SCIENTIFIC AMERICAN

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

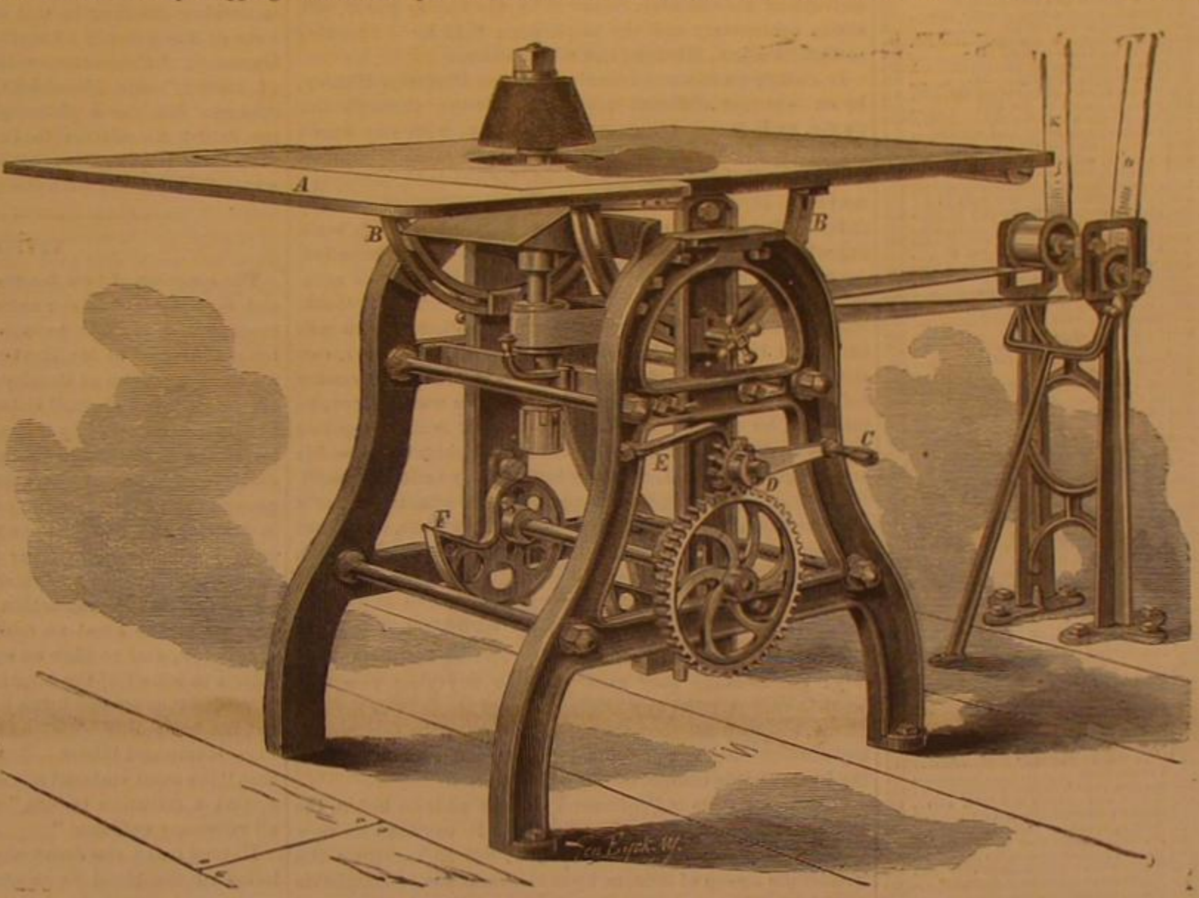
Vol. XXXI.—No. 13. [NEW SERIES.] | NEW YORK, SEPTEMBER 26, 1874. | $3 per Annum. With Postage, $3.20.

THE AMERICAN STOVE PLATE DRESSING MACHINE.

This machine is designed to obviate a large amount of work upon stove castings, now performed by hand labor, with the cold chisel and file. A well made stove should have every joint nearly perfect, the doors so nicely adjusted that a strip of tissue paper inserted at any point cannot, when the door is shut, be withdrawn, and the edges of the holes smoothly ground over the entire surface. It has also become the practice lately to give a fine polish to the outside edges of the tops and bottoms. It is hardly necessary to point out that all this extra work, when done by chipping with a cold chisel and smoothing with a half round file, necessitates not only an expenditure of tools but of time, rendering the operation obviously an expensive one.

The present device is so constructed that the castings may be at once adjusted in proper position and at any angle against a grinding wheel, which, acting against either their inner or outer edges, speedily removes irregularities and produces a nicely finished surface.

The operation consists in placing the work, after the gate is broken away, upon the table and setting the latter at the proper angle. This last is done by loosening the two hand nuts, which engage with the semicircular braces, B B, as shown in our engraving. The stove top or other piece is then carried rapidly around with its interior edge in contact with the emery wheel, which renders the portions ground smooth and bright. For this work, solid emery wheels are exclusively used.



THE AMERICAN STOVE PLATE DRESSING MACHINE.

In order to polish the outside edges, an additional table, A, secured to the front of the main table, is used, and the stove top is laid bottom side up on a small form, made from inch board and having a hole for the pipe receiver. This form is placed on the table, and the work thereon brought in contact with the wheel, as already described. After the edges of the casting are roughed off, the solid wheel is removed, a covered one substituted, and the plate finely polished.

The vertical adjustment of the table, which allows of the work being brought against any desired point on the face of the wheel (so as to insure evenness of wear of the latter) is effected by turning the crank, C, which operates the cams, F, through the pinion, D, the whole being controlled and held in position by the dog, E. By using a shorter spindle and cup-shaped wheel, the machine may be advantageously employed for surface grinding.

Application for patent now pending. For further particulars address the Northampton Emery Wheel Co., Leeds, Mass,

The Swatara.

Owing to the haste necessary in despatching the Swatara, with the transit of Venus observing party on board, it was impossible to give her engines, which were the first of the compound type fitted in a United States man-of-war, the benefit of a trial trip.

It appears, however, that under steam and sail she made the passage from this port to Bahia in 85 days. The official report of the engineer has not yet arrived; but from other sources, the *Army and Navy Journal* learns that with fires under six boilers and with an average speed of six and a half knots, she consumed about fifteen tuns of coal per twenty-four hours. The temperature in the engine rooms cannot, it is said, be kept under 130° or steam higher than forty-five pounds.

Nitrous Acid in Plants.

Schönbein first detected nitrous acid in the juices of different plants, by the common reagent for that acid, a solution of potassium iodide, starch, and sulphuric acid, which gives to the liquid containing nitrous acid a fine blue color. Subsequently, however, he was led to attribute this bluing to the presence of active oxygen and no longer to nitrous acid. In order to determine whether or not Schönbein's second conclusion was a correct one, a series of experiments has been made at the laboratory of the Illinois Industrial University, a paper on which M. P. Genadius contributes to the *American Chemist*. The conclusion drawn from these tests is that very strong evidence is offered of the presence of nitrous acid in plants; for the formation of nitric acid would be preceded necessarily by that of nitrous, the latter being, as it were, a stepping stone to the former. So that the bluing, which the experiments obtained from the juices of the different plants, is probably caused in large measure by the nitrous acid present in those juices, with which, as soon as the oxygen of the air comes in contact and the chemical changes (fermentation and decomposition) begin, this acid is either destroyed or changes into nitric.

KINZEL'S RAILWAY TRACK LIFTER.

This is a simple device for lifting railway tracks which, it

is claimed, will accomplish its work in half the time required with the screw jack or other apparatus, while necessitating scarcely half the power. The track can be raised to any hight up to 18 inches, and is held by the machine at any desired elevation within this limit. The operation is easily performed by one man, as indicated in Fig. 1 of the annexed engravings.

The upper ends of two upright posts are bound with iron stirrups and bolted firmly together. The lower ends are secured by bolts and angle irons to a foot piece. Between the two posts is a back, A, which extends for a suitable distance from the foot piece upward.

Working in metal boxes in the upper part of the posts is an iron shaft, B, one and a half inches thick, to which two chains, carrying a heavy hook, are attached. On this shaft, and close to the inner side of one of the posts is a ratchet wheel, C, Fig. 2, with which engages a pawl pivoted to the post. Outside of the latter, the end of the shaft is formed into a six-sided nut to receive the wrench lever by which the shaft is turned and the chains wound thereon. On the other end of the lever is formed a steel tamping bar, D, used for tamping the cross ties.

The device is placed close to the rail, under which the hook engages (dotted lines, Fig. 1). The lever is then worked until the rail is elevated to the desired hight, where it is held by the pawl in connection with the ratchet wheel. The chains have short links and are of $\frac{7}{16}$ inch iron. The weight of the entire machine is from 45 to 50 pounds, and by its aid from 8,000 to 10,000 pounds, it is stated, can be readily lifted by one man. It is adaptable to a variety of uses, is easily adjusted and replaced, and can be made without difficulty at small expense by any railroad shop.

Patented July 8, 1873. For further particulars regarding sale of rights, etc., address the patentee, Mr. Geo. J. Kinzel, Knoxville, Tenn.

New Electromagnetic Station Indicator.

Mr. Charles W. White, of New York city, has patented, August 18, 1874, through the Scientific American Patent Agency, a quite ingenious station indicator, by means of which the names of places printed on an endless band are caused to appear and change by the action of mechanism, controlled by electromagnets. The rollers over which the band passes are geared to each other, and are rotated by a spur wheel, which is itself turned by a ratchet in which a pawl engages. The latter connects with levers vibrated by the movements of the magnet armatures, so as to cause the pawl to turn the ratchet, and so cause the band to move around the rollers. There are two sets of this gearing, in order that the band may be turned in either direction. In addition to this, there is a check pawl, which is lifted when the carrying pawl is operated. This locks a ratchet, so that the band is firmly held at any point until again set in motion by the mechanism. The indicators are placed in any convenient position in the cars, and from each set of magnets an independent circuit is led to the point whence the machine is to be controlled, where a suitable closer is placed in each circuit. Upon one circuit being closed, the indicating ribbon is unwound from the top roll, and wound on the lower one; the other circuit established, the reverse takes place.

The mode of locking the mechanism and the ratchet arrangement for turning the rolls are novel, and embrace efficient improvements in the electromagnetic principle for operating station indicators.

Pacific Ocean Telegraph Survey.

The survey ordered by the United States government, to ascertain the practicability of laying a telegraph cable through the Pacific Ocean, between this country, China, and Japan, has just been successfully completed by Commander G. E. Belknap, of U. S. S. Tuscarora. The greatest depth of water measured was 4,037 fathoms or $4\frac{1}{2}$ miles. Nothing to interfere with the working of a cable was discovered.

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

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

TERMS.

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

Club Rates:

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

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

VOLUME XXXI, No. 13. [NEW SERIES.] *Twenty-ninth Year.*

NEW YORK, SATURDAY, SEPTEMBER 26, 1874.

Contents:

(Illustrated articles are marked with an asterisk.)

ANIMALS ARE AUTOMATA.

One of the most interesting features of the recent meeting of the British Association was the address of Professor Huxley on "The Hypothesis that the Animals are Automata, and its History." This title at once arouses a lively interest, since, among other things, it holds out the promise of a solution of those curious phenomena of sagacity or instinct in the lower animals, which sometimes lead us to question seriously whether the reasoning faculty be totally absent. The beginning of the address is mainly historical, or, more correctly, it is an explanation of the biological propositions of Descartes, and comparison therewith of modern ideas, showing the similarity. By Descartes, the hypothesis above mentioned was evolved, the supposition (reduced to its simplest forms) being that animals are absolutely machines, that—to illustrate—a dog neither sees, smells, nor hears, but that the impression which gave rise to those states of consciousness in a dog gave rise, by a mechanical reflex process, to actions which correspond to those which we perform when we do see, do smell, and do hear.

And this is susceptible of apparent experimental verification. Professor Huxley mentions the case of a frog in which the anterior portion of the brain is destroyed. The animal may live for years, and yet it is certain that it neither sees nor hears. It will sit forever in the same spot; and yet when urged against obstacles, it will turn to avoid them. It will swim in water or balance itself on the hand, as that member is slowly revolved. Something evidently passes through the sensory nerve, acts upon the frog's machinery and the nervous system, and causes it to adapt itself to the proper position.

A still more curious instance cited is that of a French soldier wounded in the left parietal bone. Although he recovered from the lesion, the man leads two distinct lives. For two days in the month he neither sees nor smells, and, in fact, is destitute of every sense except that of touch. Yet he avoids obstacles, eats (though he is utterly destitute of any discrimination in point of taste), performs a large number of actions on mere suggestions, and, stranger still, shows a totally different moral nature; as, while at other times he is inflexibly honest, when affected he becomes an inveterate thief.

With this brief reference to his illustrations we may at once come to Professor Huxley's conclusion, in which, however, he fails to concur wholly with Descartes. He says: "Taking into account the incontrovertible fact that the lower animals which possess brains at all possess (at any rate, in rudiments) a part of the brain, which we have every reason to believe is the organ of consciousness in ourselves; then it seems vastly more probable that the lower animals, although they may not possess that sort of consciousness which we have ourselves, yet have it in a form proportional to the comparative development of the organ of that consciousness, and foreshadow, more or less dimly, those feelings which we possess ourselves." In other words, an animal is, according to Professor Huxley, a sensitive, conscious automaton; its sensations, its volitions, and its thoughts are but the products and consequences of mechanical arrangements. A certain molecular change in the nervous system determines a sensation; the emotions thereby excited leave in the brain, in turn, molecular changes which constitute the physical foundation of memory. These changes give rise to volitions, which, in the animal, will be simply states of emotion which precede its actions; it is a *conscious machine*. And this, Professor Huxley says, "applies in its fullness and entirety to man;" and he expresses no fear of the logical consequences. Yet he does not—indeed, we fail to see how he could—avoid the admission that these very logical consequences of his doctrine, rather than the theory *per se*, will excite controversy and the imputation that he is speeding toward fatalism, atheism, and materialism.

It strikes us as a remarkable fact that Professor Huxley, by an entirely different road—a tunneling through the de ths, as it were—brings us face to face with one result which Dr. Hammond, in his discussion of morbid impulse, reached by a surface path. A man, for example, commits a murder. If we turn to the morbid impulse theory, we may defend him on the ground that there is a flaw in his brain organism, which leaves him in a state when "he is impelled, consciously, to commit an act which is contrary to his natural reason and to his normal inclinations." This is "conscious mechanism," pure and simple. There is no will employed in the matter. Huxley's doctrine, however, carries us further, and allows the accused to plead the broader defence of "unconscious cerebration." He was injured, he may say, he struck, he killed; the power which impelled him to strike was the same which caused him to raise his arm to guard himself, a purely involuntary action. Practically, of course, no such defence would be admitted; but it leads us, from both the doctrines above referred to, to a closer investigation of how far man is responsible for his own actions.

PROFESSOR TYNDALL'S ADDRESS.

There are utterances which mark epochs in human history: not because they give voice to anything new, not because they suggest any original line of thought or investigation, but because they strike, so to speak, the intellectual key note of the age, announcing from some high position the irrepressible conflict of the coming years.

Of such a nature is Professor Tyndall's address before the assembled scientists of Great Britain. It contains no new thought, it announces no new truth; yet in asserting the irresistible sweep of Science upon the remaining strongholds of religious dogma, it is calculated to stir up a grand commotion, not merely in the class so neatly described by the senior Draper as the only example, in the fauna of the world, of that non-development which they so loudly affirm, but among progressive scientists themselves. The timid can no longer blink the fact that the drift of scientific thought, certainly in the minds of its highest representatives, is toward the complete subversion of the fundamental doctrines taught by the ecclesiastical world. It is no longer a question of the earth's form, or position, or age which marks the conflict of Science and religion; no more is it a question of man's place in Nature, his relation to other forms of life, or the origin of his physical frame; these outposts have been carried, and the citadel itself is entered; the distinction between mind and matter, or matter and spirit, is denied, and with it the personal immortality of man, the personal dominion of the universe, and all that these involve.

In the words of this spokesman of British Science, we may see the workings of British thought: "Trace the line of life backward, and see it approaching more and more to what we call the purely physical condition. We reach at length those organisms which I have compared to drops of oil suspended in a mixture of alcohol and water. We reach the *protogenes* of Haeckel, in which we have 'a type distinguishable from a fragment of albumen only by its finely granular character.' Can we pause here? We break a magnet and find two poles in each of its fragments. We continue breaking; but however small the parts, each carries with it, though enfeebled, the polarity of the whole. And when we can break no longer, we prolong the intellectual vision to the polar molecules. Are we not urged to do something similar in the case of life? Is there not a temptation to close, to some extent, with Lucretius, when he affirms that 'Nature is seen to do all things spontaneously of herself, without the help of the gods'? or with Bruno, when he declares that 'matter is not that mere empty capacity which philosophers have pictured her to be, but the universal mother who brings forth all things as the fruit of her own womb'?"

In its unexpected frankness, Professor Tyndall's answer to these questions reminds one of the reply given by a canny Scotchman, on being asked by a tourist if he did not sometimes feel sorely tempted to forget the "sawbath day" and go salmon fishing in the river that flashed by his cabin door. "Na, na," gravely responded Sawney, "I's no temptit; I joost gang!"

So with Professor Tyndall. Where men of less resolution pause and shut their eyes to the inevitable, he "joost gangs." "Abandoning all disguises," he says, with a fearless honesty that will command respect if it fails to command assent, "the confession that I feel bound to make before you is that I prolong the vision backward across the boundary of the experimental evidence, and discern in that Matter which we, in our ignorance, and notwithstanding our professed reverence for its Creator, have hitherto covered with opprobrium, the promise and potency of every form and quality of life." In other words, we are what we are, all things are what they are: not because it has been the pleasure of an artificer, "fashioned after a human model and acting by broken efforts, as man is seen to act," to so create us, but because of the potency of what we are wont to call lifeless matter, whose nature it is to evolve all that we see around us or feel within us, all things that have been or will be, through the play of molecular force. We live because matter lives. We think and feel because it is the function of material combinations such as compose us to think and feel, all the phenomena which we distinguish as physical or mental having their unsearchable roots in what he ventures to call a cosmical life.

To those familiar with the *history* of human thought, there is nothing startling in this confession. Precisely the same view of the potency of matter has been widely accepted in Germany. "Consciousness itself is nothing but an attribute of matter," says Moleschott, and others are equally outspoken. But for a philosophically conservative body like the British Association to listen to such assertions from its president is something altogether unexpected, something which will not end with the hearing.

VIVISECTION.

The question of how far we have the moral right to torture and mutilate the lower animals in the course of scientific investigation is again brought to public attention through a letter addressed by Mr. Henry Bergh, President of the Society for the Prevention of Cruelty to Animals, to Dr. Austin Flint, of the Bellevue Medical College of this city. This subject has been in controversy for nearly two centuries, and through its recent agitation in England has elicited the published opinions of many of the ablest British physiologists of the present day; so that we have abundant authority to guide us in drawing the line between that sacrifice of brutes which is both justifiable and proper through the magnitude of the ends which are secured thereby, and the wanton cruelty which impels the destruction of life uselessly.

We have so great an admiration for the philanthropy of Mr. Bergh, and so high an appreciation of the results of his efforts in behalf of the long-suffering animals, that it is with difficulty that we can bring ourselves to the task of pointing out the errors into which he falls through a laudable zeal in his self-imposed labors. But we cannot admit his assertions that "the most eminent physiologists have pronounced vivisection a scientific failure," or that "lifeless bodies furnish all necessary evidence."

Harvey owed the demonstration of the truth of the circulation of the blood to experiments upon living animals—experiments which he details with great minuteness in his famous work. John Hunter studied the terrible disease of aneurism, and perfected the surgical operation for its cure upon brutes. Sir Charles Bell gave us our knowledge of the nature of the sensatory and voluntary nerves, and their double origin in the spinal cord; and Marshall Hall demonstrated the equally important discovery of the excito-motory action of the nervous system, through the same means. In both of these last instances, it was impossible to use anæsthetics, and the agonies of the animals were doubtless terrible; but they sink into utter insignificance beside the weapons which they placed in the hands of the physician wherewith to combat the pain and suffering of millions for ages hereafter. We might continue and adduce scores of cases similar to the above. Majendie's investigations, and the new remedies which they gave to Science; Blake's studies on saline matter in the blood; Gadden's localization of the cerebral function; the labors of Ferrier, Goltz, Michael Foster, Lewis, Hitzig, Fritz, Brown-Séquard, Bert, Dalton, and the recipient of Mr. Bergh's letter, Dr. Flint, are well-known examples which occur as we write.

