialty of his 20-inch Swing Lathes. All parts are interchangeable, being made in duplicate, by patent machinery, thus ensuring Accuracy and Excellence of Workmanship.

☞ For price and Photo. write direct

"Little Giant" Injectors
FOR LOCOMOTIVES & STATIONARY BOILERS. Simple and Reliable.
PHILIP S. JUSTICE,
14 North 5th St., Philadelphia—42 Cliff St., New York.

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.



The American Turbine Water Wheel, Recently improved and submitted to thorough scientific tests by James Emerson, showing the following useful effect of the power of the water utilized, being the highest results ever known.
Percentage of Part Gate: ½, 50.08; ⅝, 69.64; ¾, 78.78; ⅞, 82.53; ⁷⁄₈, 82.90. Per cent. of Whole Gate: 83.14.
A full report may be obtained of STOUT, MILLS & TEMPLE, Dayton, Ohio.

PERFECTION OF SPEED ON WATER WHEELS secured by the Rotary Hydraulic Governor, under all possible conditions. Never fails. Under extreme changes, it operates the entire gate in ten seconds. Warranty unlimited. No pay till tested. JOHN S. ROGERS, Treas., 19 John Street, Boston, Mass.

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

$5 to $20 per day at home. Terms Free. Address GEO. STINSON & Co., Portland, Maine.

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 1,000 being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address
THE J. C. HOADLEY CO. Lawrence, Mass.
97 Liberty st., New York.

IRON BRIDGES—CLARKE, REEVES & Co., PHŒNIXVILLE BRIDGE WORKS. Office, 410 Walnut Street, Philadelphia, Pa.
Specialties—Accurate Workmanship—Phœnix columns—Use of double refined iron. No welds. All work done on the premises, from ore to finished bridges. Illustrated Album mailed on receipt of 75 cents.

Machinery,
Wood and Iron Working of every kind. Leather and Rubber Belting, Emery Wheels, Babbitt Metal, &c.
Sturtevant Blowers.
Of every size and description constantly on hand.
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, pulleys, etc. GEORGE PLACE & CO.,
121 Chambers Street, & 103 Reade Street, New York.

"EDEOGRAPHY." A new book on the art of Writing by Sound; a complete system of Phonetic Short Hand—the shortest, most simple, easy, and comprehensive, enabling any one, in a short time, to report trials, speeches, sermons, &c. The Lord's Prayer is written with forty-nine strokes of the pen, and 140 words per minute. The unemployed should learn this art. Price, by mail, 50 Cts. Agents wanted. Address T. W. EVANS & CO., 139 S. Seventh Street, Phila., Pa.

$425. Upright Engine and Tubular Boiler (4) HORSE POWER, with all Trimmings; also (10) HORSE POWER. Send for Circulars.
VARIETY IRON WORKS Co., Cleveland, O.

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

SPANISH CEDAR BOARDS.
14 to 27 Feet Long, all Widths.
Sawed expressly for Shell & other Boats.
Also, FULL STOCK OF HARD WOOD LUMBER.
Geo. W. Read & Co.,
Steam Band Saw Mill, foot 5th & 6th Sts., E. R., N. Y.

HAND SAW MILL—SELF-FEEDING.—1 man do work of 3 men guaranteed. Slit 3-inch timber with ease. Send for Circular.
L. B. COXE & CO., 197 Water St., N. Y.

WANTED, A RELIABLE LADY
OR GENTLEMAN, in every town, to act as sole Agent. Business respectable and remunerative. No money required. Address DISCOVERY, P.O. Box 2809, New York.

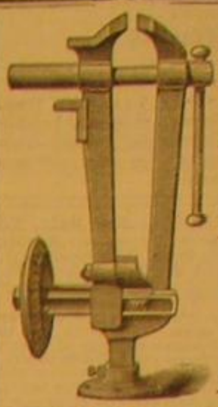
The Eagle Foot Lathe AND APPURTENANCES.
Adapted to all classes of wood and metal turning, &c. Well made, accurate, and reliable. Fully warranted. Send for Catalogue. W. L. CHASE & CO.,
93, 95, 97 Liberty St., New York.