But while Mr Bergh is, perhaps, as we have endeavored to show, too sweeping in his wholesale condemnation of vivisection, he is undoubtedly right in inveighing against the infliction of unnecessary torture on the unfortunate brutes; and in this respect we earnestly endorse the ground which he takes. It is a common practice in many medical colleges to sacrifice scores of animals yearly for the repetition of experiments which have proved well settled and thoroughly understood facts. The insertion of a canula into a dog's stomach, in order to submit a bit of meat to the prolonged action of the gastric juice, or the placing of bullets in a pig's leg to show the growth of the bone, are common examples, which, since they are useless, are certainly cruel. Nor is there any necessity of following the practice of a distinguished physiological lecturer in this city, of interrupting the thread of his explanations to seize a wretched cat, cut its throat, and composedly hand the reeking viscera about his class for examination. For such unnecessary torture there is no excuse.

A committee of the British Association, in 1870, considered this subject quite fully, and produced the following report, which we would recommend to faculties of medical colleges throughout the country, and incidentally to the notice of Mr. Bergh

1. "No experiment which can be performed under the influence of an anæsthetic ought to be done without it.

2. "No painful experiment is justifiable for the mere purpose of illustrating a law or fact already demonstrated; in other words, experimentation without the employment of anæsthetics is not a fitting exhibition for teaching purposes.

3. "Whenever, for the investigation of new truth, it is necessary to make a painful experiment, every effort should be made to ensure success, in order that the suffering inflicted may not be wasted. For this reason, no painful experiment ought to be performed by an unskilled person with insufficient instruments and assistance, or in places not suitable to the purpose, that is to say, anywhere except in physiological and pathological laboratories, under proper regulations.

4. "In the scientific preparation for veterinary practice, operations ought not to be performed upon living animals for the mere purpose of obtaining greater operative dexterity.

"Signed by M. A. Lawson, Oxford; G. M. Humphry, Cambridge; John H. Balfour, Arthur Gamgee, Edinburgh; William Flower, Royal College of Surgeons, London; George Rolleston, Secretary, Oxford."

AMERICAN BEACON LIGHTS.

It might naturally be supposed that the United States, with its immense coast line, and the reputed enterprize of its citizens, would be likely to occupy a prominent position among the nations in respect to the scientific construction and management of its beacon lights. But from all the facts that can be gathered, it would appear that we are considerably behind the age. We hope the members of the Light House Board will read the SCIENTIFIC AMERICAN hereafter, and so keep posted in respect to all new and useful improvements in the production of lighting apparatus.

Major G. H. Eliot, United States Engineers, Secretary of the Light House Board, has recently published a report, which is the result of careful examination of the light house systems of European countries. For this labor the writer was afforded exceptional facilities by and through the English authorities, in return for the same courtesy afforded to a representative of the latter in this country, lately charged with the inspection of our fog signals. Major Eliot points out that, while the English and French systems closely resemble our own, there are points in which we may take them as models with advantage. Among these, he mentions the use of gas and the electric light in positions of importance, the use of azimuthal prisms in certain localities, the use of fog signals and revolving lights on light ships, the character of the lamps, and, lastly, the class of keepers, who are retained in service until superannuated, who are eligible to promotion, and whose lives are insured by the Government for the benefit of their families. The English and French lamps, it seems, are superior to ours, in that their light may be governed by the keeper to suit varying conditions of the atmosphere—whether foggy, more or less dark, etc. It is stated that the first order sea coast lights of England may be raised from an equivalent of 342 (their minimum) to 722 candles, while the maximum power of our first class light is uniformly the equivalent of only 210 candles. While the English and French lights have been in recent years increased in power, the actual consumption of oil per unit of light has been decreased by improvements in the supply of oxygen to the flame; and it is suggested that if the modifications described in detail should be adopted, the illuminating power of our lighthouses would be augmented by more than fifty per cent, thus vastly increasing their efficiency in thick and obscure weather.

Mineral oil is rapidly replacing vegetable and animal oils, and by every nation (with the exception of ourselves) the lamps are being changed for its use. It is more cleanly than the lard oil at present used, and not affected by cold; while the lamps do not require trimming during the longest nights, thus leaving much less to depend upon the vigilance of the keeper. It is estimated that we could import a fine quality of Scotch oil (though there is no reason why our own refiners should not make a sufficiently good article), and save $50,000 a year, besides gaining more valuable lights, by substituting mineral for the oil now in use.

It would seem that the suggestions made are quite practicable, and if carried out would render our lighthouse system probably the finest in the world. As it is, vessels can cruise for 5,000 miles along the Atlantic and Gulf coast without losing sight of a light; and there is a large number of houses on the remaining 5,000 miles of our seacoast. Our present Lighthouse Board controls 591 lighthouses, 35 fog signals, 363 day beacons, and 2,838 buoys.

ALASKA AND THE ICELANDERS.

When Mr. Seward completed his bargain with Russia for that out-of-the-way corner of this continent now known as Alaska, there was a general expression of opinion that $7,200,000 of national money, while ordinarily a rather low figure to pay for 580,107 square miles of territory, was nevertheless an excessive price when that territory was, to all appearances, unfit for any but seals and Esquimaux to exist upon. This rather unfavorable impression at the outset was hardly of a nature to engender any widespread public interest in our new acquisition, so that the far-off addition to our domain has heretofore received little attention from any one save from a few hapless government officials who may have been ordered to duty in cold, rainy, and generally disagreeable Sitka. An expedition was sent thither in 1865 to survey a route for a Russo-American telegraph; but the completion of the first Atlantic cable caused the abandonment of the project. Then the territory has been made a military and collection district. Frederick Whymper in England has published a book about it, and Mr. W. H. Dall, to whom we are indebted for valuable archæological investigations among the Aleutian Islands, has produced a similar work. From these volumes the public has read all about Alaska that it cares to, has tossed them aside, and has straightway again consigned the territory, with its seals and its bears, its mountains and its glaciers, and its thousands of square miles, explored and unexplored, to further oblivion.

Nevertheless, to a few thoughtful people the question continues to present itself: "What are we going to do with a political division with a population of 29,097 souls, of whom only 1,300 pretend to have fully acquired the blessings of civilization; where there are 150 rainy days in a year at most places, and sometimes 285 days of incessant downpour at Sitka; where the temperature descends to −70° Fah., and averages about +44° throughout the year? The productions are abundance of timber, some coal, a little gold and silver, ditto copper, plenty of sulphur, and furs worth about $85,000 per annum. In such parts of the country as we know anything about—and that is only along the coast line of 4,000 miles—it appears that there are resources well worth development, but immigrants are very scarce, and capital would doubtless consider any investment in this direction precarious.

It would be an odd coincidence if the inhabitants of one out-of-the-way country, as little thought of as Alaska until the recent celebration of its one thousandth birthday drew the attention of the world to its bleak and rocky shores, should be the means of reclaiming our far northern purchase—should discover its mines, hew its vast forests, and populate its towns—perhaps some day ask for its admission into our family of States. The Icelanders are gazing toward Alaska. Four or five hundred immigrants have arrived in Canada and the United States; and already a petition, signed by fifty Icelandic names, has been forwarded to the President, asking for Government cöoperation in exploring the the territory with a view to its colonization. The reasons why they thus turn to the most uninviting portion of our domain are cogent, forcible, and convincing. It is too far north and too cold for any civilized person but an Icelander to exist in comfort. Its climate is excellently suited to the raising of hardy Icelandic cattle, allowing of an abundant supply of beef, butter, and cheese to the Pacific coast; its fisheries and timber production would supply a large portion of the country. The Fish Commission tell us that our Eastern fish are getting scarce, while that there is a general feeling of uneasiness at the widespread destruction of our forests is well known. May not the sturdy fishermen and lumbermen of Iceland aid us in supplying the deficiency from sources now undrawn upon? May not shipyards appear in Alaska as well as in Maine? The Icelanders say that their colony would supply seamen for the naval and merchant marine, and thus they offer both ships and men to aid in restoring our now depleted carrying trade.

We think that this proposition should meet with favorable consideration from the Government. The Icelanders are a hardy, brave, loyal people. Education among them is prized to a degree greater than among any other mass of people on earth, and we know of no nation whose emigrants could be incorporated in our own people with greater advantages to ourselves. In case they meet with no encouragement from our Government, the nucleus of the coming colony will probably be formed in Canada, and the advantage of increased population will accrue to England instead of to ourselves. There seems to be little question as to the expedience of affording the moderate national aid asked by these people, when considered in connection with the probability, on the other hand, of leaving our territory virtually in the hands of savages for an indefinite period to come.

QUEER RAINS.

An ant rain recently happened in Cambridge, England. *The Chronicle*, a journal of that city, in detailing the circumstance, says that at about six o'clock in the evening, shortly after a rise in temperature had taken place, a shower of ants in countless millions settled in the streets, covering the pavements. The insects were the small winged male ant (*formica fusca*), together with two other varieties, one large without wings, and another of intermediate size with wings. It appears that the creatures must have taken wing or emerged from ground nests; but how far they had traveled, or by what atmospheric phenomenon they were transported, remains an interesting subject for investigation.

It is said that in the early part of this century similar showers occurred in various parts of England and in the Pyrenees, and a few months ago a dense cloud of the insects was seen passing over Cambridge; but there is believed to be no record of an ant rain of such magnitude as this last one.

In examining into this subject of queer rains, we have found a large number of singular cases of downfalls of fish and other animals from the sky, a reference to which will be of interest in the present connection. Showers of fish have been numerous, and are generally explicable by the occurrence of water spouts, which draw them up into the clouds, whence they are carried by strong gales to the land. In Scotland rains of herrings have frequently occurred, the fish in some instances falling far inland, miles from any body of water. A shower of frogs fell near Toulouse in 1804, and in 1827 an immense number of black insects appeared in the midst of a snow storm at Pakroff, Russia. There is a tradition in Lapland that mice of a particular kind have been known to fall from the clouds. The rat shower of Norway has passed into a historical fact. This was a most extraordinary though perfectly explicable occurrence, since it was traced to a whirlwind, which, overtaking an enormous army of the rodents during their annual journey from a hilly region to the lowlands, whisked them up and deposited them in a field at considerable distance.

Immense showers of dust have repeatedly happened in the South of Europe, covering, in one instance, the entire surface of Italy and Sicily, or about 100,000 square miles. Darwin states that a rain of this kind, which took place in 1824, covered the enormous area of 1,648,000 square miles in Northern Africa. Ehrenberg has found the dust to consist of infusoria. It is of a reddish color, and upwards of 320 distinct organisms have been recognized in it.

THE FAIR OF THE AMERICAN INSTITUTE.

The forty-third annual exhibition of the American Institute was formally opened on September 9, in the same building (on Third avenue, between 63d and 64th streets, in this city) in which it has been held for several years past. The ceremony consisted in the usual chorus of hammers, mingled with other noises indicating busy labor, with which the voice of Mr. Nathan C. Ely, Chairman of the Board of Managers, endeavored, though somewhat unsuccessfully, to compete for a brief interval in an effort to deliver an address. The latter, which the speaker, evidently in deference to the strain upon his vocal organs, cut as short as possible, was merely a setting forth of the advantages of industrial expositions, followed by the formal declaration of the opening of the Fair. Then the band pitted itself in an heroic struggle against the hammers, and the visitors wandered around and admired the extent and variety of the packing boxes and the broad vista of unoccupied tables.

So far as we are able to judge of the Fair, in its present chaotic condition—and we have long since despaired of ever finding it otherwise on the opening day or during the fortnight following—there are indications that the exhibition will be a very interesting one. The machinery department is again superintended by Mr. John T. Hawkins, a gentleman who won well deserved praises for his ability and energy in the same position last year. This portion of the Fair, mainly through the efforts of Mr. Hawkins, is much the furthest advanced. Both of the main engines—one by Hampson, Whitehill & Co., of 100 horse power, and the other by William Wright & Co., of 75 horse power—started promptly on time, and the shafting throughout the building was in motion at the hour fixed, although not a tithe of the machines were connected therewith. The list of entries in the department shows about the same number as at the Fair of 1873, with not very many novelties. Two exceptionally large and fine displays of machine tools, by the New York Steam Engine Company and Messrs. George Place & Co., respectively, are the prominent features. These include the latest mechanical improvements and refinements, and, as they will be exhibited in actual operation, will be well worthy of study. We shall allude in detail to the new inventions in these collections, in a subsequent article, adding here only a word of credit to both exhibitors for their promptitude in having such heavy goods in position and (with some exceptions) in running order, which is in marked contrast with the tardiness which characterizes the proprietors of the woodworking and other light tools.

Of the numbers and variety of the goods to be exhibited in the main hall, no satisfactory idea is yet possible. The arrangement of the tables, we notice, has been altered from that in previous Fairs so as to render articles more easily found, while affording them a better chance of display. The addition of a very large and elegant fountain in the center of the hall is a marked improvement. As a work of art it is worthy of the highest praise, while it serves as a grateful relief to the eye, which is disgusted at the scenic atrocities which still remain in the arches at each end of the building.

There is an alarming eruption of red, white, and blue paper muslin rags all over the roof, which reminds us partly of the colored tissue paper stuck on the ceilings of lager beer saloons for the benefit of flies, and partly of the festoons on a political stump platform. The taste which dictates the obscuring of the noble arches which span the area by such cheap and ugly so-called decorations is simply execrable; while the presence of such inflammable stuff in such quantities, situated high up above the innumerable gas flames and in close proximity with the thoroughly dry wooden beams, above which is a tar and gravel roof, seems to us to offer a premium on a wholesale conflagration. This part of the Fair will, or at least should, excite the interest of the Fire Department.

For the present, we leave the exhibition to extricate itself from the reigning disorder, deferring our usual comments on the novelties displayed until the show is complete.

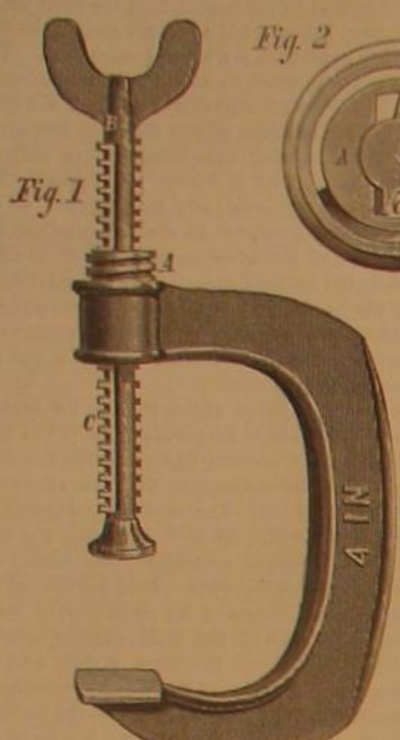
THE hay in some parts of Iowa is so very abundant and cheap that it has been found more economical as a fuel for steam purposes than peat or any other substance. One enterprising inventor writes to us to know if he can obtain a patent for the idea of using hay for fuel in steam boilers. He thinks it new in the annals of steam engineering to use hay for firing.

THE attempt to export young American shad to Germany for stocking the rivers, has proved a failure. Although abundantly supplied with fresh Croton water, all of the hundred thousand fish died of starvation before the end of the journey.

A CORRECTION.—In the description of the vapor burner of Mr. F. A. Sawyer, page 122 in No. 8 of our current volume, the statement that the burner tubes are provided "with pans to catch the drip" should read "pans to prevent cold air rushing up and chilling the tubes." The error exists in the patent specification.

IMPROVED ADJUSTABLE CLAMP.

This is one of those simple and yet very effective little devices which is sure to meet with a ready application from all having occasion for its use. The shape, clearly shown in the annexed engraving, is such as to insure strength, stiffness, and convenience in handling, and the material used is malleable iron. The socket on the upper extremity of the frame is threaded to receive a screw, A. Through the latter passes the clamping rod, B, along the sides of which are cast a series of projections, as shown at C. These enter grooves at the side of the rod orifice through the screw, so that the rod may be moved up and down through the latter with ease. In use, however, the object to be clamped is



placed between the frame and the enlarged lower end of the rod. The latter is then pushed down against the object and turned to the right. The projections, C, then enter notches made along the sides of the grooves in the screw, and consequently carry the latter around with the rod, thereby forcing the same tightly down upon the work. The sectional view, Fig. 2, will render the arrangement of grooves and projections clearly understood. A quarter turn to the left disengages the projections on the rod from the notches, so that the rod can at once be drawn back.

It is unnecessary to point out the advantages resulting in saving of time in turning down screws, as well as the firmness with which the clamp holds its work. The invention is made in various sizes, and is, of course, applicable to a variety of uses, by cabinet makers, carpenters, and others. A vise for wood workers' use has also been introduced, we understand, constructed on the same principle. The present invention is sold by the trade.

Further particulars may be obtained by addressing Hammer & Co., Branford, Conn.

FURNACES, THEIR CONSTRUCTION AND MANAGEMENT.

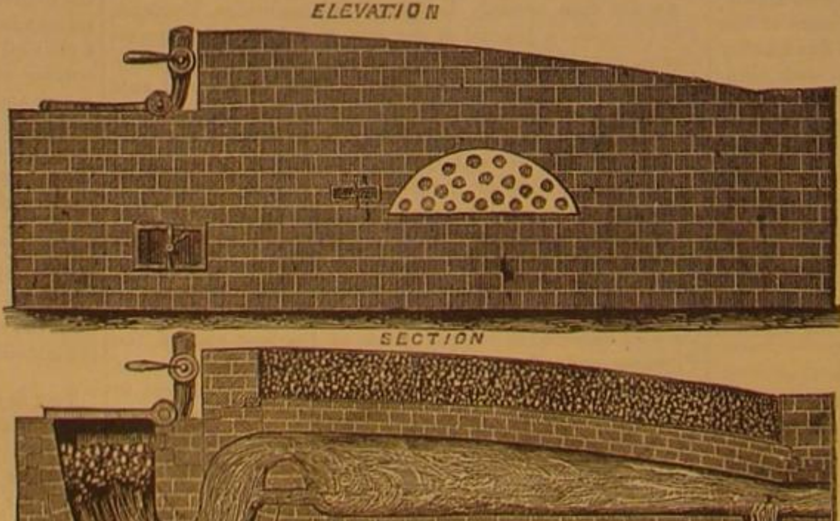
READ BEFORE THE EDINBURGH AND LEITH ENGINEERS' SOCIETY BY MR. CHARLES FAIRBAIRN.

Dr. Joule, in some experiments conducted some time ago, ascertained that a grain of zinc consumed by a galvanic battery generated sufficient power to raise 145.6 lbs. 1 foot high. Now it has been proved that a grain of coal consumed in combustion exerted a power of nearly 1,400 foot pounds. This is nearly ten times the power given out by the zinc. It is said, however that thermo-electric engines utilize the initial force supplied about four times better than heat engines, which would make a grain of zinc give about two fifths of the power of a grain of coal. But zinc costs from forty to fifty times as much as coal, while it gives only two fifths of the efficiency.

During a number of years I have been trying experiments with furnaces, with a view to the economy of fuel. As opportunity occurred, the furnaces I experimented on have been of various kinds, but lately they have been what are known as reverberatory furnaces, chiefly used for puddling and reheating iron.

I do not suppose that any person who has not had an opportunity of seeing a furnace in operation could believe that the effect would be so powerful; the inner lining actually acquires a white heat, thus serving as an accumulator, which is given out again when the temperature of the fire is reduced (as in the case of a fresh charge of fuel), and at the same time assisting to bring the fresh fuel into active combustion more rapidly; the heat is again returned to the fire bricks, and kept ready for future use.

Doctor Siemens, in his celebrated gas furnace, has been very successful in economizing fuel in very large iron manufacturing establishments. The Siemens furnace requires great care in its management, and is said to be more useful for heating large masses of iron for forgings or long bars than for puddling or the intricate processes of iron manufacture. However suitable for large establishments where a great number of furnaces have to be supplied with gas, it is clearly too cumbrous and costly for smaller places, and the question arises—can we not effect, approximately at least, a similar result in single furnaces to what is done by the Siemens furnaces? I think so. Regarding the quantity of air required in the ordinary furnace for the combustion of coal, I suppose that very few people have any idea of the magnitude of the demand. It is generally given as 300 cubic feet, or 24 lbs. of air to 1 lb. of coal. Let us place this in another light. In my own establishment in Gateshead I have seven furnaces, each of which uses about one ton of fuel per day, in all about seven tons; therefore 7×24=168 tons of air required. Again, a pound of coal requires about 300 cubic feet of air. If we imagine the 168 tons of air made into a long stream of one square foot in area, the total length will be 21,381 miles in length. Another great cause of the loss of heat, as before stated, is the quantity of heat continually passing away to the chimney. One difficulty—that is, regulating the supply of air to the furnace—can only be overcome by artificial means, either by a fan blast or steam jet. I believe the time is fast approaching when the supply of air to furnaces will be regulated in this way as the most efficient and economical, and as obviating a great many of the faults of our present furnace. The idea is old enough. However, the arrangement of furnace I will describe presently may or may not be new. I never saw it before, nor am I aware that anything of the same kind has been tried, and to it I have added a supply of air by means of a blower. In this furnace, of which the drawing is a longitudinal section, the coal is introduced from the top, and is always on the top of the incandescent fuel, at the side of the furnace furthest from the place where the flame makes its escape. The hearth is of fire brick, and during the meal hours all the ashes and clinkers are removed by the hole in the side of the furnace. The area of the hearth is about two thirds of the area that it was previously; the blast was introduced above the new coals, and passes through them. As the coals begin to ignite, all the inflammable gases are forced through the fire, and at the same time mixed with air. The advantages with this kind of furnace seem to be the following: (1) The whole of the gaseous products are made available; (2) there is entire absence of smoke, in consequence of perfect combustion; (3) there is a smaller quantity of air required, probably about one fourth less, that is, about 18 lbs. to 1 lb. of coal; (4) no increase of temperature above the external air is required in the chimney, and the escaping heat from the furnace can be used for other purposes; (5) a higher temperature in the furnace, and more rapid circulation of heat; (6) the perfect control which the attendant has over the furnace as regards temperature, getting the fire lighted and into operation in less time, when they have not been in use. There is also another very important point in connection with this method of making reheating furnaces—that the air can be so nicely adjusted by means of the blast and damper as to insure that nearly all the oxygen will be taken up by the carbon and gases, in consequence of which the iron is heated with scarcely any loss from oxide or scale. The balance of pressure can be made so that, even where there are unprotected inlets to the interior of the furnace, the flame can be made to come to the edge of the open space. I believe the efficiency of the furnace might be largely increased by using hot air, which might be done by passing it through pipes or brickwork placed in the flues; for if we have the heat of the furnace at 2500°, and the entering air heated to 500°, the result would necessarily be a great saving. On this point we have the experience of blast furnaces as an indication of what might be saved by this means alone.



FAIRBAIRN'S FURNACE.

The application of this method of constructing furnaces is more difficult to existing steam boilers, and this we can only accomplish by constructing a separate combustion chamber, in which the gases could be properly ignited before passing below the boiler.

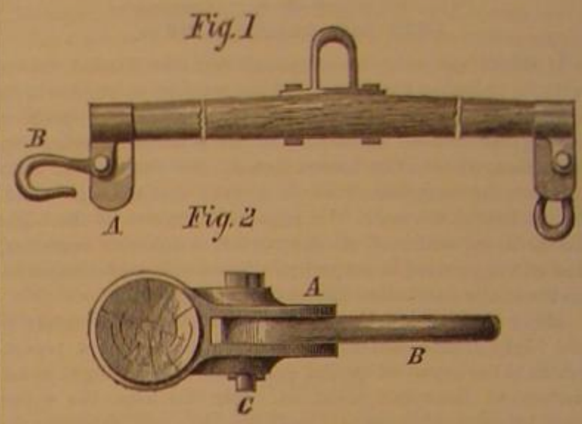
[We are indebted to *Engineering* for the engraving.—EDS.]

STARLING'S FERRULE AND HOOK FOR WHIFFLETREES.

This is a simple device for attaching lugs or traces to whiffletrees, the operation of which is clearly indicated in the annexed engravings.

The ferrule is fitted to the end of the whiffletree in the usual manner. Upon the forward side is a slotted lug, A, shown enlarged in the end view, Fig. 2, to receive the eye of a hook, B, which is secured by a pin, C. The portion of the lug through which the pin hole is formed, and between the aperture and the ferrule, is constructed thick enough to give sufficient strength. The part, however, in front of the pin hole, and upon its inner side, may be made thin, as said parts serve only as a guard to cover and protect the point of the hook when it is extended forward or swung inward, as shown in Fig. 1. This thin portion does not project along the outer edge of the lug; so that, when the hook is swung outward, its point will be uncovered and the trace readily attached.

When used in plowing, the iron pin may be replaced with a wooden one, so that, should the plow strike an obstacle



the pin may break and thus prevent injury to the plow. Patented through the Scientific American Patent Agency, June, 2, 1874. For further particulars address William Starling, Hallock, Peoria county, Ill.

New Prussian Guns.

The *Gazette* of Cologne, Germany, says, of the new Prussian field guns: They are of the same diameter and caliber as the former pieces, but weigh 391 kilogrammes instead of 260, while the new projectiles weigh 6½ kilogrammes instead of 4½, and have an initial velocity of 500 instead of 360 meters. The trials made with the new gun against the old one were highly satisfactory; at the distance of 1,500 metres, the number of pieces of shells in the target was in the proportion of 2.5 to 1, and balls and pieces of sharpnels 3 to 1; but these advantages have been obtained at the expense of lightness and handiness. The whole, gun, charge, and carriage, weighs 1,725 kilogrammes, instead of 1,575, a diminution of mobility equal to about one twelfth. In order to test the importance of this fact, it has been decided that the horse batteries, attached to cavalry divisions, which are to execute grand manœuvres toward the end of September, shall be supplied with the new pieces. The manœuvres are to take place at Frankfort-on-Oder, Magdebourg, Haguenau, and Brumath.

French Saw Making.

The Paris makers have almost a monopoly, we understand, in the making of ribbon saws, and of late years they have given much attention to the production of all kinds of saws and other articles made of sheet steel. Among others, M. Dugoujon, who has steam works at Paris, has patented a number of improved modes of manufacture. The blades, after being rolled cold several times, in order to render the grain close and the metal homogeneous, are heated in special furnaces, from which the air is carefully excluded, and when at the proper temperature are plunged in a bath of colza oil; this is done in a dark chamber. The tempering is effected with the aid of machines, which cause the blades to pass between cast iron plates, heated to a fixed temperature, according to the nature of the article to be produced. The teeth of the saws are cut by machinery, which require only laborers to attend it. Since the war, which deprived the establishment of some of its best men, M. Dugoujon has effected the planishing and grinding of circular and other saws and many similar articles by machinery, and, it is said, with great advantage with respect to regularity and stiffness.

Another introduction is the mechanical reduction of the joints of ribbon saws. The breaking of the joint is the only inconvenience about this useful instrument. The workman, in reducing the welded part by means of the file, scarcely ever left it of exactly the same thickness as the rest of the blade; thus it either created extra friction or was liable to break.

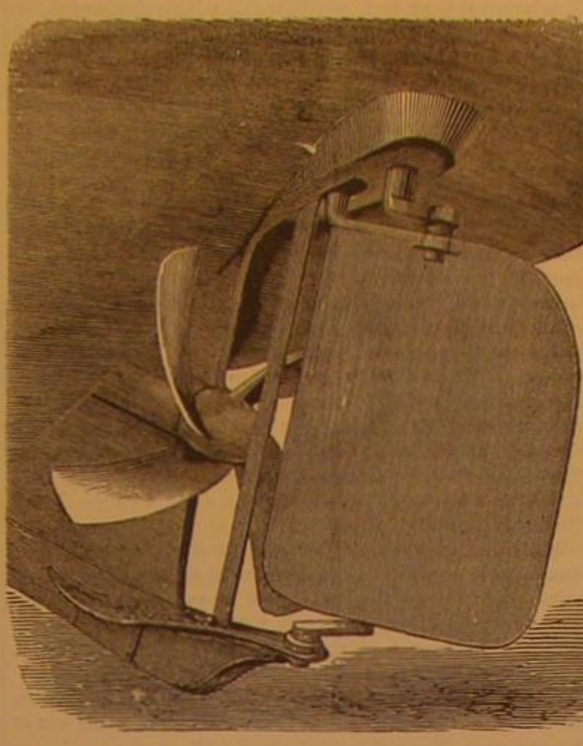
By the new method the reduction is made by grinding instead of filing; and as that is effected longitudinally, instead of across the blade, the thickness is rendered perfectly uniform. This invention is said to save 60 per cent in wages, besides the cost of files.

IMPROVED RUDDER.

The ordinary balance rudder, as is well known, is pivoted near its middle, and can, with a large rudder area, be easily put over to large angles. But it has certain disadvantages which have prevented its being adopted in any except a few very large steam vessels in the Royal Navy. It stops the way of the ship at slow speeds, and is uncertain in its action when the vessel is under sail. This is supposed by many to be due to the fact that the fore part of the rudder is on one side of the ship while the after part is on the other side; and the idea of Mr. Gumpel's rudder is to retain the advantage of the ordinary balance rudder as to ease of turning with a large rudder area, and to obviate its drawbacks by keeping the whole of the rudder on the same side of the vessel for any degree of inclination.

The means by which Mr. Gumpel accomplishes this can best be described by reference to the engraving, which is taken from a photograph. The fore part of the rudder is kept in the middle line of the vessel by the guide rod at its upper fore corner, which is capable of sliding forward and aft in a groove or slot under the vessel's counter. The inclination of the rudder is obtained by making its axis, which is near its center, move round on a crank on what usually forms the rudder head. A spindle goes down through the rudder center, round which the rudder is capable of revolving, and this spindle, with the arms at the top and bottom, form the crank, which carries the rudder center out of the middle line; and the direction of the plane of the rudder is regulated by the guide rod at the fore end being compelled to slide along the middle line. It will easily be seen that the advantage which this rudder has over the common rudder in point of power is mainly at large angles.

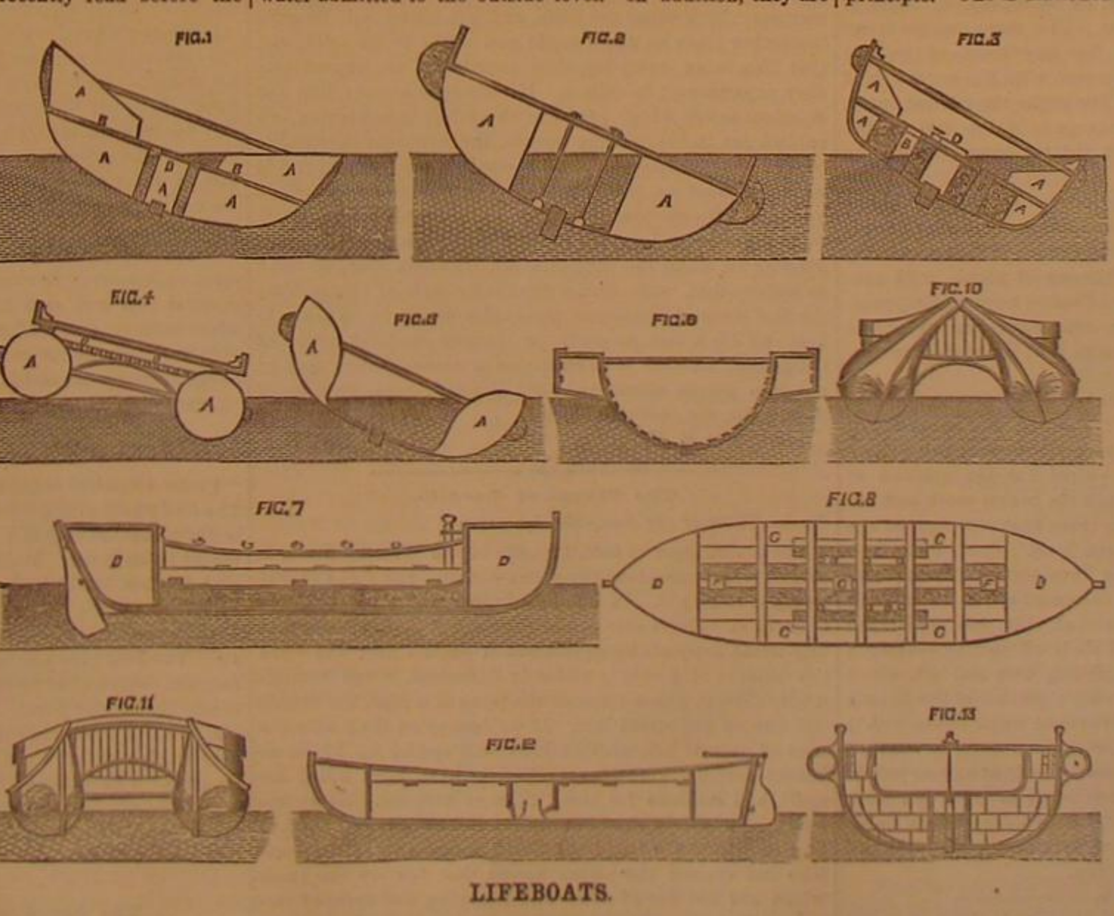
The chief objection, says *Engineering*, from which we extract the engraving, raised to Mr. Gumpel's rudder is that it seems complicated. It certainly does appear more complicated on paper than when seen fitted to the vessel; and the ease with which it could be worked, although the steering wheel was small, and a half turn of it put the rudder hard over, was a subject of much remark on the trial. That it would be of great advantage to river steamers and other craft requiring good steering powers, there can be little doubt; but it would be premature to pass an opinion on it for sailing vessels. The tendency appears to be rather in favor of small rudders for sailing vessels of the mercantile marine, although in yachts they are sometimes of considerable area in proportion to the size of the vessel. It is obvious that the advantage of a balanced rudder of any kind is felt chiefly where large rudder area is required.



GUMPEL'S RUDDER.

ON LIFEBOATS.

Mr. Charles H. Beloe, C. E., recently read before the Liverpool Polytechnic Society an exhaustive and able paper on the above important topic. Excluding such appliances as rafts, buoys, belts, and similar apparatus, he confines himself solely to the single subject in question; and dividing the boats into two classes, namely, those used off shore and those kept aboard ship, he proceeds to discuss the peculiarities and valuable improvements existing in the many types now in use. In general, the qualities which should be present in every vessel of this description are summed up by the Royal National Life Boat Institution as: (1) Great lateral stability or resistance to upsetting. (2) Speed against a heavy sea. (3) Facility of launching or taking the shore. (4) Immediate self discharge of any water breaking into her. (5) Self-righting if upset. (6) Strength. (7) Stowage room for a large number of passengers. From the descriptions which follow, taken from Mr. Beloe's paper, and by the aid of the annexed diagrams, for which we are indebted to the *Engineer*, the reader will be able to examine comparatively the principal varieties of life boats now in use in England:



LIFEBOATS.

Fig. 1 represents the north country or improved Greathead plan, and is now nearly obsolete. These are the widest rowing life boats in existence, some of them having as much as 10½ feet to 11 feet beam, with a length of 30 feet. These wide boats require long oars, with two men to each, to propel them, thereby risking a large number of lives in every boat. They do not possess the property of self-righting, and it was in one of them that twenty lives were lost in 1849. The airtight compartments are marked A. These side air cases contribute vastly to the stability of the boat, by leaving a very small space for the water to occupy, when one gunwale is thrown level with the sea, and that space but slightly on one side of the center of gravity, consequently the water shipped would have but little tendency to weigh the boat down. The continuation of the air cases to the gunwale is objectionable, as they occupy space which is valuable for the stowage of shipwrecked persons. A water tight deck, marked B, extends across the boat, a little above the level of the sea outside; and any water that may be shipped is discharged through tubes into the sea below. Fig. 2 represents one of the Norfolk and Suffolk sailing life boats, which are nearly as ancient in model as the one just described. The extra buoyancy is obtained by means of cork fenders outside the gunwale and by side air cases, occupying a large portion of the interior of the boat. With regard to stability, these Norfolk boats retain more water when inclined to leeward than some boats, as shown by Fig 2, but a large portion of it is to the windward or higher side of the center of buoyancy, where it serves the purposes of ballast, and thereby adds to the stability. They are almost entirely ballasted with water. One great advantage of this plan is that the boats are so easily handled in launching or beaching, as they are launched empty; but as soon as they are cleared of the beach, the plugs are withdrawn, and the water admitted to the outside level. In addition, they are furnished with iron keels. They are exclusively sailing boats, being nearly unmanageable under oars. They measure from 39 feet to 46 feet in length, and from 10½ feet to 12 feet in breadth. A plan and sections of the self righting life boat of the Royal National Lifeboat Institution are shown by Figs. 3, 7, and 8. This is the result of all the experience gained by the institution in the management of its large fleet, now consisting of 235 lifeboats.

On the plan, Fig. 8, A represents the watertight deck, B the relieving tubes, C the side air cases, D the end air chambers, E the ballast, F scuttles to admit of a free current of air under the watertight decks when the boat is ashore, G another scuttle for air, and to receive a pump. In the cross section, Fig. 3, A represents the sections of the side air cases; B the relieving tubes, of the same depth as the space between the decks and the boat's floor; C C C C are spaces beneath the deck, placed longitudinally at the midship part of the boat, and filled with cases packed with cork, forming a portion of the ballast; D, scuttle for ventilation, having a pump fixed in it, by which any leakage beneath the deck can be pumped out when afloat. The extra buoyancy is obtained entirely by means of air cases. When the lee gunwale is level with the sea, there is more space inside to leeward of the center of gravity than in Figs. 1 and 2, the air cases having the corners taken off to afford room for the stowage of passengers, and to prevent the side buoyancy being placed too high for the purposes of self-righting. The self-discharge of water is provided for by the relieving tubes, B, for, as the watertight deck is always slightly above the level of the water outside, any sea that is shipped must flow out through these tubes, which are furnished with very simple self acting balanced valves, that afford no obstruction to the free egress of water, but, closing by the pressure of the sea outside, effectually prevent the admission of any. The actual time occupied by one of these boats in freeing itself from water is about 30 seconds. A large portion of the ballast is composed of cork or wood, as shown at CCCC. The really distinguishing feature of these boats is the property which they possess of self-righting. The best proof of the safety of the boats is the fact that during the last twenty two years the Institution has only lost from all causes, twenty-nine persons from its own lifeboat crews, and many of these lives were lost by the men being crushed against wrecks, falling overboard, etc. The method by which this peculiar property is obtained is by attaching a heavy iron keel to the boat, and otherwise providing a sufficient weight of ballast, by giving a considerable amount of sheer, and by enclosing the bow and stern by airtight chambers. These chambers have sufficient buoyancy to support the whole weight of the boat when upset, with the keel at a considerable hight above the water; it is then floating on two points, with the ballast far above the center of buoyancy, thus forming an unstable equilibrium. In this position the boat cannot remain; and as soon as the keel falls to one side or the other of the center of gravity, the weight of ballast drags the boat round, the water escapes through the relieving tubes, and she is again ready for service. The following are the requirements requisite to insure self righting: (1) Ballast. (2) Enclosed air chambers at the bow and stern, placed sufficiently above the center of gravity. (3) Limited breadth of beam. (4) Limited side buoyancy.

In order to insure strength and elasticity, these boats are now built of fir, on the diagonal principle; formerly they were clinker-built, of oak.

Figs. 10 and 11 represent two boats built on the tubular principle. One is stationed at Rhyl, and the other at New Brighton, both being under the control of the Lifeboat Institution. The latter boat tows and sails admirably, though a trifle heavy under oars. A sectional elevation of her is shown in Fig. 10. Her dimensions are as follows: Length over all, 40 feet; diameter of tubes, 3 feet; distance apart, 3 feet 6 inches. The Mersey Docks and Harbor Board has a boat built on this principle, but with a difference in the mode of construction. The tubes, instead of being circular, are flat on the inner sides, see Fig. 11; the ends of the tubes are not brought together, but the inner sides remain parallel throughout, and have a sort of bow or cutwater at one end. One object of this plan is to prevent the water thrown off by the bows of the tubes being thrown in between them, where the space is confined, and where it undoubtedly retards the boat. By the altered plan, it is contended that all the water thrown off by the bows shall pass away freely outside the tubes. This boat is undoubtedly faster under oars than the New Brighton one, but not equal to her in buoyancy and strength. Her dimensions are as follows: Length, 36 feet; breadth, 10 feet 2 inches outside tubes; breadth, 9 feet 8 inches outside gunwales; diameter of tubes, 3 feet. The objections to this class of boat are: The prejudices of the fishermen and boatmen respecting a boat so unlike anything to which they have been accustomed; their great weight, the clumsy carriage which they require, their unsuitability for launching off a lee shore, and their great cost.

SHIPS' LIFEBOATS.

In order to improve this most important description of boat, in February, 1870, the Society of Arts offered its gold medal for a ship's lifeboat, suitable for the mercantile marine, under the following conditions, mentioned in the second division of the discourse.] Mr. Beloe said that all ships' lifeboats should have these requirements: (1) Buoyancy sufficient to insure that the boat be manageable, when, in addition to the number of persons and additional dead weight (if any) she is intended to carry, she is filled by a sea. (2) The fittings or appliances by which such buoyancy is obtained to remain efficient under all circumstances of climate and temperature, as well as under exposure to sun, weather, and salt water. (3) Fitness for use as an ordinary ship's boat. (4) Strength. (5) Durability. (6) Lateral stability, or resistance to upsetting on the broadside. (7) Relief of water to the outside level. (8) Cheapness. (9) Simplicity of structure. (10) Lightness. It will be seen at once how different are the conditions from those of a shore life boat, and how the ordinary boats of the Institution would fail to comply with them, especially with requirements Nos. 3, 8, 9, and 10. Self-righting is not considered as essential; in fact, boats in an open sea are far less likely to be upset than in the heavy breakers near the shore. The council of the Society of Arts has awarded two gold medals, one to Messrs. Woolfe & Son, for their wooden boats, and one to Messrs. Hamilton & Co., for their iron boats.