THE JOHN HARDICK
Niagara Steam Pump.
HUBBARD & ALLER, Brooklyn, N.Y.

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

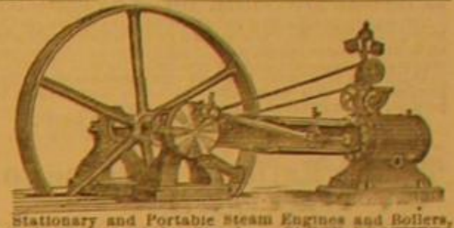
WROUGHT IRON BEAMS & GIRDERS
THE Union Iron Mills, Pittsburgh, Pa. The attention of Engineers and Architects is called to our improved Wrought-Iron Beams and Girders (patented), in which the compound welds between the stem and flanges, which have proved so objectionable in the old mode of manufacturing, 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.

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



PATENT PARALLEL Machinist's Vise,
MANUFACTURED BY
HARRISBURG FOUNDRY AND MACHINE COMPANY.
Harrisburg, Pa.
☞ *Send for Circular and Price List.*

LATHE & MORSE TOOL CO.,
Worcester, Mass., Manufacturers of
MACHINISTS' TOOLS
Lathes, Planers, Drills, &c., &c.



Stationary and Portable Steam Engines and Boilers, of all sizes. Send for Circular. CLUTE BROTHERS & CO., Schenectady, N. Y.

FOR SALE—A valuable improvement in Corn Husking Implement. For particulars and sample, address the inventor, J. F. SCHMELTZER, Manteno, Kankakee, or K. K. K. Co., Ill.

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

HAND SAW MILL—Saves the labor of 3 men. S. C. HILLS, 51 Courtlandt St., New York.

WOOD WORKING MACHINERY

MOLDING, MORTISING TENONING & SHAPING MACHINES;
BAND SAWS,
SCROLL SAWS,
Planing & Matching MACHINES, &c.,
For RAILROAD, CAR, and AGRICULTURAL SHOPS, &c.,
☞ Superior to any in use.
J. A. FAY & CO.
CINCINNATI, Ohio.

ESTABLISHED 1858.

TRADE MARK PATENTED.

The best and cheapest Paint in the world for Iron, Tin, or Wood. For sale everywhere. PRINCE'S METALLIC PAINT CO., Manufacturers, 96 Cedar St., N.Y.
CAUTION.—Purchasers and consumers are cautioned against purchasing imitations of our METALLIC PAINT. All genuine *PRINCE'S METALLIC PAINT* will bear our name and trade mark on each and every package. Send for a circular.

WORKING CLASS Male or Female, $30 a week; employment at home, day or evening; no capital; instructions and valuable package of goods sent free by mail. Address, with 6c return stamp, M. YOUNG & Co., 173 Greenwich st., N.Y.

MILLS and BOLTS
Cheapest and Best. Man Power Mills. Wind & Horse Power Flower & Feed Mills, Steam & Water, Custom & Merchant Mills, Complete Buckwheat & Middlings Mills & Separators. Flouring Mill & Bolter Combined in one Machine. Vertical Corn & Flour Mills, 30 in. size, grinds 600 bu. Corn in 10 Hours. Send Stamps for Catalogue & papers, with 61 Engravings of Mill Machinery. EDWARD HARRISON, New Haven, Conn.

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

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, 1-2 100-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.

$4 PER CENT Guaranteed with N.F. Burnham's 1874 PATENTED TURBINE **Water Wheel** The best in Market. Price less than any other first-class Wheel. ☞ Send for a Pamphlet and be convinced. N.F. BURNHAM, York, Pa.

MONEY—WAGES.
To all having spare time; $4 to $12 a day; something new; pleasant; honorable; large profits; no risks; home or abroad; day or evening; thousands making money. Particulars and valuable samples free.
Address F. M. REED, 139 8th St., N. Y.

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

Advertisements.

Back Page - - - - - - - - $1.00 a line.
Inside Page - - - - - - - - 75 cents a line.
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Friday morning to appear in next issue.

ENGINES AND BOILERS—For Sale, 2d hand Engines and Boilers of all Sizes—all Rebuilt, Good as New. A large stock on hand. Send for circular. JAMES HILL & CO., Allegheny, Pa.

NEARLY 1000 NOW IN USE—BUFFALO PONY PLANER—will earn itself and pay expense of running in eight days. Price from $100 to $145 each. Send for large Illustrated Sheet of Parr's Celebrated Amateur Lathes, Tools and Fittings of every description, 112 Engravings, including 30 original and Inimitable Fret or Scroll Work Designs. Free to all. Address GEORGE PARR, Manufacturer of Mechanic's Tools and Light Machinery, Buffalo, N. Y.

AMERICAN BLACK-BOARD RUBBER—Post paid for 25c. Territory for sale to Agents. ECONOMY MAN'F'G CO., Louisville, Ky.

GRAND DISCOVERY OF THE AGE.

A Great Blessing for Navigators

The undersigned offers for sale a new invention, in the way of a rudder, that will steer a canal boat or a ship, in an astonishing manner, with great power and force, and will not *damage the banks of a canal.* He will furnish a pattern of a boat, with the new invented rudder. The purchaser of this wonderful discovery would have to procure letters patent from our government.
HENRY BARSALOU,
Ste. Anne, Kankakee county, Ill.

Todd & Rafferty Machine Co.

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

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.

WIRE ROPE

Address JOHN A. ROEBLING'S SONS, M'f'rs, Trenton, N. J., or 117 Liberty St., New York. Wheels and Rope for conveying power long distances. Send for Circular.

INDEPENDENT
BOILER FEEDERS
SEND FOR ILLUSTRATED CATALOGUE
COPE & MAXWELL MFG. CO.
HAMILTON, OHIO.

FOR SALE—Four Engine Lathes, 36 inches swing, geared in face plate—one, 17½ feet between centers, with cross feed and gearing for screw cutting, made by Wood, Light & Co., Worcester, Mass.—three, 19 feet between centers, made by Lewes & Phillips, Newark, N. J. Counter shafts and steady rests complete with all the lathes. Used about eight months turning steel tubes of Illinois and St. Louis Bridge, and in first class condition. Weight about 7,000 lbs. each.
Also, the superior **Testing Machine** of the Illinois and St. Louis Bridge Co.; a very accurate and reliable machine, adapted to all forms of tests, and of 100 tons capacity. All sold for want of further use. Apply to JOHN A. NICHOLS, Keystone Bridge Company, Pittsburgh, Pa.

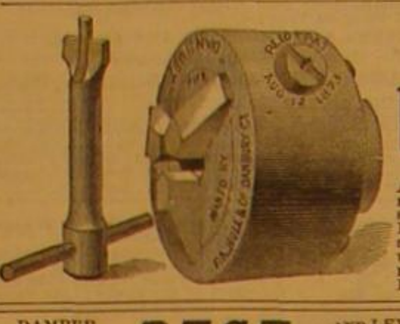
JUST OUT.
THE
Science Record
FOR
1874.