Messrs. Woolfe & Son's lifeboat was 25 feet long by 7 feet beam, was built of wood, and had end and side compartments of the proportions recommended by the committee. There is no special peculiarity in the shape of the boat, except that she is very flat-floored; the top of the air cases being flat and level with the thwarts, they afford additional accommodation for passengers. With the crew on board and the water admitted to the outside level, this boat has a freeboard of 20½ inches, and with fifteen additional passengers the freeboard is reduced to 12 inches. It takes eight men to stand on the gunwale to bring it awash. The air cases are easily removed, thus rendering the boat available for service as a cargo boat. The seas breaking into her are ejected to the outside level by means of two plug holes in the bottom, the remainder being baled out after the plugs are again inserted.

Messrs. Hamilton & Co.'s metallic lifeboat is a counterpart of Messrs. Woolfe's boat, having the same length and breadth; and the proportions of the air cases are identical. The two points of difference between Hamilton's and Woolfe's are in the material (one being built of galvanized corrugated iron, and the other of wood) and the means of ejecting the water. The two plug holes, 3 inches in diameter, are placed in the center of the boat, and a watertight bulkhead is fixed on each thwart, on opposite sides of the plug hole, see Fig. 12. Each of these bulkheads is furnished with a simple flap valve, opening inwards. In the event of the boat shipping a sea, she is turned head to wind; and as the bow rises to the waves, all the water contained in the forepart of the boat passes through the valve in the foremost bulkhead, but cannot pass the second one, consequently the water is heaped up in the space between the two bulkheads. As the bow falls again the valve closes, and the water in the center would be higher than the outside level if the plugs have been left in; on withdrawing them it would fall to the level of the sea. The same process is repeated as the stern rises, and a few movements of the boat are sufficient to free her from water, with the exception of about one inch in the bottom. The larger the central space, the more rapid will be the discharge of water; but on the other hand, the greater will be the residuum left in the boat.

Messrs. Lamb & White's lifeboat was the first real ship's lifeboat that was ever adopted, and has undoubtedly done a great deal of good service. A cross section of it is shown by Fig. 5. It is built of two thicknesses of plank, with prepared waterproof material of an adhesive nature interposed. The whole of the internal work, comprising the watertight compartments, bulkheads, and decks, is of the same construction.

Combe's cork and cane lifeboat, Fig. 13, is composed of two baskets, placed one inside the other, and secured to a deep wooden keel, the space between the baskets being filled with cork. No provision is required for the ejection of water, which passes freely through the basket work and between the cork, the bottom of the inner basket or floor of the boat being above the outside sea level. One of the best features of this most ingenious invention is the mode in which the stability of the boat is increased by the water being retained on the windward or elevated side, and discharged on the leeward or lower side. This is effected by leaving a central space in the bottom, extending fore and aft, which is not filled with cork, and by lining a portion of the bottom of the boat and the sides of this central water space with a waterproof material, by which means the water is retained on the side which is lifted up, and its weight acts as ballast on the side where it is wanted, and tends to right the boat. One great advantage of this form of construction is its lightness, a boat, 25 feet long, 8 feet beam, and 3 feet 4 inches deep, only weighing one ton.

THE ST. GOTHARD TUNNEL.—It appears, from a recent report made to the Swiss Federal Council, that at the close of June the contractors had completed nearly one seventh of the whole distance of nine miles, 2213 feet. The progress made during July was about evenly balanced, but the advance on the Goeschenen side was rather more rapid than that effected on the Airolo side.

SMOKING BY CLOCKWORK.—A new toy, lately patented, consists of a figure of a dandy with a cigar holder in his mouth. In the pedestal there is a small bellows, operated by clockwork and spring. A small cigar is lighted and placed in the holder; and when the spring is set in motion, the dandy puffs away, as natural as life, until the cigar is consumed.

Correspondence.

Practical Mechanism.

To the Editor of the Scientific American:

I have carefully read Mr. Joshua Rose's essays on practical mechanics, and also the controversy upon hardening and tempering tools. Mr. Rose is elucidating a perfection of workmanship not attained by one experienced mechanic in a hundred. It is an easy matter to run a lathe; but to get the utmost attainable duty out of it is quite another thing, and this Mr. Rose shows exactly how to do. I have worked in shops where the work was let out by the piece, and have found innumerable cases where one man in a particular branch, with the same tools, did much more work than others. How is this? It is done by little, fine points in the manipulation of the work and the tools, which only a few succeed in perceiving. For instance, in one essay Mr. Rose says: "So much side rake may be given a tool that it will feed itself without the aid of any feed motion; for the force required to bend the shaving (in heavy cuts only) will react upon the tool, forcing it up and into the cut; while the amount of bottom rake, or clearance, as it is sometimes called, may be made just sufficient to permit the tool to enter the cut to the required thickness of shaving or tool feed, and no more; and it will, after the cut is once begun, feed itself, and stop itself when the cut is over." Such a tool as is here described is the very perfection of a tool for heavy cuts; there is absolutely nothing beyond it, that is, provided always that it is forged and hardened as Mr. Rose directs. Not a "wrinkle" has he omitted.

Mr. Hawkins says that "if a tool be dipped at the lowest temperature at which it will be hard at all, it will be harder when ready for use than if dipped at any higher temperature, if required to be drawn in temper at all." A tool for ordinary work, such as shown by Mr. Rose in his Fig. 6, treated by either of these methods would be utterly worthless for the work assigned to it by Mr. Rose, that is, running 36 or 27 feet a minute with a feed of 20 or 25. Nine out of ten expert workmen discard the feed motions of small lathes and feed the tool by hand, when doing short work, because the feeds are so fine as to prevent getting out a satisfactory amount of work. The employer of a fine feed is incapable of judging of the merits of a tool, since his practice never puts a tool to a full test. "The temper of a tool, made just hot enough to harden at all," is altogether indefinite, and practically useless. Mr. Rose gives special instructions for taps, etc., and he gives the colors in combination (as patent lawyers say) with the conditions; so that, both being observed, the result is uniform and correct. What result may be obtained by other conditions is another thing. I know of no better plan than Mr. Rose's, and I do not believe there is one in use. Mr. Hawkins appears to have varied his conditions, and his results have therefore become varied and indefinite in consequence. The latter says in one place that a workman may dip a chisel too little, and the chisel will be soft; in another place he may bungle and make it too hard, and that this is an everyday shop practice: "an unprofitable shop experience," he calls it. He afterwards says that the chemical action which produces the colors in tempering is a subject not, in his opinion, beyond the American mechanic's capability to comprehend. The capability to comprehend is as undisputed as the fact that it is foreign to the whole question. No mechanical motive, no fair motive called forth, such a remark. I do not believe that it is American shop practice to make the blunders Mr. Hawkins charges, but I do believe that, were such a deplorable state of things true, the first duty of American mechanics would be to learn to heat and dip a tool properly, so that the chemical action of tempering, whether it be oxidation or carbonization, may be put into proper operation, without which considerations of time, color, etc., are all valueless.

Greenpoint, N. Y. W. H.

The Plague of Locusts.

To the Editor of the Scientific American:

The grasshopper or locust plague of the Western States is an evil which threatens the entire country, and steps should be taken to stop it. In order to do that, we must get at the cause of it. Every acre of land producing wild or cultivated vegetation supports its equivalent of animal life; and when the balance of power is violently disturbed, it will revenge itself. When a man steps on the teeth of a rake, the handle will rise up and strike him. If we destroy on the plains one kind of animal life, another kind will spring up which we cannot destroy. Millions of buffalo have been killed for sport, and millions for their hides or tongues. Every one who sees a buffalo shoots at it. If it does not fall then, it lingers with the wounds till death relieves it. Every one who has crossed the plains knows that few are the spots which are not dotted over with decaying and decayed carcases. But the greatest slaughter of animals is done by poisoning the wolves and coyotes. Each hunter spreads poisoned bait over a large track of country, and every morning rides round to take the skins; and each dead animal left to rot is in turn a bait to slay thousands of vultures, crows, ravens, hawks, and birds of all kinds, forming a carpet of their feathers for yards round each carcass. It is no wonder, then, that the hoof of the buffalo and the sharp bill of the feathered tribe disturb not the egg of the locust, as it lies near the surface of the ground, waiting for the warm, dry days to come, that it may be hatched out and fly.

The vast plains, while waiting to be used as the abode of man and his dependents, should not be deprived of their beasts and birds. Every prairie chicken and bird consumes an enormous quantity of insect eggs. The wolf and the bear feed on the locusts before they can fly. By these agents, clouds of these plagues would be prevented from rising to strike the Western farmer with want and famine. The locust must now be consumed or abolished in some way, or he will possess the land. We must improve the means of gathering them and using them for fuel or fertilizers, and laws must be enforced which will protect the beasts and birds of the wilds. If large brilliant fires were kept burning at night in the line of their flight, they would come to the light, and, getting their wings burnt, would remain.

Chicago, Ill. JOHN WHITEFORD.

Passage of Gas through Heated Cast Iron.

To the Editor of the Scientific American:

It is generally supposed that the products of combustion will, under some circumstances, pass through heated cast iron. My impression is that experiments, made in Paris several years ago, lead to this conclusion. I remember reading something of the kind at the time, but I have never been able to find an authorized statement of the investigations which lead to this conclusion. Can you put me in the way of finding an account of these experiments? In case you are unable to do this, will you kindly inform me what you think the facts in the case are? J. W. PINKHAM.

Montclair, N. J.

[ANSWER.—We have heretofore published the reports of experiments to which our correspondent refers, wherein it was claimed that carbonic acid gas, resulting from the combustion of the fuel in cast iron furnaces, will pass directly through the iron plates; and the recommendation was therefore made that wrought iron should be substituted for cast iron in the manufacture of hot air furnaces, stoves, and other domestic heaters. But this conclusion we regard as erroneous, for we think that the quantity of gas that thus passes through the cast iron plates is too small to be ordinarily appreciable. In fact, Dr. Hayes, of Massachusetts, in a note published in the SCIENTIFIC AMERICAN last year, stated that that he had conducted a series of special experiments which fully confirm the above view.

We are aware that the escape of gas from our stoves and furnaces is a subject of serious and common complaint. But the trouble is principally due to the badly fitted joints of the cast iron plates, to the improper closing of dampers (thus forcing the gas out at the joints), and also to defective draft in the chimney. It would be difficult to find any cast iron stove or heater in use that is not more or less visibly open at some of its plate or pipe joints, through which gas may, of course, freely flow out. Until some method is invented to seal these openings, the subject of the issue of gas through the pores of the plates, as a sanitary question, will be likely to remain in abeyance.—EDS.]

The Small Engine Question.

To the Editor of the Scientific American:

Some years ago I built a small engine, with a cylinder 2x5 inches, and a balance wheel of 3 feet diameter and 100 lbs. weight. The boiler is 15x36 inches and has fifty ¾ inch flues. It is set horizontally, with the fire box at one end. The fire returns through the upper flues, superheating the steam. The cylinder is on top of the boiler. Fifteen gallons of water are required to charge the boiler; and when the engine is running at 50 lbs. pressure and 300 revolutions per minute, it evaporates about 2 gallons per hour. The amount of fuel is about the same as required by a good sized cook stove. It runs 12 feet of 2 inch shafting, a 6 inch circular saw and cuts 2 inch lumber well; or it runs a wood lathe to turn stuff 6 to 8 inches in diameter. The engine has been run, more or less, for ten years without repairs of any importance, and is in good order now.

Brunswick, N. J. N. T. W.

To the Editor of the Scientific American.

I have a vertical engine, 2½ inches stroke x 2½ inches bore. The feed pump plunger is ½ inch x 2½ inches stroke. The boiler is horizontal, 24 inches x 12 diameter, with 12 flues, each 1½ inches in diameter. Boiler is set in a heavy sheet iron case, with fire box 12x14 inches; the fire passes under the boiler, back through the flues, and over the top of the boiler, and out of smoke stack. No part of the boiler is exposed to the air. The feed pipe passes into the boiler front through the fire, and delivers the water in the back end of the boiler at nearly the boiling point. I have the engine in a boat 16 feet long x 4 foot beam, turning a 14 inch wheel. It makes steam very freely; in fact I run with the door open two thirds of the time. I have run 60 miles in 9 hours with 4 men, burning 48 lbs. of coal. It is the most perfectly working engine I ever saw, large or small.

Manistee, Mich. N. G. NEER.

The Speed of the Mary Powell.

To the Editor of the Scientific American:

In your issue of September 5, I see you mention that the Mary Powell ran to Piermont, a distance of 28 miles, in one hour. On investigation, I fail to find your statement of the distance to Piermont confirmed. I make it about 22 miles

New York city. L. H. ROSSIRE.

J. FRAUENBERGER, of New York city, has recently patented a composition for producing artificial corals, ivory, and similar articles, made of caseine, mixed in the proportions described, and boiled under suitable heat, with a varnish-like solution of copal in concentrated liquid ammonia and alcohol, to be colored and prepared for the various applications in the arts.

PRACTICAL MECHANISM.

NUMBER IX.

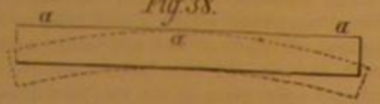
BY JOSHUA ROSE.

VISE WORK—PENING.

The operation termed pening is stretching the skin on one side of work to alter its shape, the principle of which is that, by striking metal with a hammer, the face of the metal struck stretches, and tends to force the work into a circular form, of which the part receiving the effect of the hammer is the outside circle or diameter.

Fig. 38 represents a piece of flat iron, which would, if it

Fig. 38.



were well hammered on the face, *a*, *a*, *a*, with the pene of a hammer, alter its form to that denoted by the dotted lines.

Fig. 39 represents a brass which, if struck with a hammer (along its bore at *a*) or other piece of metal for driving it in while fitting, would gradually assume the form denoted by the dotted lines.

Fig. 39.

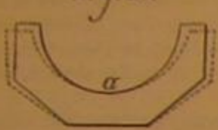
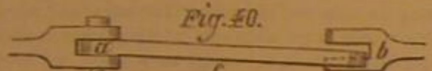


Fig. 40 represents a rod connected at the end, *a*, with a double eye and pin, and requiring to descend true so as to fit into the double eye, *b*, at the other end; if, therefore, it is pened perpendicularly on the

Fig. 40.



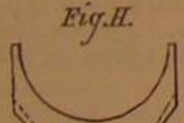
face, *c*, of the rod, the stretched skin will throw the end around so that it will come fair with the eye, *b*. Connecting rod straps which are a little too wide for the rod ends may be in like manner closed so as to fit by pening the outside of the crown end, or, if too narrow, may be opened by pening the inside of the crown end; but in either case the ends of the strap alter most in consequence of their lengths, and the strap will require refitting between its jaws.

Piston rings may be made of larger diameter by pening the ring all round on the inside, and there are many other uses to which pening may be used to advantage, such as setting frames, refitting old work, taking the twist out of work, etc., but it must be borne in mind that if, after a piece of metal has been pened, a cut is taken off it, it will return to its original shape, as the effects of the pening do not extend more than $\frac{1}{16}$ of an inch in depth. When, therefore, a brass or other work requiring to be bored is driven in and out by a piece of metal or a hammer, it stretches the skin; and when the brass is bored, the stretched skin being cut away, it assumes its original shape and hence becomes slack or loose in the strap or block. A light hammer having a round pene should be used; and light blows should be employed for pening, as they are the most effective.

FITTING BRASSES TO THEIR BOXES.

The pattern for a brass which is hexagonal upon the bottom or bedding part should not be made of exactly the same shape as the hexagonal part of the box upon which it beds, because the brass, in casting, shrinks in the direction of the diameter of the bore to such an extent as seriously to alter the angles of the bottom of the brass as compared with the angles on the bottom of the pattern. To compensate for this change of form, the angles on the sides of the pattern should be made more obtuse than those on the sides of the box, as described in Fig. H, the dotted lines being the angle of the box. The shrinkage referred to is not merely that due to the contraction of the metal in cooling, but is an alteration of form which takes place in all castings of more or less segmental circular form, especially in the case of light castings. In castings of 4 inches or less diameter, the rapping (given by the molder to the pattern to loosen it in the sand, so as to be able to extract the pattern without damaging the mold) is about equal to this alteration of form; but in larger castings an allowance must be made for it.

Fig. H.

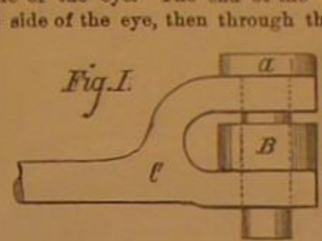


In fitting a brass to its box, first fit the sides of the brass to the box, keeping them at an equal angle to the joint or top face of the brass, so as to let the brass down evenly and not with one side or one bevel lower than the other. To find if the brass is level, use inside callipers as a gage, applied from the top face of the brass to the top face of the box. When the brass is let down so that it approaches the bottom of the box, rub upon the bed of the box a coating of marking; and then upon the end of each bevel, and upon the bottom and near each corner (of the bevels and bottom), place some small pellets of red lead, mixed stiffly; then when the brass is driven home upon its bed and again taken out, the pellets of red lead will adhere to the box because of the marking, and (by their respective thicknesses) denote how nearly the angles or bevels of the brass fit to the box; because where the brass touches the bed of the box, the pellets will be smashed; but if the pellets are intact, it demonstrates that there is space between the box and the brass. It is obvious that the brass requires chipping in those places where the pellets are crushed, and in proportion to the thickness of the pellets that are the least crushed. The pellets should be removed and replaced each time before driving the brass home, and removed when they appear of even thicknesses, the fitting being completed with marking only. All brasses must be fitted to their boxes more tightly than they are intended, when finished, to be, because they go in from the process of boring and are consequently an easier fit after than before being bored.

FITTING LINK MOTIONS.

The planing and boring of the link, of the die, and of the eccentric rod double eyes being completed, the faces of the links may be filed up to a surface plate. The slot of the link should then be filed out to a gage of sheet iron of the proper sweep, the sides of the slot being kept square at all parts with the face of the link: each end of the slot at the termination of the stroke of the die should be eased off a little, so that, when the link and the die are hardened, the latter will not bind hard in the ends of the former, as would otherwise inevitably be the case. The die may then be fitted, to a rather tight fit, to the slot of the link, putting a very light coat of marking upon either or both of them, which will serve as a lubricant to prevent them from cutting, and will show the high spots upon both the link and the die, which spots must be eased off until the die fits to a working fit, providing the link and die are not intended to be hardened. If, however, they are to be hardened, the die must be made of a somewhat easier fit to allow for the expansion of the metal, which takes place in hardening. To fit the double eyes (that is, the eccentric rod ends) upon the link (or quadrant), a bolt and washer should be provided, the pin being a fit to the hole in the eye and to the hole in the washer, the head of the pin and the washer being the finished diameter of the outside of the eye. The end of the pin is passed through one side of the eye, then through the washer, and

Fig. I.

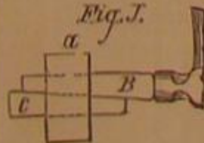


then through the other side of the eye, as illustrated in Fig. I, *a* being the pin, B, the washer, and C, the double eye.

The underneath faces of the pin and washer will, if revolved by hand, mark the two faces (against which they bear) true with the hole of the double eye; and when those faces are finished, the pin may be turned end for end, and the other two faces trued in the same manner. The object of making the head of the pin and the washer of the same diameter as the double eye is that they may be used as gages to which to file up the outside of the double eye, for which purpose they should be hardened so that the file will not cut them. The double eyes being filed to fit the link, the washer (having been used, as above described, as a gage to keep the faces true to the hole) must then be clamped to the link, care being taken to make the hole of the link as true as possible with the hole of the double eye, and to slacken the bolt of the clamp if the double eye requires moving to come fair with the hole in the link. If the clamp were not slacked, striking the double eye to move it would probably spring one jaw out of true with the other. A hand reamer may be passed through the double eye, taking out a light cut, and thus making the holes through the link and double eye parallel and quite true with each other.

If, after the link has been hardened, the die is of too tight a fit, place oil and fine emery in the slot, put the die in its place and (with a piece of wood, through the hole of the die) force it back and forth from end to end of the slot, or in such parts only as it may be too tight; this will grind out the tight places. If the link is tight at the extreme ends, as is sometimes the case, a piece of flat copper shaped and used as a file may be used with grain emery and oil to grind out such ends. If, however, the link has altered so much as to make the grinding a long and tedious operation, it may be opened by placing a bolt and nut in such a position in the slot that the head of the bolt will rest against one side and the end face of the nut against the other side of the slot; the head of the bolt should then be held stationary with a wrench or spanner, and the nut, being unscrewed, will force open the link. Another method is to take two keys, such as connecting rod keys, both having an equal amount of taper on them and place them in the slot of the link as here shown, *a* being an end view of the link, and B and C the keys referred to. The operation is to place a hammer against the head of one key, as here shown, to prevent it from driving out of the link, and to drive in the other key. The advantage of this method over the screw and nut is this: The link will spring considerably before it will alter its form, so that, when applying the bolt and nut, it is difficult, in the second operation (providing the first has not effected the desired opening of the link), to find exactly how much to unscrew the nut. In using the keys, however, lines may be drawn across the keys to denote exactly how far they were driven in during the first operation, which lines will guide the judgment as to how far to drive them in the second operation. If a link opens, that is, if the slot becomes wider during the process of hardening, it may be closed by clamping, or even by a strong vise.