THIS NEW AND splendid annual book presents in brief form the most Interesting Facts and Discoveries in the various Arts and Sciences that have transpired during the preceding year of title, exhibiting in one view the General Progress of the World in the following Departments:
1.—CHEMISTRY AND METALLURGY.
2.—MECHANICS AND ENGINEERING.
3.—ELECTRICITY, LIGHT, HEAT, SOUND.
4.—TECHNOLOGY—Embracing New and Useful Inventions and Discoveries relating to THE ARTS;
5.—BOTANY AND HORTICULTURE.
6.—AGRICULTURE.
7.—RURAL AND HOUSEHOLD ECONOMY.
8.—MATERIA MEDICA, THERAPEUTICS, HYGIENE.
9.—NATURAL HISTORY AND ZOOLOGY.
10.—PISCICULTURE AND FISHERIES.
11 & 12.—METEOROLOGY, TERRESTRIAL PHYSICS GEOGRAPHY.
13.—GEOLOGY AND MINERALOGY.
14.—ASTRONOMY.
15.—BIOGRAPHY.
Every person who desires to be well informed concerning the Progress of the Arts and Sciences should have a copy of SCIENCE RECORD. It is a most interesting and valuable Book, and should have a place in every Household, in every Library.
600 pages, Octavo. Handsomely Bound. With Engravings. Price $2.50.
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* on receipt of $5.

SCIENCE RECORD FOR **1872, 1873, and 1874** Now ready. Each $2.50. For the three volumes $6.50

MORRIS, TASKER & CO.,
PASCAL IRON WORKS,
PHILADELPHIA,
TASKER IRON WORKS, NEWCASTLE, DELAWARE.
OFFICE.................FIFTH AND TASKER STREETS, PHILADELPHIA.
OFFICE AND WAREHOUSE.................NO. 15 GOLD STREET, NEW YORK.
OFFICE AND WAREHOUSE.................NO. 36 OLIVER STREET, BOSTON.
Manufacturers of Wrought Iron Welded Tubes, plain, galvanized, and *rubber coated*, for gas, steam and water, Lap-Welded Charcoal Iron Boiler Tubes, Oil-Well Tubing and Casing, Gas and Steam Fittings, Brass Valves and Cocks, Gas and Steam Fitters' Tools, Cast Iron Gas and Water Pipe, Street Lamp Posts and Lanterns, Improved Coal Gas Apparatus, &c. ☞ We would call the Special Attention to our Patent Vulcanized Rubber-coated Tube.
THOMAS T. TASKER, JR. STEPHEN P. M. TASKER.



THE "DANBURY"
Universal Drill Chuck
C. H. REID'S PATENT, AUGUST 12, 1873,
A success. Heartily endorsed by all using it. Stronger and **more durable** than any other. Holds drills from 0 to ⅜, full size, and will hold much larger by turning down shanks to ⅜. Is operated quickly and always easily; cannot clog, **set**, or in any way **get out of order.** Has now been a year in constant use, working perfectly. All are sold with full warrant, to be returned if not satisfactory. F. A. HULL & CO., Manufacturers, Danbury, Ct Send for Illustrated Descriptive Circular.

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

IMPROVED 1874.
DOUBLE ACTING
BUCKET-PLUNGER
Steam Pumps
ALWAYS RELIABLE.
VALLEY MACHINE COMPANY,
Easthampton, Mass.

NEW YORK SCREW MANUFACTURER.
MACHINE SCREWS of all descriptions, defying competition in prices and quality. SILVER MEDALS, Exhibitions 1852 & 1867.
C. DUCREUX, Ag't,
93 Elizabeth, N. Y.

BABBITT & HARRIS
Patent Piston Packing
Rights for sale for Shops, Railroads, &c.
All licenses, to be genuine, must be filled out on a printed form, with Steel Plate Engraving of my Engine at head of page.
Any party having a written license, is requested to return it at once to me, when a printed one will be issued instead. WILLIAM A. HARRIS, Builder of Harris-Corliss Engines, Providence, R. I.

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

TANNATE OF SODA *is not* Patented, *and cannot be* Patented. Thomas's Fluid Tannate of Soda *is a perfect Success* for removing scale from Steam Boilers, WITHOUT INJURING BOILER. It has removed Bushels of Scale from Single Boilers, thereby saving Tons of Coal. It saves 20 times its cost in Fuel, and saves 20 times its cost in repairs of Boilers. Sold in Bbls. 500 lb., ½ Bbls. 250 lb., ¼ Bbls. 125 lb., at the low price of 10 cents per pound—less than one third price of other preparations, and superior to all others. Address orders to N. SPENCER THOMAS, Elmira, N. Y.

NOYE'S
Mill Furnishing Works
are the largest in the United States. They make Burr Millstones, Portable Mills, Smut Machines, Packers, Mill Picks, Water Wheels, Pulleys and Gearing, specially adapted to flour mills. Send for catalogue.
J. T. NOYE & SON, Buffalo, N. Y.

WANTED—An experienced manufacturer of unchemicalled Corn Starch. To a satisfactory man, good wages and steady employment will be given. Apply, in person or by letter, to OWENS, LANE & DYER MACHINE CO., Saint Louis, Mo.

TO PARTIES BUILDING AND USING Steam Engines—The undersigned call attention to Tremper's Patent Adjustable Cut-off. Operated by the governor. Can be applied to any Engine. Send for a circular, to PUSEY, JONES & CO., Wilmington, Del.

FOR SALE—A SPLENDID FOUNDRY BUILDING, with New and Improved Machinery. The building is well arranged for the purposes of a Foundry, Malleable Iron Works, and Machine Shop.
Address FOUNDRY COMPANY,
Tippecanoe City, Miami Co., O.

WIRE ROPE.
John W. Mason & Co., 43 Broadway, New York.

H. W. JOHNS' PATENT
ASBESTOS ROOFING
☞ Send for descriptive Pamphlets, Price Lists, &c. *Liberal inducements to Merchants and Dealers.*
H. W. JOHNS, 87 Maiden Lane, N. Y. } Patentee and Sole Manufacturer, ESTABLISHED 1858.

Lumbermen's Gazette.
An Invaluable Statistical Journal for Lumbermen. Thirty-six large pages, elegantly printed and bound. Published monthly, at $2.00 a year. Single copies 25 cents.
Address "LUMBERMAN'S GAZETTE," Bay City, Mich.

Samples from B. E. Hale & CO., 56 and 58 Park Place, N. Y. Sole Agents for Eastern States.
BUILDING PAPER!
FOR SHEATHING, ROOFING, DEAFENING, CARPET LINING, AND PLASTERING
Samples from Rock River Paper Company, Chicago, Ills.

SUPER-HEATERS
Save fuel, and supply DRY steam. Attached to boilers or set in separate furnaces. H. W. BULKLEY, Engineer. 98 Liberty St., New York.

Pyrometers. For testing Ovens, Boiler flues, Blast furnaces, Super-Heated Steam, Oil Stills, &c.
Address HENRY W. BULKLEY, 98 Liberty St., New York.

J. G. ROGERS & CO., Madison, Ind., are the original introducers of **TANNATE OF SODA** for cleaning boilers. Their preparation of this Salt was patented May 21st, 1871. It success has led to many fraudulent imitations against which the public is warned. *Their T. S. is the solid Salt itself—no dilution.* ONLY 1 TO 2 OUNCES DAILY REQUIRED. Price 35c. a lb. Send for book. References: Remington & Sons, Ilion N. Y.; Root Steam Engine Co., N. Y.; Owens, Lane Dyer & Co., Hamilton, O.; Oneida Community, Oneid., N. Y.

GRINDSTONES
2000 TONS ON HAND. FOUNDED 1810.
J. E. MITCHELL. PHILA.

N. Y. STEAM ENGINE CO. 98 CHAMBERS ST. N. Y.
We make Without Charge, For Patterns, GEAR WHEELS, with our Patent Moulding Machine.
FOR
Machinists' TOOLS,
OF ALL KINDS,
ADDRESS:
N. Y. Steam Engine Co.
98 Chambers St.
NEW YORK.

Universal Hand Planing Machine, a labor-saving invention, attached to any vise, to bench with stand and chuck, or to work itself, set to work in any direction in a moment. Up and down feed to Tool; reversible self cross feed. Quickly saves its cost in hands of all metal working mechanics. JACOB E. SUITTERLIN, mf'r, 60 Duane St., N. Y.