Fig. J.

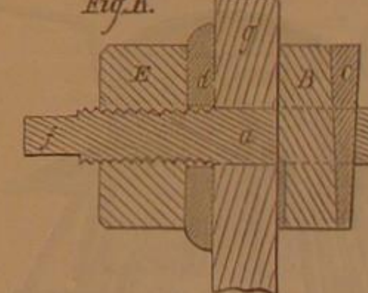


FITTING CYLINDERS.

A casual cylinder or pair of cylinders (there being no templates for marking the holes, etc.,) should be fitted up as follows: If that part of the cylinder cover which fits into the cylinder has a portion cut away to give room for the steam to enter (as is usually the case), mark a line across the inside flange of the cover, parallel to the part cut away, and then scribe each end of the line across the edge of the flange. Then mark a similar line across the cylinder end, parallel to the steam port where it enters the cylinder, and scribe each end of this line across the cylinder flange, so that, when the cylinder cover is placed into the cylinder and the lines on the flanges of the cylinder and the cover are placed parallel to each other, the piece cut away on the cover will stand exactly opposite to the steam port, as it is intended to do. The cover may then be clamped to the cylinder, and holes of the requisite size for the tap (the tapping holes, as they are commonly called) may be drilled through the cover and the requisite depth into the cylinder at the same time. Concerning the correct size of a tapping hole in cast iron, as compared to the tap, there is much difference of opinion and practice. On the one hand, it is claimed that the size of the tapping hole should be such as to permit of a full thread when it is tapped; on the other hand, it is claimed that two thirds or even one half of a full thread is all that is necessary in holes in cast iron, because such a thread is, it is claimed, equally as strong as a full one, and much easier to tap. In cases where it is not necessary for the thread to be steamtight, and where the depth of the thread is greater by at least $\frac{1}{4}$ inch than the diameter of the bolt or stud, three quarters of a full thread is all that is necessary, and can be tapped with much less labor than would be the case if the hole were small enough to admit of a full thread, partly because of the diminished duty performed by the tap, and partly because the oil (which should always be freely supplied to a tap) obtains so much more free access to the cutting edges of the tap. If a long tap is employed to cut a three quarter full thread, it may be wound continuously down the hole, without requiring to be turned backwards at every revolution or so of the tap, to free it from the tap cuttings or shavings, as would be necessary in case a full thread were being cut. The saving of time in consequence of this advantage is equal to at least 50 per cent in favor of the three quarter full thread.

The cylinder covers must, after being drilled, as above, be taken from the cylinder, and the clearing drill put through the holes already drilled so that they will admit the bolts or studs, the clearing holes being made $\frac{1}{16}$ inch larger than the diameter of the bolts or studs. The steam chest may be either clamped to the cylinder, and tapping holes drilled through it and the cylinder (the same as done in the case of the covers), or it may have its clearing holes drilled in it while so clamped, care being taken to let the point of the drill enter deep enough to pass completely through the steam chest, and into the cylinder deep enough to cut or drill a countersink nearly or quite equal to the diameter of the drill. If, however, the steam chest is already drilled, it may be set upon the cylinder, and the holes marked on the cylinder face by a scriber or by the end of a piece of wood or of a bolt, which end may be made either conical or flat for the purpose, marking being placed upon it; so that, by putting it through the hole of the chest, permitting it to rest upon the cylinder face (which may be chalked so as to show the marks plainly), and then revolving it with the hand, it will mark the cylinder face. This plan is generally resorted to when the holes in the chest are too deep to permit of being scribed. To true the back face, round a hole against which face the bolt head or the face of the nut may bed, (in cases where such facing cannot be done by a pin countersink or a cutter used in a machine), the appliance here

Fig. K.



shown may be employed, *a* being a pin provided with a slot at one end to admit the cutter, B, which is held fast by the key, C, and is also provided with a square end, *f*, by which it may be turned or revolved by means of a wrench, and with a thread to receive the nut, E, *d* being a washer; so that, by screwing up the nut, E, the cutting edges of the cutter are forced against the cylinder, *g*, and will, when revolved, cut the face, against which they are forced, true with the hole in the cylinder through which the pin, *a*, is passed.

RICH beds of magnetic ore have been developed in the southwestern portion of Bethlehem Township, Hunterdon County, N. J. The ore is of uniform and excellent quality, containing as impurities manganese, alumina, silica, and lime, being free from sulphur and phosphorus. It is well adapted for making Bessemer steel, and is used by the Bethlehem Iron Company, and the Pennsylvania Steel Works at Harrisburg.

LEAD POISONING.—MM. G. Bergeron and L. L'Hote state that twenty-six persons in the department Seine-et-Marne were attacked with symptoms which were at first ascribed to bilious typhoid fever, but were subsequently traced to lead poisoning. The lead was found in the brine used for salting butter, where it was present as chloride. Two of the cases proved fatal. A notable quantity of lead was found in the intestines, the liver, and the brain of the dead.

Contributions to the Early History of Steam Navigation.

On the 9th of February, 1811, letters patent of the United States, No. 25, were granted to Robert Fulton of New York, for "constructing boats or vessels which are to be navigated by the power of steam engines." The State department at Washington has had occasion recently to make searches among its archives for records pertaining to the early patents' and among the curiosities thus brought to light is a letter from Robert Fulton, bearing date of New York, May 25, 1812, in which he requests Mr. Monroe, then Secretary of State, to give a positive order that his patents for steam boats should not be copied or examined except in case of disputes in law between him and other persons, of which, he says, there were none at the time; and intimates that the doing so enables speculators to contrive, not real improvements, but means of evasion, to the ruinof useful inventions.

Two letters of Henry Spencer have also been found, one bearing date of Albany, August 3, 1798, and the other of Albany, September 3, 1798, both accompanied by drawings and written descriptions of an invention, which he claims to have made, on boats made use of in inland lock navigation, and which may be applicable, he says, to the navigation of the great seas, and of a screw and other means of propulsion to such boats.

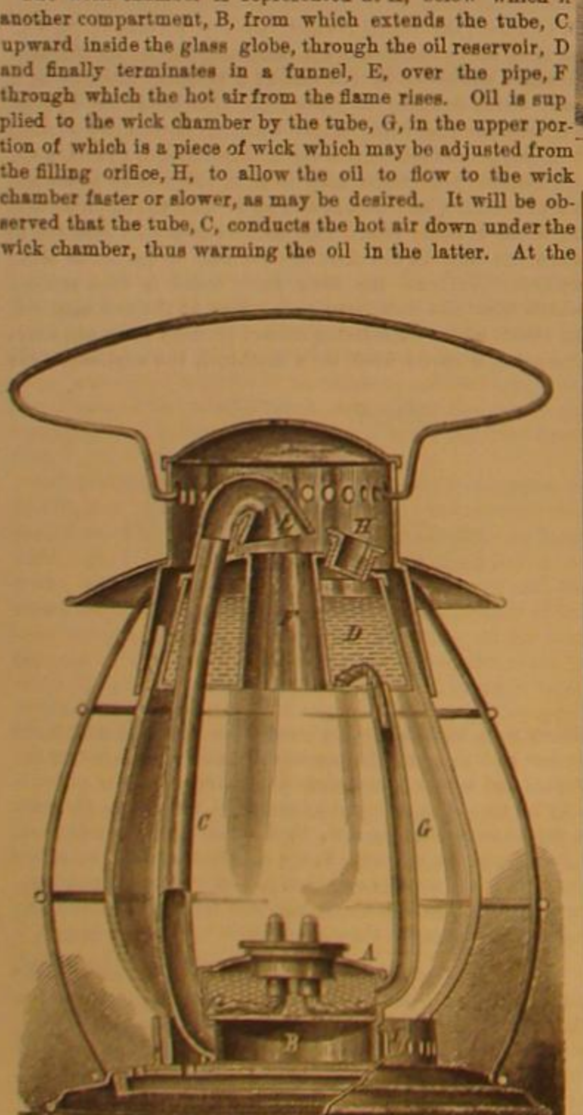
Measurement of the Chemical Action of Solar Light.

Dr. T. L. Phipson, F. C. S., in a note to the *Chemical News*, says: Many years ago I made some experiments on this subject in Paris, and described a method which I believe capable of giving more accurate results than any hitherto obtained. Having discovered that a colorless solution of molybdate of ammonia in sulphuric acid became greenish blue when exposed to the sun, and colorless again during the night, and that the amount of chemical action exerted to produce this tint may be accurately determined by a dilute solution of permanganate of potash, it suffices to operate always upon the same quantity of substance, and to expose it to the light for the same period of time, and in every respect in the same conditions, in order to possess a perfectly accurate process by means of which the problem of the chemical intensity of solar light may some day be solved in a completely satisfactory manner.

LORDON'S IMPROVED LANTERN.

The lantern herewith illustrated is constructed so that the heated air from the flame passed up through an oil reservoir, and thence is conducted down below the wick chamber, the object being to heat the oil in the latter, and thus afford a clearer and brighter light.

The wick chamber is represented at A, below which is another compartment, B, from which extends the tube, C, upward inside the glass globe, through the oil reservoir, D and finally terminates in a funnel, E, over the pipe, F through which the hot air from the flame rises. Oil is supplied to the wick chamber by the tube, G, in the upper portion of which is a piece of wick which may be adjusted from the filling orifice, H, to allow the oil to flow to the wick chamber faster or slower, as may be desired. It will be observed that the tube, C, conducts the hot air down under the wick chamber, thus warming the oil in the latter. At the



base of the lantern is a series of holes connecting with the hollow space, I, for purposes of ventilation.

Patented through the Scientific American Patent Agency, July 14, 1874. For further particulars address Daniel Lordon, Fremont Center, Mich.

THE recent eruption of Mount Etna was predicted by Professor Silvestri, who has made a special study of such phenomena.

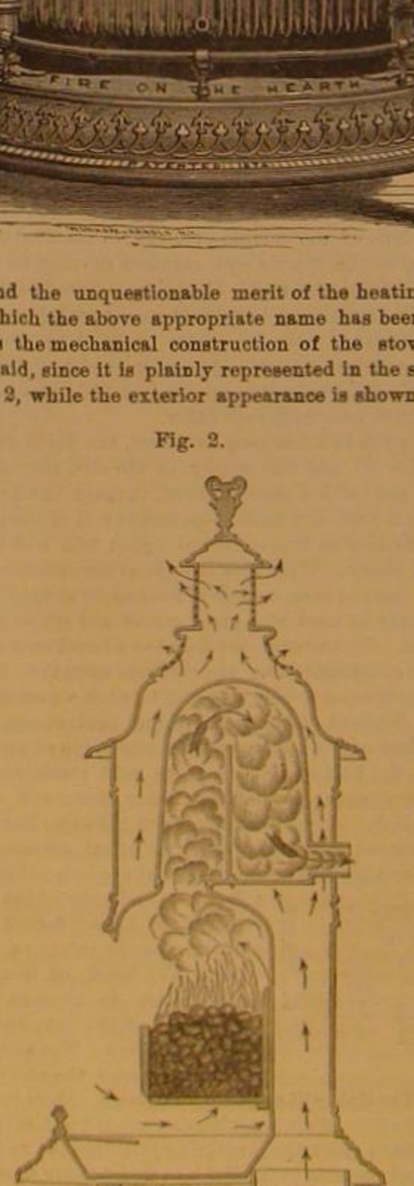
THE FIRE ON THE HEARTH.

While it has been and still is our general rule to decline the publication of engravings of stoves in our editorial columns, we believe it to be to the interest of our readers that our regulation in the present instance should be suspended. We make this exception on account of both the

Fig. 1.

novelty and the unquestionable merit of the heating apparatus to which the above appropriate name has been given. As regards the mechanical construction of the stove, little need be said, since it is plainly represented in the sectional view, Fig. 2, while the exterior appearance is shown in Fig.

Fig. 2.



1. There is a large drum above the fire, surrounded by a jacket so arranged that a constant supply of fresh air may be continuously brought into contact with greatly expanded surfaces, which absorb the maximum quantity of heat, and impart it rapidly to the inflowing currents, thus preventing overheating, and at the same time supplying the room with an abundant, genial, and invigorating atmosphere. It will be observed from the sectional engraving that two distinct currents pass through the stove. One enters beneath the grate, ascends to the chamber above, passes over the diaphragm therein, and thence goes to the chimney, furnishing the draft. The other enters under the stove, and becomes heated by contact with the hot surfaces; and rises through the jacket, thus compelling a constant circulation through the latter. The fire is entirely open, so that a large supply of additional heat is radiated therefrom. The construction, evidently, is such that there is no opportunity for leakage of the deadly carbonic acid; nor is there any contact of highly heated plates with the air of the room to generate carbonic oxide. Purity of the air—which is the most important requirement—being thus insured, the maintenance of proper circulation is provided for, as already described, so that the stove becomes an efficient ventilator, constantly changing the atmosphere, while distributing at the same time, throughout all parts of the apartment, a moderately warmed, fresh current. In this last respect its advantage over the ordinary open grate in the mantel will be obvious, not only in point of better utilization of the fuel and consequent economy in the same, but in the fact that the old objection to grates, of "roasting the face while the back is freezing," is effectually done away with.

In addition to the advantages which we have enumerated are those of simplicity, there being no intricate flues to become clogged and foul, no dampers to get out of order, and no grate set far into the interior, to dump or clean which is a constant aggravation. The latter is easily shaken, and clinkers readily removed.

It will not require the complimentary testimonials, which the manufacturers submit, from Mr. Lewis W. Leeds (than whom no engineer has more carefully studied the subject of ventilation and warming) and other excellent authorities to demonstrate the value of the invention. It will be a veritable blessing in schools, churches, factories, and all similar apartments where large numbers of people are confined, for lengthy periods of time, for study or work.

Patented by Mr. W. L. Phillips, July 13, 1874. For further particulars, address the Open Stove Ventilating Company, 107 Fulton street, New York city.

Detection of Fuchsin Adulterations.

It has become quite common for French wine merchants and confectioners to use fuchsin to highten the color of their wares. The poisonous properties of this substance have been repeatedly demonstrated, so that, in addition to its being a mere adulteration, its consumption in other substances is directly detrimental to health.

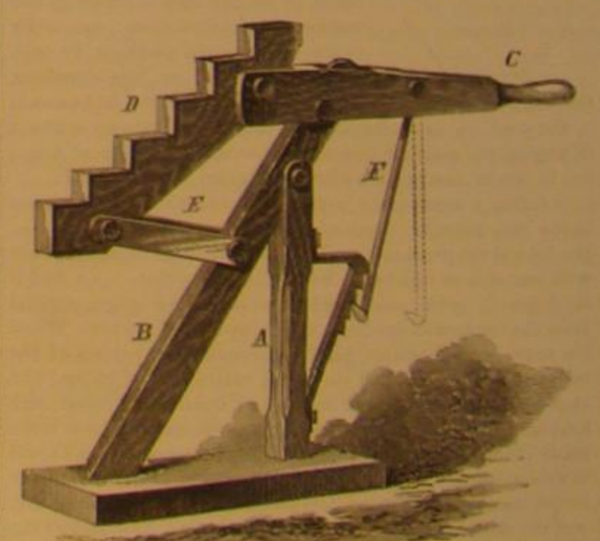
The presence of the substance can be readily recognized in the following manner: Place about 1½ ounces of the suspected compound in a vial, and treat first with 150 grains of subacetate of lead, and then with 300 grains of amylic alcohol. If, after agitating the mixture, the alcohol which separates appears colorless, no fuchsin is present; if the alcohol is colored red, the reverse is the case.

ROWLAND'S WAGON JACK.

The annexed engraving represents a simple and inexpensive form of wagon or lifting jack, which is applicable to all kinds of vehicles.

The upright standard, A, supports an inclined bar, B, both being secured to a substantial base piece. To the upper extremity of the bar, B, is pivoted the lever, C, the forward end of which is similarly attached to the notched bar, D. The lower portion of the latter connects with the bar by means of the pivoted connecting bars, E. To the lever, C, is pivoted the rod, F, the lower end of which is hook-shaped, to engage in the teeth of the bent ratchet bar, shown attached to the rear side of the standard, A.

In using the jack, the free end of the lever, C, is raised and the machine is moved forward until the axle of the wagon rests in one of the notches of bar, D. The lever is then carried down until the load is raised to the desired hight. The hook, F, is next swung forward from the position indicated by the dotted lines in the engraving, and caused to engage upon one of the teeth of the ratchet bar, thus holding the load



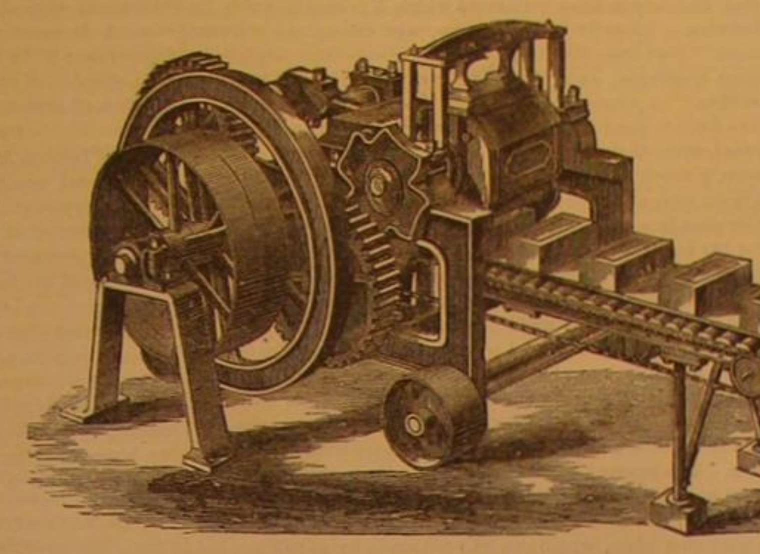
suspended. By slightly pressing down the lever, C, the hook readily drops away from the ratchet, thus lowering the axle or other object supported.

Patented through the Scientific American Patent Agency, June 16, 1874. For further particulars regarding purchase of State and county rights, address (during next two months the inventor, Mr. James S. Rowland, Cambridge, Ohio.

IMPROVED BRICK PRESSING MACHINE.

We publish herewith an illustration of this machine, by which its construction will be at once understood. The bricks to be compressed, in order to give them a greater density than they acquire in production, are allowed to harden in the air for a few days before being pressed. The machine consists of a sliding block moved to and fro by a connecting rod driven by gearing from the pulley, as shown, and of a revolving barrel containing four chambers, in each of which is fitted a sliding die containing the marks to be stamped upon the brick. The front of the sliding block is also furnished with a stamper. On the top of the machine is a plunger fitting the recesses in the barrel, and moving up and down intermittently by means of the cam shown in the sketch, which is connected to the plunger by means of the four bars shown bolted to the crosshead of the plunger. The action of the machine is very simple. A brick is laid on edge upon a table between the front of the sliding block and the barrel. The sliding block advances and pushes the brick from the table into the recess in the barrel, which is immediately opposite, compresses it, and then retires, leaving the table clear for another brick to be laid on. Meantime the barrel has advanced a quarter of a revolution, carrying the pressed brick with it until it arrives opposite the plunger before mentioned, and this, descending, forces out the brick, which drops upon the endless traveling band beneath, and is carried forward to the taker off. In this way, says *Engineering*, to which we are indebted for the engravings, 10,000 bricks per day can be pressed.

The machine was exhibited by Messrs. John Whitehead & Co., of Preston, England, at the recent show of the Royal Agricultural Society at Bedford.

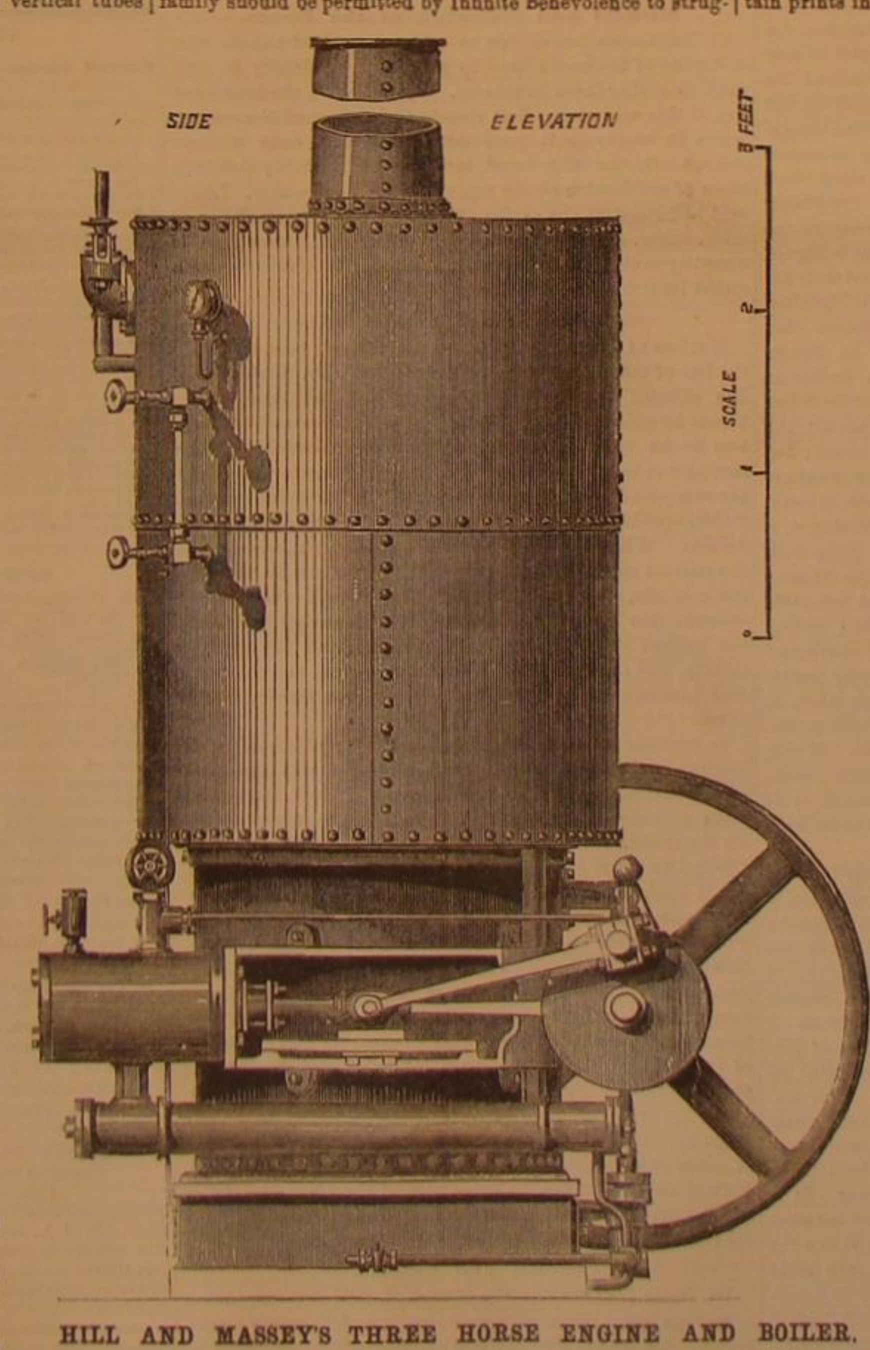


WHITEHEAD'S BRICK PRESS.

NOVEL ENGINE AND BOILER.

The neat little engine which we illustrate herewith requires scarcely any description to make its construction intelligible. The boiler is fitted with internal vertical tubes arranged in groups of three, secured at each end in malleable cast iron caps, and fixed to the fire box by nuts and bolts. The boiler is covered outside by a sheet iron smoke box, so that lagging is not required, and through this casing all the pipes are led.

The engine, it will be seen, is bolted directly on to the boiler. This is the first instance (says *The Engineer*, from which we extract the engraving), perhaps, in which a horizontal engine has been secured directly to the boiler and not to the base plate; and the arrangement has a good deal to recommend it for small powers, as the amount of space occupied is reduced to a minimum, as is the quantity of material used; and the cost is, of course, diminished accordingly.



HILL AND MASSEY'S THREE HORSE ENGINE AND BOILER.

Ways to Success.

Over fifty years ago, a youth, working on a farm, asked his father to give him money enough to buy a gun. The old man could not spare it, but the boy, nothing daunted, found an old piece of iron about the place, and in the course of time contrived to make a gun barrel out of it, with the very meager facilities afforded by a country blacksmith's shop. He had not the materials to make a lack and stock, so he walked to the nearest town and traded for the necessary attachments, and was encouraged by the smith for having made so good a shooter: this gave him the ambition to make another, so he went to cutting out grindstones from the native rock to raise the money for gun materials; in a short time there was a considerable demand for guns of his make. During the French war with Prussia, he was called upon to furnish guns for the army, and in less than eight months he made and delivered to the government of France rifles of a particular pattern, costing five millions of dollars, which amount was duly paid. The same man furnishes rifles now for the United States, South America, Rome, Spain, Egypt, and Japan. The farmer's boy who wanted a gun is Eliphalet Remington, of Ilion, N. Y. His manufactory covers four acres of ground, and he employs twelve hundred men. Not satisfied with this achievement, he has recently completed a sewing machine, which is reported to represent the latest and most perfect advance in the improvements of this important adjunct of domestic economy. This is the type of a boy who, when there is not a way, makes a way for himself.

Many a youth would have sat down and pouted, thinking over what a hard thing it was that he could not get a gun, with hard thoughts against the father for being so stingy. Not so with young Remington; he wanted a gun and was determined to have it; the very necessities of his situation stimulated him to the exercise and consequent development of his powers of planning and devising; in other words, of thinking for himself. And such are they, the world over, who achieve noted success. Those who think for themselves plan for themselves, and upon themselves lean. So it was with Fitch, and Goodyear, and Howe. Their early history was the history of a struggle with privation, and want, and litigation, and almost despair; and the immortal Morse must be added to the list, owing all to their patience, and courage, and indomitable persistence. If young Remington had been supplied with a gun he would have "gone a-gunning," and fallen gradually into a kind of idle, loafing, aimless life, a burden to himself and a benefit to nobody. The very necessity of effort has been the making of many; while many more, who have had their wants gratified with the asking, have sunk into insignificance, and their name and memory have long since perished from the earth.

Some have been heard to express a wonder that the human family should be permitted by Infinite Benevolence to struggle against poverty and want. But as the human mind is constituted, it is better to struggle than to idle, better to work than to wait; better to lean on one's self than on another. It is the men who, as boys, struggled for a foothold in the world, who now wield the world's destinies, and do the most to mold its history.—*Hall's Journal of Health.*

Printing without a Press.

A photo-carbon print on glass is first obtained in the usual way, says the *Bulletin Belge*, which is then varnished with rather weak gum dammar varnish made with pure benzine. The print should be surrounded then with an edging of mastic varnish, and in the meantime the following solution prepared by the help of the sand bath:—Gelatin, 1 part; gum arabic, 1 part; glycerin, 2 parts; with the least possible quantity of water. This mixture is poured warm on to the carbon print after slightly heating it to prevent the glass from cracking. It should form a thick coating on the top of the image, and when sufficiently congealed the whole is detached from the glass. The mass of gelatin forming the bed of the separated print, as it were, is then placed upon any plane surface at hand, and the image is ready for being printed from. The usual law governing the action of the gelatin matrix causes the ink applied to its surface to adhere where the insoluble gelatin has retained the pigments, and to be repelled where the soluble gelatin still retains its moisture-absorbing properties.

When wishing to print from this image, ordinary lithographer's ink, slightly thick, is taken and thinned with some oil or oil of turpentine, indeed, with any oil except boiled oil. A ground glass large roller is the best to ink with, the ordinary printer's roller producing a stickiness that causes adhesion to the surface of the image and tends to tear it. The roller is covered with ink in the usual way, namely, by working it over an elastic surface, such as a bed of gelatin would be, until the ink is distributed with perfect uniformity. In almost the same manner it is applied to the image until it is sufficiently inked. If over-inked, the surplusage may be removed by a moist rag.

If the ink used be too thick, it will adhere only to the deep shadows, and must be thinned if half tones are to be included. This peculiarity may be utilized either in order to give a greater depth to the shadows of a picture or to obtain prints in different tints at the same time from the same plate. In the former case rollers with inks of different consistence are used, and in the latter rollers covered with different colored inks, also of different viscosity. The plate is inked first with the thickest of these, and so on, the thinner ink refusing to overlay those first applied, and which adhere to the deeper shadows, and only filling in what they leave out. Pictures on a colored ground can thus be easily produced.

The printing is very simply done. A smooth surfaced paper, either glazed or coated with non coagulated albumen, is laid on the plate and pressed down on to it, either by means of an india rubber scraper or a roller covered with flannel. The impression thus taken is carefully removed, and the printing proceeded with in the same fashion as described, only that the plate must be moistened between each impression.

The negative used should be one on which the image has been obtained through the glass in the camera; and if such a plate be not at hand, the carbon print forming the matrix should be taken on stearin paper. This paper is made by placing a sheet of ordinary albumenized paper on a bath composed as follows:—Ordinary alcohol, 3½ ounces; stearin, 3½ drachms; common resin, ¼ drachm. Dissolve the stearin in warm alcohol, and add the resin afterwards. A print developed upon this support is then re-transferred to the glass coated with gum dammar varnish.

The facility with which curved surfaces can be printed upon in this way makes it an admirable plan for printing upon vases, etc., with vitrifiable colors; and it is, in fact, a handy plan, if not for commercial photographic printing, at least for trying all kinds of experiments, and one by which amateurs might amuse themselves without much difficulty and at small cost.

Modern Cast Iron.

The Philadelphia *Trade Journal*, in an editorial on improvement in cast metals, recapitulates the advantages gained by the modern scientific manipulation of cast iron, in a concise and forcible manner. In the past 40 years the gross weight of our cast iron articles has been diminished fully one half. Half a century ago the iron frame of a Washington printing press weighed nearly 1,000 pounds; and although it was an arch of metal 9 inches wide by 3 inches thick, so poor was its quality that it was often broken by the pull of one pressman's arm. Our present smooth light castings show an actual elasticity under strain which approaches the service of wrought iron, allowing a large reduction in weight of metal and in the consequent expense.

["Old and New."]

DENTISTRY IN THE UNITED STATES.

NUMBER I.

MOUNTING OF ARTIFICIAL TEETH.

The material used for the bases, or plates, upon which the teeth are attached, are various. The best is gold, after which follow silver, aluminum, continuous gum, and dental vulcanite. The iridio-platinum, whalebone gum, and several other bases, being entirely new, no decided opinion can be given upon them. Gold being the most expensive, not only in intrinsic value, but in the amount of labor necessary to make it up into plates, is not now as generally used as it was before the invention of the dental vulcanite base. A patient having a set of teeth made on gold pays not only for the amount, or weight, of metal received from the dentist, but usually, also, for all that the operator purchases from the dealer. When purchased from the shops, it is cut to a pattern which is made from the wax impression; but after being "struck up," that is, shaped to correspond to the upper or lower jaw, there is a great deal of filing, scraping, and finishing to be done, all of which takes from the weight of metal. Though the patient pays for these scraps, they are never demanded of the dentist; but he takes good care they are not lost. His finishing is done over a leather apron or "jeweller's drawer"; and, as a second "catchall," he has a piece of carpet under his bench. I have frequently imitated the pedler in "Aladdin" by exchanging, not "new lamps for old," but new carpets for old, giving a trifle in addition, much to the satisfaction of the dentist, and more to my own, as I have in one year cleared sixty-five dollars for the trouble of burning the old carpets in crucibles. This amount, of course, is very small compared with what the dentist saves in his apron. The first cost to the operator for gold enough to make an ordinary sized upper plate is about twenty-five dollars; and if the patient should try to sell this same plate after using it only once, or even after it has been "struck up" before using, it would only yield about twelve dollars in currency, which is the difference in weight and price in buying and selling.

Aluminum, the lightest in specific gravity of all the metals, is very seldom used, on account of the inability of the best mechanic to make a perfect fit with it, as the metal will shrink in the casting; and the slightest imperfection in a plate ruins it for service. Experimentally (that is, in making general models, or the like), this metal will answer for base plates; but practically (that is, in fitting a cast to any particular mouth), it is a failure. The manufacture of the continuous gum work is rather a hazardous undertaking, and requires a great outlay for furnace and tools, besides the apprenticeship, which is indispensable for becoming an expert in its manufacture; which facts have been a stumbling block in thr way of its general use. Nor is this the only drawback. As its name indicates, in this work the plate which covers the mouth and the teeth is in one continuous piece, all being of the same kind of body; the various colors and enamels necessary to a natural appearance being applied to the biscuited set, after which it is fused. It is during this process that the operator has his "heart in his mouth"; for he knows not whether even one out of the three sets which he has in his muffle will, when cool, fit the mouth for which it has been formed. When successfully made, the set has all the appearance of the natural gum and roof of the mouth; but the patient has in his mouth quite as much as he wants to carry, for the set is a trifle heavier than one on gold. Should it by accident drop, and strike upon a hard substance, it would be useless to pick it up, as nothing can be done with the pieces. Some operators can repair a set when merely cracked; but even when this is done in the most scientific manner, the repairing will show; and the second fusing which it gets in repairing is liable to warp it out of shape, and beyond redemption. For these reasons it is mostly ostracized by the profession. Silver requires as much labor, to swedge, solder, and finish, as gold, without as much profit, or as satisfactory results, as from the use of gold. It corrodes, and produces sores in the mouth if constantly worn; so that it does not answer for permanent sets, though it is frequently used for temporary ones, where gold is to be used for the permanent sets.

The dental vulcanite, or, as it is more commonly termed, "rubber," has for the past few years been almost universally used, and is every day gaining a firmer foothold in the mouth (so to speak) of our people, as well as abroad. This is not from its real merits, but from the dentists' pushing it. I have seen the time when dentists considered it a greater honor to save a natural tooth than to successfully extract it, and replace with an artificial one; but the influence of this "mercurialized gum" has been adverse to the point of honor, and too many of them look only to profit. This material, when purchased from the shops, is in sheets about three inches wide, five inches long, and three sixteenths of an inch thick. It is sold by the pound, each sheet being sufficiently large for one plate and part of another. It is very pliable, and, if slightly heated, can be pressed between plaster molds, and forced into the finest crevices. When the teeth have been placed in the base thus molded, the mold containing the gum and teeth in position is placed in a copper boiler made for the purpose, called a vulcanizer, heated to 320° Fah., and kept at that point more than an hour and a half; then it is taken out, and the plaster removed. The "gum," now vulcanized, has the appearance of a piece of Virginia pine bark, and can be cut, filed, and fitted to the mouth and cheeks, as easily as a piece of such bark, the difference being that the "plate," as it is termed after the above process, is susceptible of a high polish. As previously stated, this material is not pushed by the dentists on its merits, but on account of the profit derived from making it up. That this composition is deleterious to the health of those wearing it, there can be no doubt, as many can testify who have tried it. I know two patients who have been unable to wear sets made upon rubber, but who have worn gold with comfort. The rubber plate salivated them, beside "parboiling" the roof of the mouth. When rubber was first introduced, there was a great deal of controversy among dentists about it. As a class, they condemned it, because there was mercury in it—a statement which it is easy to prove by burning a piece in a spirit lamp, and seeing the "liquid metal" ooze from the mass. But suddenly their objections were overcome; and now they say "there is nothing like rubber." A single set, for which the patient pays twenty-five dollars, does not cost the operator, exclusive of rent and labor, more than six dollars, which pays for teeth, rubber, wax, plaster, varnish, tin, and wear of tools. As it is well known that an active mechanical dentist can make a set on this plan in a short working day, it gives him a good price for his knowledge and labor. I know four cases made by different practitioners, the time of making which varied from five to five and a half hours, from the taking of the impression until the patient was pronounced "fitted."

In kind and quantity of material used for plates in the different sections of the country, there is but a slight difference, the Eastern using about four fifths vulcanite base, the the remaining fifth being divided among the other materials, and the Western and Southern holding about the same proportion. The amount of waste in base plates varies with the kind of material used. Rejected gold or silver plates can be remelted, and used over. The continuous gum is made on a platinum plate, which can be used again by re rolling; but for the vulcanite there is no redemption. A plate rejected is a dead loss. The teeth may possibly be removed by patiently sawing and cutting the vulcanite away from the pins; but this usually costs more than the teeth are worth, and is seldom attempted. The inability of the operator to adapt the plate made for one mouth to another compels him to require a cash deposit, sufficient to cover all expenses, from the patient who orders the set; and by the amount required as a deposit, the patient can generally judge of the cash cost of the set.

MEDICAL NOTES.

Rickets and Softening of the Bones.

C. Heitzmann has shown by experiment that rickets and softening of the bones may be produced artificially in animals by giving them lactic acid. In carnivora, the continued use of this acid causes first rickets and then *mollities ossium*, while in herbivora it produces *mollities* at once without rickets. On the other hand, lactic acid is probably absent in cases of ossification of old age and of some diseases. Lactic acid is formed by the action of nitrogenous food on sugar of milk, sugar, and perhaps starch. It exists in considerable quantity in the juice of muscle, and must be connected with either its formation or action.

Inhaling Sal Ammoniac.

Muriate of ammonia, in vapor, has latterly been added to the list of medicines taken by inhalation. Dr. Liebermann has effected several surprising cures of clergyman's sore throat by this method. The cures were obtained in from two weeks to six months, with four inhalations daily, each lasting five to ten minutes. The clergymen under treatment are compelled to avoid alcoholic drinks, tobacco, and spices. Public speakers and singers were likewise cured of the infliction. When the disease extends to the nasal membrane, the patient should pass the vapor from the mouth through the nostrils, as some do tobacco smoke. If the malady extends into the Eustachian tube (often causing deafness), the patient should close the mouth and hold the nostrils tightly, and then blow as if to blow the nose, and the vapor will pass into the tubes. Deafness is either ameliorated or cured.

In nervous asthma, with no pulmonary *emphysema* or dilatation of the heart, two cases were permanently cured out of six, and the others had the intervals between the paroxysms prolonged. In bronchitis, the inhalations were taken six times daily. In twenty-two chronic cases, the cure was effected in from seventeen to thirty eight days. In twenty-six cases associated with pulmonary emphysema, the secretion and cough were greatly benefited, and the cure was effected in from six weeks to two months; the emphysema, however, remained. In twelve cases of pertussis, the paroxysms of cough were much relieved in seven, and the disease cured in from three to five, weeks; in the others there was no result. This vapor gives rise to more or less irritation of the mucous membrane, with loss and renewal of the epithelium, and local hypersecretion. Such temporary aggravation of symptoms is soon followed by relief. The pulse is increased, a sense of heat and moisture of the skin is often felt, and there is sometimes profuse perspiration, with increase of urine, improvement of the voice, and relief of the cough and tickling sensations. In severe cases, general treatment should accompany the inhalation.

Croton and Chloral.

Dr. Oscar Liebreich, in the *British Medical Journal*, makes some important observations on the use of this new anæsthetic. He says it differs from chloral widely in some of its effects. A drachm of croton chloral, dissolved in water and swallowed, produces in fifteen to twenty minutes a deep sleep, with anæsthesia of the head. He has experimented on maniacs during an attack of mania. They remained sitting on their chairs in a deep sleep for two hours together. If anæsthesia had reached so high a degree through the use of hydrate of chloral, the patients would have dropped from their chairs, and their pulses and respirations would have been considerably retarded. In some cases of *tic douloureux*, the remarkable phenomenon is exhibited of pain ceasing before sleep sets in. But the remedy only acts as a palliative in this dreadful disease. However, its action is to be preferred to that of morphia. He has never observed any unfavorable effects of croton chloral on the stomach or any other organ in frequent experiments. The indications for the use of this remedy are to be found: 1. In cases where hydrate of chloral is inapplicable on account of heart disease; 2. In cases of neuralgia in the region of the *nervus trigeminus*; 3. In cases where very large doses of chloral are necessary to produce sleep. He there recommends the addition of croton chloral to hydrate of chloral.

Prurigo and Pruritus.

In the *London Medical Record*, Dr. Rothmund states that the internal administration of carbolic acid in pruritus excels every other method. He has tried also the hypodermic injection of it with marked success, there being no local irritation produced, as one would expect. Solutions of pure carbolic acid are better than those of carbolate of soda.

A Cure for Hydrophobia.

It is stated that this most dreadful and most incurable of diseases finds its antidote in a plant, or rather tree. An infusion of the stems of *nottoria grandiflora* has been successfully employed in the East Indies, especially in the neighborhood of Bombay. Major Wheeler cites five cases of mad dog bites cured by this infusion; the sixth would not use it and died. This is from the *Archiv. der Pharmacie*.

KITE NAVIGATION.—Mr. John T. Lacey, of Bridgeport, Conn., has recently made a voyage of twenty-two miles on Long Island Sound, in the space of three and a quarter hours, in a row boat towed by a kite. The boat was twelve feet long and the kite ten feet high by eight feet wide. About six hundred feet of cord was let out. The speed of the boat is stated to have been considerably greater than that of a small sailing craft which attempted a race. This was probably due to the greater velocity of the wind at the elevated position of the kite. The towage of boats by kites is a very old amusement, but it is a slow method of navigation. The boat and kite can only travel in one direction, directly before the wind; whereas the ordinary sail boat can move obliquely, in various directions.

DECISIONS OF THE COURTS.

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

PATENT CORSETS.—MORITZ COHN *vs.* THE UNITED STATES CORSET COMPANY *et al.*

[In equity.—Before Blatchford, Judge.—Decided June 20, 1874.]