STEAM BOILER AND PIPE
COVERING
Saves ten to twenty per cent. CHALMERS SPENCE CO., foot E. 9th St., N. Y.; 1202 N. 2nd St., St. Louis, Mo.

THE AMERICAN TWIST DRILL CO., Woonsocket, R. I., are now the sole owners and manufacturers of the celebrated DIAMOND SOLID EMERY WHEELS. ☞ Illustrated Catalogue of Emery Wheels, Machinery, and Tools FREE.

C. HENRY HALL & CO., 20 Cortlandt St., N. Y. City.
THE PULSOMETER.

The simplest, most durable and effective STEAM PUMP now in use. Will pump gritty or muddy water without wear or injury to its parts. It cannot get out of order.
Branch Depots:
11 Pemberton Square, Boston, Mass.
1327 Market St., Philadelphia, Pa.
59 Wells Street, Chicago, Ill.
South Western Exposition, New Orleans.
811 & 813 North Second St., St. Louis, Mo.

REYNOLDS & CO.
MANUFACTURE
Screws & Bolts
For Machinery of every variety.
ALSO
Bridge and Roof Bolts.
STEEL & IRON SET SCREWS
A specialty. Also, Small Articles for Patentees, in great numbers, at No. 145 East St., New Haven, Conn

GLASS PUMP CYLINDERS, BLOWN and made perfectly **true** on inside by drilling. T. DEGNAN, Glass Pump Cylinder Maker, Cor. Milk and Oliver St., Boston, Mass.

Portland Cement.
S. L. Merchant & Co. 76 South St., New York. A Practical Treatise on Cement furnished FREE.

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

American Saw Co.
NO. 1 FERRY ST., NEW YORK.
Movable-Toothed Circular Saws.
Eccentric Geared Power Presses.

THE TANITE COMPANY
TANITE TRADE MARK EX USU UTILITAS
Emery Wheels Emery Grinders
STROUDSBURG MONROE Co. PA.

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

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

ENGINES AND BOILERS, New and Second Hand, Portable and Stationary. For description, address GOODWIN & WHITE, Oil City, Pa.

LUBRICATORS.
DREYFUS' transparent Self-acting Oilers, for all sorts of Machinery and Shafting, are reliable in all seasons, saving 75—95 per cent. The **SELF-ACTING LUBRICATOR** for Cylinders is now adopted by over 150 R. R. in the U. S., and by hundreds of stationary engines. NATHAN & DREYFUS, 108 Liberty st., N. Y.

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.

NEW-YORK STEAM ENGINE CO.
MANUFACTURERS OF
MACHINISTS' TOOLS
OF ALL DESCRIPTIONS
CHAS. A. CHEEVER TREAS. GEO. O. DOW SECY. No. 98 CHAMBERS ST. NEW-YORK

HOUSTON'S PATENT
TURBINE WATER WHEEL.
Simplest, Strongest, Cheapest, Best.

In the test at Holyoke, in 1872, the Houston gave the **highest percentage ever shown** in a reliable test and the **highest average results ever obtained.** In practical use it is everywhere demonstrating its superiority over all others. Emerson's full report furnished on application. Send for Circular.
MERRILL & HOUSTON IRON WORKS,
Beloit, Wisconsin.

PORTLAND CEMENT,
From the best London Manufacturers. For sale by JAMES BRAND, 55 Cliff St., N. Y.
A Practical Treatise on Cement furnished for 25 cents.

PROSPECTUS
OF THE
SCIENTIFIC AMERICAN.
THE BEST MECHANICAL PAPER IN THE WORLD.
TWENTY-NINTH YEAR.
VOLUME XXX.—NEW SERIES.

The publishers of the SCIENTIFIC AMERICAN beg to announce that on the third day of January, 1874, a new volume commences. It will continue to be the aim of the publishers to render the contents of the coming year more attractive and useful than any of its predecessors.

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

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.

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.

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 1874	5.00

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 and drafts payable to
MUNN & CO.,
37 PARK ROW, NEW YORK

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