This suit is brought on letters patent granted to the plaintiff, Apri 1873, for an "Improvement in corsets." *

The claim is in these words: A corset having the pockets for the reception of the bones formed in the weaving and varying in lengths relatively to each other, as desired, substantially in the manner and for the purpose set forth. *

The principal defence relied on in this case is that the invention of the patentee is found in the Johnson provisional specification, regarded not as a patent, but as a publication printed in England prior to the patentee's invention. *

Held by the court:

An English provisional specification regarded not as a patent, but as a printed publication.

Such a specification, in order to be sufficient to invalidate a patent in this country, must describe what is claimed in the patent, in a manner so distinct and clear as to leave no reasonable doubt that the thing described is the same.

Under the 61st section of the act of July 8, 1870, which provides that it may be set up as special matter of defence to a suit for the infringement of a patent, that the invention covered by it had been previously described in a printed publication, such defence must be established affirmatively by the defendant before judgment can be rendered in his favor.

Cohn's patent of a corset, woven of a shape to fit the person of the wearer, and with woven pockets for the whalebones, varying in length relatively to one another, to accommodate the desired shape of the corset, held invalid, in view of English provisional specification, Johnson, No. 148 of 1584.

[*Charles M. Keller*, for the plaintiff.
George Gifford and *W. C. Witter*, for the defendants.]

NEW BOOKS AND PUBLICATIONS.

THE PSYCHOLOGICAL AND MEDICO-LEGAL JOURNAL. Conducted by W. A. Hammond, M.D., assisted by T. M. B. Cross, M.D. New Series, Vol. I., No. 1. Five dollars per annum. New York: F. W. Christern, 77 University Place.

The prëeminence of Dr. Hammond as an authority on neurology and mental disease gives interest and value to this publication, which is a continuation of the *Journal of Psychological Medicine*, some time since discontinued. It contains Dr. Hammond's recent address, as President of the Neurological Society, on "The Effects of Alcohol on the Nervous System," a document of great value on a difficult subject, usually discussed with more acrimony than sense. The opinions of Drs. Lente, Willard Parker, Peters, and Clymer are reported; and some able and exhaustive criticism on current literature germane to the subject, with an address to the reader, closes the book.

GAZETTEER OF RAILWAY STATIONS IN THE UNITED STATES and the Dominion of Canada. Price $1. Philadelphia: National Railway Publication Company, 233 South Fifth street.

This compendious volume gives the telegraph, express, post and money order offices, and their locations as to county, State, and line of railway, with the population, and the name of the express company delivering at each railway station. It is a useful volume.

BULLETIN OF THE MINNESOTA ACADEMY OF NATURAL SCIENCES, with the Reports of Committees, etc. Minneapolis, Minn.: Johnson and Smith.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From August 14 to August 22, 1874, inclusive.

ATTACHING PICKS, ETC., TO HANDLES.—C. A. Hardy, Philadelphia, Pa., *et al.*
BOOT, ETC.—J. L. Joyce, New Haven, Conn.
CAR SPRING.—G. Godley, New York city.
CAR WHEEL.—R. N. Allen, Hudson, N. Y.
FLASK FOR CASTING.—J. F. Whiting *et al.*, Boston, Mass.
GAGE COCK.—T. A. Weston, Ridgewood, N. J.
MAKING CAST IRON.—G. G. D. L. Byron (of New York city), London, Eng.
MOLDING CEMENT PIPES, ETC.—J. M. Stockwell, Portland, Me.
PLAITING MACHINE.—O. M. Chamberlain, New York city.
REGISTERING FARES, ETC.—E. Chesterman, Philadelphia, Pa.
ROLLER COMPOSITION.—J. H. Osgood, Boston, Mass.
ROLLER SKATE.—W. P. Gregg, Boston, Mass.
SEWING MACHINE.—J. Hayes *et al.*, New York city.
SEWING MACHINE.—J. T. Jones, Ilion, N. Y.
SUSPENDERS.—B. I. Greely, Boston, Mass.
TOOL-HOLDING CHUCK.—F. Armstrong, Bridgeport, Conn.
VENTILATING BEDS, ETC.—E. L. Roberts, Plainfield, N. J.

Recent American and Foreign Patents.

Improved Car Coupling.

Benjamin B. Harris, Lockport, Ill., assignor to himself and William B. Rouse, same place.—This invention consists of a pivoted drop latch with a slotted spring slide and recessed balance weight back of the latch for bearing thereto, and holding it in coupled and uncoupled position. The link is carried against the drop latch, which is placed in position in the slot in front of the sliding spring plate. The drop plate is forced back thereby, together with the sliding plate, until the inclined end is released from the same and swings back, allowing the entrance of the link to the cavity, and simultaneously therewith the forward motion of the sliding plate into its former position. The link strikes then the balance weight, and causes thereby the pressure of the front end on the shoulder part of the drop latch, so that the same is carried down on the sliding plate and firmly bound thereon. The link slides along the drop latch up to the shoulder when pulled, and has thereby sufficient play for the oscillations of the cars. For uncoupling, the sliding spring plate is connected by means of a side slot of the drawhead and rod with a suitable lever mechanism, so that by moving the spring plate in a backward direction the drop plate may be released, and on swinging forward uncouple the link.

Improved Mode of Securing Plaster to Walls.

Patrick H. Power, New York city.—This invention consists of a support for preventing the plastering from becoming detached from the laths. A network of wire cloth or other suitable material is laid over the plastering and secured to the joists, through the mortar, by nails or screws. This wire is placed over the last coat of mortar, and the coat of hard finish laid over it.

Improved Process for Pulping Paper Stock.

Hector J. Lahousse, Prague, Bohemia, assignor to himself and Howard Lockwood, New York city.—This invention consists in subjecting the pulp and the bleaching liquor to the action of a grinding mill, in lieu of the ordinary beating engine, for reducing the knots and joints, and for raising the temperature to the required point. From the mill the stock can be conducted to an air blast, so that it may be cooled, and to complete the bleaching operation by being brought in contact with cool air.

Improved Mole Trap.

Thomas Brannan, Carrollton, Ill.—This device consists in a square upright frame, through the upper bar of which passes a rod carrying at its lower end a cross piece in which are a number of spikes. The trap is then placed lengthwise upon the mole track, and the dropper is worked down and up until the spikes pass freely through the ground. The drop is then raised and held by a slide, a trigger resting firmly upon the ground. With this arrangement, as the mole comes along in either direction, when his nose strikes the trigger the drop falls, driving the spikes through him, killing him instantly.

Improved Burglar Alarm.

Abraham Neving, Glen Hope, Pa.—There is a lever to hold the escapement of a clock mechanism from working, and a slide to raise the lever and allow the escapement to work. This is so combined with a clock mechanism and an alarm bell that the slide may be set by a door or window, so as to be moved in case the door or window is opened, and lift the lever off from the escapement and allow the bell to sound. The connection of the slide and lever is such that they can be disconnected and allow the slide to be pushed back from the door or window during the daytime without allowing the bell to sound.

Improved Compost Distributor.

Edwin R. Cox and Gray C. Garriss, Goldsborough, N. C.—One wheel is loose on the axle of an ordinary cart frame, and the other is fast to the same. On the axle thus rotated is a manure-distributing wheel, the arms of which are provided with cutters to divide and with a hook to drag forward the manure, which is supplied to it from a feed box arranged above.

Improved Manufacture of Bone Black.

Solomon Billitz, New York city.—This invention consists of the arrangement of the fire chamber centrally between the scouring boiler for freeing the bones of the fatty, fleshy, and tendonous matters, and the calcining hearth, into which a suitable number of cylindrical retorts with sliding bottoms are placed for discharging the bone black into vessels below and charging from above without interrupting the fire. The fire is drawn by flues from the calcining hearth to the scouring boiler, and thence to the chimney, while the vapors or gases are conducted by pipes from the cylinders, to be cooled off in a coil for further utilization.

Improved Pulp Engine.

William Kennedy, New London, Pa.—This invention relates to a combination of sand trap and water conduit, the latter having an inlet aperture that communicates with the opening in the tub or engine, and a long slot through which the water is discharged. This slot is so arranged in relation to the perforated or open work top of the trap that, when the latter located in front of the roller, a current is created to quicken the speed the mingled water and stock. The stock, being thus exposed to the broad streams injected by considerable force, is separated and delivered to the roll in a good and uniform condition.

Improved Ash Can Receptacle.

Louis Greenbaum and Louis F. Winter, New York city.—This consists of a receptacle which is placed below the level of the pavement and arranged with a false sliding bottom for the ash can, to be raised and lowered by a swinging bail with suitable lever connections. The receptacle and ash can are closed by a hinged lid at the level of the pavement. The bottom of the receptacle is concaved and perforated for carrying off water. The unsightly ash can is thus located entirely out of the way, and the exhalation of any disagreeable odors is prevented.

Improved Sash Holder.

Thomas Hooley, Davenport, Iowa.—This invention consists in providing the lower corner of the sash with recessed grooves, inclined toward the corner, of which the lower one has an adjustable slide piece. The latter is carried along guide pins of the horizontal sash, on which a rubber ball rests until raised by the lifting of the slide from beneath for binding the sash by wedging in between the inclined part of the vertical sash rail and the casing.

Improved Sheet Metal Ash Barrel.

Thomas M. Bell, New York city.—This invention relates to an ash barrel provided with a corrugated metal plate secured to the side thereof. By this construction, the barrels, when being emptied, will always rest upon the corrugated plates, which will prevent them from being bruised or injured by the rough contact with the edges of the cart bodies, to which they are exposed by the careless handling to which they are subjected.

Improved Wire Straightening and Cutting Machine.

James Greenwood, Mount Carmel, Pa.—This invention consists of a pair of gripers and a lever combined in such manner that the gripers are caused to gripe the wire at two points, and then pull it for straightening it by tension. Shears between the gripers cut the wire in pieces of any length required after it is straightened, so that the present process of cutting and straightening wire from a coil for weaving or other purposes is simplified and cheapened.

Improved Apple Parer.

Solomon E. T. Dodson, Steubenville, Ky.—This invention consists of forks arranged on a revolving reel, to be presented in succession to the driving wheel and cutters, to allow of removing the pared apples and putting others on some forks, while others are performing work. It also consists of automatic trip and spring mechanism which throw the forks and cutters out, and stop them when the apples are pared, and release the reel from its stop mechanism, to allow it to be shifted to remove the pared apples and present others to the cutters to be pared. There is also a contrivance on the reel for automatically gearing the cutters and fork again, when it is shifted; and a sliding carrier for the knives, worked by a crank shaft gearing with the driving shaft, and mounted on the trip slide, by which the reel is locked for being geared by the reel when it is shifted to change the forks.

Improved Locking Nut.

Casper Dittman, Leacock, Pa.—This invention consists in a nut lock which aims not only to prevent the backward rotation of a nut under the influence of jars and jolts, but to automatically take up the expansion and contraction of the bolt under different temperatures.

Improved Combined Cake Steaming and Washing Machine.

G. W. Mitchell, Baltimore, Md.—This invention relates to the preparation of crackers and cakes for market, and consists in novel means of removing all cohering flour, dust, and discoloring matter, and giving them a cleaned, polished, and attractive appearance.

Improved Valve Motion.

George Rickert, Eckley, Pa.—This invention consists of an air pump so combined with pistons for working the steam valve that air is compressed in the cylinder of the valve pistons on both sides until the moment it is required to have the valve shift. One side of the valve piston is then opened to the exhaust, and the piston is instantly thrown by the compressed air on the other side, thus producing an instantaneous motion of the valve by the aid of compressed air.

Improved Toy Swing.

George Küller and Charles Toelcke, Hoboken, N. J.—This invention consists of rods which suspend the swing from pivots on which they vibrate. They extend above the pivots, and carry a slotted cross bas in which the wrist of a crank turned by clock spring works imparts the vibratory motion to the swing. The machinery is hidden by a case, so that toy figures alone are represented to the eye as the means of impelling the swing.

Improved Carpet Lining.

Edward H. Bailey, Brooklyn, N. Y.—This invention consists of fastening the paper or cloth sheets and the enclosed filling of which carpet linings are made by slips of suitable textile material inserted in slits made through the fabric, and bent over or down on both of its sides, and pasted to the fabric. In practice the slips will be inserted by mechanical means. This mode of fastening does not, like stitching or tufting, draw the fabric together, but leaves it in the same state of elasticity at the points of fastening as in other parts; nor does it tear the paper at the holes.

Improved Cutter Head.

Benjamin Pearson and Horace W. Pearson, Newburyport, Mass.—This invention consists of a rotary cutter, in which two blades are arranged side by side, and separated by a disk of thin metal projecting from the face of other disks, all so contrived that the cutters may be used for cutting the gains in the end of the felly for the ferrule by which they are connected. The disk of thin metal between the cutters runs against the ends of the felly, to gage the cutters to the felly lengthwise, and the disks from which the cutters project serve to regulate the depth of the cut.

Improved Permutation Lock.

Joseph Cassino, Greenville, Miss.—This invention consists of a combination lock with a suitable number of tumblers, which are set by a perforated combination disk and adjusting screw, in connection with a recessed sliding bolt carried into the tumbler slots by a key operating a pinion and rack of the bolt. The corresponding numbers on the dial plate of the knob produce the combination for setting the tumblers and throwing the main bolt into open position.

Improved Device for Moving Railway Carriages.

Christian Anderson, Paxton, Ill.—This invention consists of a little frame of metal adapted to be readily connected temporarily to a car. It has a crank shaft, reducing gears, and a chain wheel mounted in it, with a chain to work on the chain wheel, and a griper at one end. It is carried along the rail in advance of the car, and attached for holding fast, while the car is drawn along by winding the chain wheel. This, by holding fast to the chain as it rolls along it, pulls the car readily to the point where the chain is fastened to the rail. The frame also carries a box below the chain wheel into which the slack chain falls.

Improved Corn Harvester.

John I. McClintic, Monroe City, Miss.—The forward ends of guide bars are attached to a U fender, the arms of which are bent forward to form fingers to raise the cornstalks that may have been bent down outward, guiding them into such a position that, when cut, their top may fall upon an inclined platform. The fender may be adjusted to bring its fingers closer to or further from the ground. Guards attached to the forward parts of the beams project upward so as to prevent the forward ends of the cut stalks from falling against the fender into such a position as to interfere with the entrance of the standing stalks into the guide passage.

Improved Roofing Paper.

Rowell Colby, Freeport, Ill.—This is a covering for roofs and walls of buildings, formed of paper and sheet metal. Very thin sheets of copper are cemented to the paper, which is rendered waterproof, so that they form one sheet, convenient for handling, packing, transportation, and application to roofs and walls.

Improved Pelerine.

Jefta Popovits, New York city.—This invention consists of a pelerine which is cut of one piece of suitable fur, provided with shoulder-protecting flaps, fitted and connected at the waist, and arranged with rear extension, so as accurately and comfortably to fit the body.

Improved Wheel Harrow.

James F. Sayer, Macomb, N. Y.—The harrow is suspended from a truck frame, at its center, so that it may vibrate. At the front end the harrow has a tongue projecting into the zigzag cam groove of a large roller, at the front end of the truck, to be vibrated by said roller, which is to be turned by traction. The tongue is adjustable, as to hight, to correspond with the cam wheel, by a slotted wedge, and it is fastened by bolts in slotted holes, to allow it to be shoved back out of the cam groove when it is not desired to have the harrow vibrated by the cam.

Improved Ship's Pump.

Leonard Egleston, Seneca Falls, N. Y., assignor to Rumsey & Co., same place.—This is a double cylinder lifting pump, the pistons of which are operated by means of levers in a vibrating socket beam, to which the piston rods are attached. There is a conical tube at the foot of each cylinder, the lower ends of which extend down into reservoirs, and are always immersed in water. These tubes have each a surrounding flange, by means of which they are supported in the base on ledges, and are held in place by the cylinders, with packing between, to secure watertight joints. The water in the reservoir always stands above the lower ends of the conical tubes, and serves as a constant priming, the pistons always bringing water at the first strike.

Improved Mill Burr Dress.

John D. Mines, Moffett's Creek, Va.—This invention consists in burrs or stones for grinding grain, provided with faces having a center dress consisting of an annular concavity with square shoulder.

Improved Machine for Forming Sheet Metal Pans.

William A. Bacon, Lowell, Mass.—The object of this invention is to provide an improved machine for bending or forming the edges of tin sheets which are intended for use in the manufacture of rectangular pans and other analogous articles of tin ware. The improvement relates to making the hinged plates of the forming machine in two or more sections, which are detachable one from the other to vary the length of the former, according to the kind of work required to be done. It also relates to means for regulating the depth and shape of the flange formed on the edge of the tin sheets, and to providing a shallow groove in which the edges of the pan may be placed and bent for wiring.

Improved Cut-Off.

Peter J. Jacken, Cleveland, Ohio.—This invention consists in novel and efficient means for connecting a governor with a slide valve, so as to graduate the supply of steam to the degree of power required.

Improved Fifth Wheel.

Martin Christianson, Green Bay, Wis.—This invention relates to the arrangement of elastic blocks with the tongue and socket therefor, which latter is formed on the lower plate of the fifth wheel. The office of the elastic blocks is to lessen the shocks on the necks of the horses, which are occasioned by the swaying of the tongue as the front wheels encounter obstructions.

Improved Rein Holder.

Alphonso Applegate, Philadelphia, Pa.—This is a rein-holding device, formed of pivoted jaws which turn on pivots by action of springs and gripe the reins with pressure proportioned to the tension thereon. The more the horse pulls, the firmer becomes the hold on the reins. By pulling back the reins, they are easily removed from the holders.

Improved Collar.

Grigsby E. Thomas, Sr., Columbus, Ga., assignor to himself and James M. Handley, New York city.—This invention consists of material, of whatever the collar is made, on the side of a standing collar for neck wear, so contrived that it projects downward over the necktie, preferably at the back, as a holder or guard, to prevent the tie from working up above the collar. The said holder is itself held against turning or swinging up by the vest collar, to which it may be pinned or buttoned.

Improved Limekiln.

Francis Strayer, Clinton, Iowa.—The stack, in which the lime rock to be burned is placed, is built of stone or brick, and is entirely surrounded by the arch and ash pit, forming the base. This base is divided into two compartments, the upper one being the arch, and the lower the ash pit. Openings through the partition allow the ashes to escape into the ash pit. There are openings from the fire place through the wall of the cupola. When the kiln is in operation, the fuel is pushed to the right and left, and distributed around the cupola, so as to heat the lime rock in the cupola uniformly throughout.

Improved Steam Engine.

John W. Hayes, Chicago, Ill., assignor to himself, Thomas W. Twombly, Jacob G. Crockett, and George L. Chatfield, same place.—This is a contrivance of the piston, and the ports for employing the piston for the valve. The piston is made hollow, receives the steam into a hollow space, and discharges it therefrom to the cylinder. The motions for opening and closing the ports are effected by a stud pin projecting from the interior of the cylinder into a spiral slot in the piston. The stud for causing the oscillation of the piston is formed on the end of the steam pipe. The exhaust pipe is adapted for the application of a suction pipe, and the piston is adapted for being reversed endwise to convert the engine into a force pump by reversing the ports relatively to the inlet and exhaust. The invention also consists of an oil jacket surrounding the cylinder, with a valve for admitting the oil into the cylinder as it is needed for lubricating the piston.

Improved Gas Apparatus.

Joseph D. Patton, Trevorton, Pa.—This invention consists of a condenser in combination with the retort and gas holder, through which the gas passes directly from the retort to be cooled, and for separating the matters subject to condensation. The said condenser is a vertical pipe or cylinder, one or more, into which the gas discharges, with a surrounding water jacket, connected by pipes with the water chamber of the gas holder, in such manner that a circulation of water will be set up, as soon as the condenser is warmed by the heat taken up from the gas, by the warm water flowing out at the top and the cold water in at the bottom.

Improved Mirror Holder.

William Simpson, Berlin, Canada.—This invention relates to an improvement in the mode of fastening the mirror holder, patented by the same inventor under date of July 15, 1873, to the frame, so that the required friction of the pivot heads of the wire holder in its fastening clamps is readily obtained, and the position of the mirror at any angle secured thereby. The present invention consists of a hinge-shaped fastening clamp, in which the end of the wire holder is placed and firmly held by a binding screw, attaching the clamp to the mirror frame and bearing sidewise over the round part of the clamp and the end of the wire holder.

Improved Tachometer.

Robert H. Elliott, Atlanta, Ga.—This invention consists of a water gage and a mercury gage combined with a pipe extending through the hull of a vessel to receive the impulse of the water, with another to be acted on by the suction, and with suitable cocks, so contrived that either gage can be put in connection with the water pipes for using water or mercury for indicating the ship's speed—an arrangement which adapts the instrument for very low speeds, which will not effect much change in the mercury, and very high speeds, which will effect too much change for a water gage of practical length. The invention also consists of a filling attachment to the gage tubes for supplying water or mercury, and allowing air to escape, as a convenient means of rearranging and regulating the gage from time to time, as may be required.

Improved Food Steamers and Boilers.

Leroy S. Bunker, Newell, Iowa, assignor to himself and O. H. Hazard, of same place.—This invention relates to the arrangement of flues beneath furnace boilers so that the maximum of heat may be conveniently utilized. The base contains a passage for conducting the heat for a furnace in a tortuous course under all parts of the boiler to the escape flue.

Improved Sulky Cultivator.

William M. Coston, Quitman, Mo.—Several holes are formed through the side bars to receive the bolts or axles, so that the said bolts may be adjusted to enable the driver's weight, whether he be light or heavy, to exactly balance the machine. The ends of the side bars are held by cross bars. To the rear ends of the side bars is attached a cross bar, to which is attached a rearwardly projecting arm, which has also a number of holes formed in it to receive the bolt by which the driver's seat is secured to it, so that the said seat may be moved forward or back to adjust it so that the weight of the driver may balance the framework of the machine.

Improved Chair.

William Goforth, Windsor, Mo.—This invention relates to constructing the chair seat with rearward extended side bars, so that the seat can be attached to the back by inside as well as outside screws. The rear legs are brought forward at their top ends and attached about one fourth the distance to the front from the back ends of the side rails of the seat, so that they serve as braces and supporters of the seat. The lower ends of the back pieces are attached to the back legs by means of screws. By putting together the chair in this manner, it is rendered firm, durable, and superior in strength.

Improved Wood Type Cabinet.

Theodore C. Hacker, Brownsville, Neb., assignor to himself and Edgar W. Gibson, of same place.—The body of the cabinet is made with close top, sides, bottom, and back, and with an open front. The shelves are divided into compartments of various sizes, according to the sizes of the type which they are to contain. To the ends of the sleeves are attached gudgeons, which enter inclined grooves in the body, so as to pivot the said shelves to said sides, and so that they may be conveniently removed. To the sides of the cabinet, a little below the inner end of the slots, are attached stops, so as to support the shelves in proper position, both when open and when closed. With this construction, when the shelves are closed, the upper edge of the front of each lower shelf rests against the bottom of the next upper shelf, so as to effectually exclude dust and dirt.

Improved Cooking Range.

Peter J. Ackerman, Paterson, N. J.—By suitable construction, the products of combustion may be made to pass over as well as under the oven, and then into an exit flue, or they may be made to pass around the ends through other flues, thence over the top of the oven, and into the exit flue. Thus the heat may be distributed wherever wanted about the oven, and very quickly.

Improved Artificial Ivory, Corals, etc.

Julius Frauenberger, New York city.—This is a composition for producing artificial corals, ivory, and similar articles, made of caseine, mixed in suitable proportions and boiled, with a varnish-like solution of copal in concentrated liquid ammonia and alcohol, to be colored and prepared for the various applications in the arts.

Improved Toe Protector for Boots and Shoes.

Theodore Cook, Trenton, N. J., assignor to himself and J. F. Williams, of same place.—Toe protectors for boots and shoes are made with a raised circular rim and a skived or tapered welt, the former projecting beyond the upper, and the latter being secured between the inner and outer soles. The invention in this case consists in constructing the welt with a dovetail slot to adapt it to contract and expand, and thus fit boots and shoes of different sizes.

Business and Personal.

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

Matson's Combination Governor—Sold under full guarantee. Address Matson Bros., Moline, Ill.

For Durkee Saw Mills, address the Manufacturers, T. B. Bailey & Vail, Lockport, N. Y.

A. R. Houghton, Jefferson, O., wishes to communicate with manufacturers of kerosene lamp burners.

Wanted, the Management and Manufacture in England of American Inventions that have been introduced in America and are patented in England. Machinist and Engineering Tools preferred. Address Wm. Horsfall, 123 Atlantic Ave., Brooklyn, N. Y.

Johnson's Universal Lathe Chuck. Address Lambertville Iron Works, Lambertville, N. J.

Auger that bores a hole two sizes at one time wanted. Address, with description, Jos. Baker, Norfolk, Va.

The Whitmore Patent Engine—4 to 10 H.P. Cheapest, best, and safest. Send for Price List. Lovegrove & Co., Philadelphia, Pa.

Three Patents for Sale—Gate and Door Bolt, Harness and Shoe Maker's Clamp, Revolving Painter's Pail. Address Josiah Smith, Southold, Long Island, N.Y.

Double Belts and Rubber Springs specially for Centrifugal Machines. Greene, Tweed & Co., 18 Park Place, New York.

For Sale, $2,500—Two Patents, saleable. Address H. S. Bail, Spartanburg, S. C.

E. H. Jones, Milwaukee, Wis., desires to communicate with parties who supply Machinery, and know how to make Matches, especially the "parlor matches."

For Sale—Tools of Machine and Boiler Shops. Walter McCollum, 333 Pearl St., New York.

The Lane M'f'g Company, Montpelier, Vt., will exhibit Circular Saw-Mill, Rotary Bed Surfacer, and Clapboard Planer, at Fair of the Mass. Char. Mech. Association, Boston, Sept. 16 to Oct. 7. Sample machines may also be seen at W. L. Chase & Co.'s, 95 Liberty St., New York City.

18x42, 16x36, 14x30, 12x24, 12x30, 11x14, 11x24, 10x12, 10x15, 9x12, 9x16, 9x18, 8½x10, 8x12, 8x16, 8x20, 7x12, 7x16, 7x20 6x6, 6x12, 5x11, 4x6, 4x8, 3x6, 5x9 Engines, and 25 others 2d hand, thoroughly overhauled, warranted reliable, with upright and hor. Boilers, Steam Pumps, and miscellaneous machinery: reasonable figures. 8 H.P. Baxter Eng., Air Compresser, Vacuum and Air Pumps. Wilson & Roake, Water and Dover Sts., New York.

Wanted—100,000 of Davis' Hay and Cotton Presses made on royalty. Address O. A. Davis, Ashland, Oregon.

Tingue, House & Co., 69 Duane St., N. Y. Manufacturers of Machine Blanketing, Felts, and Cloths' Endless or in piece, for Printers, Engravers, Polishers Piano Forte Makers, Paper Makers, Calico Printers, Punching or Washer Cloth, Filter and Strainer Cloths for all kinds of liquids. Sample sent on application.

Baxter's Adjustable and S Wrenches by the Case. Greene, Tweed & Co., 18 Park Place, New York.

To Manufacturers and Amateurs—Solutions for covering all kinds of metals with different metal, either by Electro Plating or chemical process, always on hand, with reliable direction for use. Address Alb. Lovie, 222 N. 4th St., Philadelphia, Pa.

Wanted—Address of Lamp Burner Manufacturers. Milton Church, Pittsburgh, Pa.

Double-Acting Bucket Plunger Steam Pumps, Manuf'd by Valley Machine Co., Easthampton, Mass. N. Y. Store, 45 Cortlandt St.; Phila. Store, 182 N. 3rd St.

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.

Electric Bells for Dwellings, Hotels, &c.—Most reliable and cheapest Hotel Annunciator. Cheap telegraph outfits for learners. Ins'ts for Private Lines, Gas Lighting Apparatus, etc. J. H. Hessin, Sc. Cleveland, O.

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

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

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

Inventors can get small plates of sheet steel very cheap, at the saw factory, 108 Hester St., New York.

The "Scientific American" Office, New York, is fitted with the Miniature Electric Telegraph. By touching little buttons on the desks of the managers, signals are sent to persons in the various departments of the establishment. Cheap and effective. Splendid for shops, offices, dwellings. Works for any distance. Price $5. F. C. Beach & Co., 263 Broadway, New York, Makers. Send for free illustrated Catalogue.

The Improved Hoadley Cut-off Engine—The Cheapest, Best, and Most Economical steam-power in the United States. Send for circular. W. L. Chase & Co., 95 & 97 Liberty St., New York.

Telegraph Inst's. M. A. Buell, Cleveland, O.

Compound Propeller Pumps, for Mines, Quarries, Canals, and Irrigating purposes. Circulars on application to Hydrostatic and Hydraulic Company, 913 Ridge Avenue, Philadelphia, Pa.

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

Portable Engines, new and rebuilt 2d hand, a specialty. Engines, Boilers, Pumps, and Machinist's Tools. I. H. Shearman, 45 Cortlandt St., New York.

For Sale—Two Steam Saw Mills and three Farms, by C. Bridgman, St. Cloud, Minn.

Deane's Patent Steam Pump—for all purposes—Strictly first class and reliable. Send for circular. W. L. Chase & Co., 95 & 97 Liberty St., New York.

Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass. Send for sample and price list.

The Pickering Governor, Portland, Conn.

Mechanical Expert in Patent Cases. T. D. Stetson, 23 Murray St., New York.

Gas and Water Pipe, Wrought Iron. Send for price list to Bailey, Farrell & Co., Pittsburgh, Pa.

Forges—(Fan Blast), Portable and Stationary. Keystone Portable Forge Co., Philadelphia, Pa.

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.

Saws made & repaired at 108 Hester St., N. Y.

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

Automatic Wire Rope R. R. conveys Coal Ore, &c., without Trestle Work. No. 34 Dey street, N.Y.

A. F. Havens Lights Towns, Factories, Hotels, and Dwellings with Gas. 34 Dey street, New York.

Temples & Oilcans. Draper, Hopedale, Mass.

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.

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

For Surface Planers, small size, and for Box Corner Grooving Machines, send to A. Davis, Lowell, Mass.

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

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., 263 Broadway, New York.

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

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.

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.

Answers to Correspondents

S. will find directions for making blackboards or slaty surfaces on p. 91, vol. 30.—W. A. G. will find directions for cleaning brass on p. 102, vol. 25, and for bronzing it on p. 331, vol. 29. For removing mildew, see p. 138, vol. 27.—N. V. H. will find full directions for gilding picture frames on p. 75, vol. 28.—C. R. H. can copper his iron wire by the process described on p. 154, vol. 26, or galvanize it as detailed on p. 59, vol. 24.—G. C. L. will find a recipe for black indelible ink on p. 273, vol. 28, and for red on p. 119, vol. 28. Directions for making rubber stamps are given on p. 156, vol. 31.

(1) G. L. H. asks: Of what is the composition made that is used by dentists in filling teeth, in place of gold? Is it of such a nature as to make an electric battery of one's mouth, if gold is used also? What is the probable effect upon the health? A. Improper union of metals in the filling of a tooth is frequently a source of irritation to the dental pulp. Tin foil is sometimes placed in the bottom of a cavity, and the operation finished with gold. In many, not in all instances, this composition produces a galvanic action, which, if not removed, will quickly destroy the pulp.

(2) N. A. W. says: I have a small spring of running water which seems to be a favorite resort for crawfish, notwithstanding my earnest efforts to exterminate them. Is the presence of these crawfish in the spring an indication of pure or impure water? A. Crawfish or crayfish (*astacus fluviatilis*) are found not only in springs, but more or less in every brook and river. In the Mammoth Cave of Kentucky, a species has been discovered. They are not considered injurious to the water, and their presence is not an index whether the water is pure or not, though they are found more frequently in pure water.

(3) S. A. T. asks: How can I make an attractive light in a store window? A. Use a carbureter, described on p. 379, vol. 30.

What can I put in paste to keep the swarms of small flies from breeding in it? A. A little carbolic acid.

How can I coat nails with copper? A. A saturated solution of sulphate of copper in water is what is usually employed for this purpose. The articles to be coppered should first be freed from grease by immersion in lye water, washed, and immersed in dilute sulphuric for a short time.

Can I nickel plate an article after it has been coppered, simply by dipping for a quarter of a second? A. We can find no record of such nickel plating as you speak of.

(4) E. R. asks: I am using a lamp that has 93 cotton wicks in it, and is about a yard and a half long, burning alcohol, for singeing the long fibers of cloth. As the alcohol is expensive, what oil can I substitute for it that would be safe, cheaper, and yet make little or no smoke? A. We know of no oil that will replace your alcohol. If your place is supplied with gas, a modification of the Bunsen gas lamp might be used with advantage, and would certainly be much cheaper than the method you now employ.

(5) H. S. B. says: I have been studying methods of decomposing kainit into Epsom salts, sulphate of potash, and common salt. Can you assist me to solve the problem? My samples contain sulphate of magnesia 32·50, sulphate of potash 23 52, chloride of sodium 20·55, chloride of magnesia 4·21; the rest is insoluble residue. A. Your best plan would be to state your methods; to write at length the various ways which suggest themselves would require too much space.

(6) D. S. H. says: 1. I have a spy glass with 5 glasses; it is 3 feet long and defines the moons of Jupiter well. Will a telescope with 5 glasses, of the same length, do as well? A. No. 2. Could one be made with 2 glasses, suitable for a beginner? A. No. An object glass must be made in two pieces, one each of crown and flint glass, or the image has colored fringes, is distorted, and injures the eyesight.

(7) E. G. asks: What is the easiest and cheapest way of cleaning dirty cotton waste? A. Boil it in a strong solution of common soda in water, and save the resultant soapy liquid to keep your drills and reamers wet when boring iron.

(8) E. J. K. asks: What is the right process for tempering steel to make it cut French burr stone or hardest flint, or to make it drill the hardest steel, such as rat-tail files? A. Forge your tools, if of English steel, at a moderate red heat, but not hot enough to scale; do not hammer it after it has lost its redness. Heat it to a low red heat; for hardening, dip it in salt water with the cold chill taken off, and temper it to a brown, dipping it according to the instruction given by Mr. Rose on p. 21 of our current volume. If you are using American chrome steel, heat it to a yellowish heat for forging, to a low red for hardening, and quench right out.

(9) L. M. D. asks: What is animal charcoal? A. Animal charcoal is made from bones and animal matters, and is a very valuable substance, on account of the extraordinary power it possesses of removing coloring matters from organic solutions; it is used for this purpose by the sugar refiners and scientific and manufacturing chemists.

What is animal glycerin? A. It is obtained by the action of alkalies on natural fats. Stearin, for instance, when boiled with a caustic alkali, is converted into a stearate of the alkali metal and glycerin. It is now produced in very large quantities and perfect purity in the decomposition of fatty substances by means of superheated steam. Glycerin is a nearly colorless and very viscid liquid, of specific gravity 1·27. It has no action on vegetable colors.

(10) P. M. S. O'F. asks: Are a perspective drawing and photograph, of the same object, from the same point of view or distance, identically alike? A. No.

(11) B. B. B. asks: 1. Why does some water eat or corrode the lead pipes in wells? What property must be in the water in order to dissolve lead? Is water drawn through lead poisonous? A. Lead is acted upon by distilled water and by rain water. Water, by reason of its affinity for the oxide of lead, acts like an acid upon metallic lead. Lead pipes through which such water passes in a short time become covered with a pellicle of carbonate of lead, which is an energetic poison. The presence of a very small quantity of foreign matter in the water, and especially of sulphate of lime, usually arrests this action, and renders the use of lead pipes in a majority of cases not hazardous. 2. Is galvanized iron pipe injurious to the water? A. No. In this case a film of the oxide is formed on the zinc, which is insoluble in water, and, for this reason, protects it from further oxidation. 3. What kind of pipe is the best through which to draw water for drinking purposes? A. Pipes lined with block tin.

(12) J. W. S. asks: How are photographic impressions transferred to lithographic stones in order to be printed from? A. Osborne's process is to take a negative on glass coated with collodion, as usual. A piece of gelatinized paper is now exposed to the action of light under the negative. The copy is covered with transfer ink; this is done by running it through a press in contact with a stone which has already received a coating of such ink. The paper, thus blackened, is made to float upon the surface of boiling water, the blackened side up. It is next taken out and washed with a sponge; the parts acted upon by light hold fast to the ink, while all other parts are completely washed off. A stone is now slightly warmed and put in the press; upon it is placed the positive print (inverted) after it has been dampened. The whole is then pressed. On removing the paper the ink is found attached to the stone and a reverse picture is made on the stone. 2. Are gelatin prints more readily transferred to stone than silver prints? A. Yes. You should consult a practical litohgrapher as to your other questions.

(13) E. V. W. says: About a year ago I replaced a small lead pipe with a 1 inch galvanized iron pipe. To my great annoyance, this iron pipe has almost closed with a hard substance resembling iron ore. How can I clear the pipe? A. The pipe probably has become filled with carbonate of lime, magnesia, iron, etc., deposited by the spring water, especially the carbonates of lime and iron. If it is practicable, muriatic acid could be used to dissolve the deposits. But the trouble is in the mineral constituents of the water and not in the tube. If the excess of lime and other salts which the water contains were previously precipitated out of it (as is sometimes done by the addition of lime water in a settling reservoir), the difficulty might be overcome.

(14) J. A. asks: 1. Will a current from a common magneto-electric machine induce magnetism in an electro-magnet? A. Yes. 2. If so, how does it compare in power with the Daniell battery current? A. This depends upon the size of the machine used. 3 If a magnet supports 5 lbs. in contact with its poles, how much will it support at ½ inch and ¼ inch distance respectively? A. The attraction would vary inversely as the square of the distance from the poles. 4. In a Daniell battery, having 3 square feet of copper surface, and also 3 square feet of zinc surface, the whole comprising only 1 cell, how much sulphate of copper and how much zinc will be required to keep it in its most powerful state of action for a week? A. Enough sulphate of copper to keep the outer solution constan ly saturated. Sulphate of zinc is not necessary. 5. How long must the silk-covered No. 22 copper wire (covering the iron cores of an electromagnet) be to obtain the greatest magnetic force of such a battery? The battery is to be but 2 feet from the electromagnet. A. You have forgotten to state the size of core.

Where is the fallacy in the following demonstration that 2 equals 1? Let $x=1$ and $y=1$. Then $x=y$, $x^2=xy$, and $x^2-y^2=xy-y^2$. Dividing the last equation by $x-y$, $x+y=y$, or $y+y=y$ or $2y=y$, $2=1$. A. In dividing the equation, $x+y=y+\frac{-2y^2}{x-y}$ and not $x+y=y$. $x^2-y^2=xy-y^2$ divided by $x-y$ is equal to $x+y=y+\frac{-2y^2}{x-y}$.

(15) W. R. asks: 1. To be a machinist, should I continue practice in drawing? A. It is important that you should understand the art of drawing. 2. Which branch of figures ought I to study? A. For facilitating calculation, you should master arithmetic, algebra, geometry, trigonometry, and logarithms. 3. What books shall I read on mechanics, etc.? A. You will find a good elementary treatise on mechanics in Silliman's "Physics."

(16) R. K. says: In Mr. J. Rose's recipe for case hardening, he says: Use 1 gallon urine to a certain quantity of bone, etc. Would a certain quantity of sal ammoniac do as well? A. The urine is the best, and the hoof and leather process is better than the bone dust.

(17) C. G. M., Norrtelje, Sweden.—We doubt whether birchwood sawdust has any value. It might be well for you, however, to insert a notice in our "Business and Personal" column.

(18) X. X.—The electrical treatment under the care of an experienced physician will doubtless benefit you.

(19) J. H. H. asks: What ought I to do in order to be a good engineer? A. It will be necessary for you to have education and practice, to become a good engineer. There are numerous good schools for giving the former, and shops for the latter.

(20) F. L. asks: At what speed should a 50 inch circular saw run in oak, elm, and cotton wood? A. Between six and seven hundred revolutions a minute would be a good speed.

(21) J. J. says: Mr. Rose in his late article on vise work says that, if his instructions are followed a polish may be obtained much finer than by using oil stone, or by any other method. Can filing be done so fine that the marks are not visible? A. Yes.

(22) W. S. J. says: I suggest the following for car ventilation: Air to be received at the head of engine by funnel-shaped apparatus, and carried back to the cars by proper connections. Suitable means for distributing it to be placed in the cars, so as not to create too much draft. In winter the air could be passed through the engine furnace for the purpose of warming it. What are the objections to this? A. The idea is by no means novel.

Our place is supplied with water by the Holley system. In drawing water I have often noticed regular pulsations in the flow, which I attributed to the pumps situated a mile from town. How long does it take to transmit the above pulsation? A. It is instantaneous.

Can you give an explanation of the duplex system of telegraphy? A. You will find it clearly explained in Pope's work on telegraphing.

(23) G. says: I send you two specimens of tyre turnings (one from each end of a piece 65 feet long, which broke at the point indicated) turned from a locomotive driving wheel 4½ feet in diameter. Have you any knowledge of longer turnings? A. Your specimen of turnings is an excellent one, on account of its thickness. We have seen longer ones, up to 170 feet long, but considering the coarse feed your shaving was cut at it is an unusually fine specimen.

(24) W. J. W. asks: 1. Is it a practicable thing to use a rubber hose to carry steam to an engine that is movable, the boiler being stationary? A. Yes. 2. How far can it be carried, out of doors, with the thermometer at −20° Fah.? A. It would not be economical to carry it any distance without covering it well.

(25) E. C. H. says: The balloon Buffalo ascended from that city on July 4. I estimate that the cost of filling this balloon (91,000 cubic feet) with hydrogen gas would be upwards of $2,000. Is this a correct estimate? What kind of gas was this balloon inflated with, and what did it cost? A. Balloons are ordinarily filled with illuminating gas, which costs about three dollars a thousand cubic feet.

In filing a hand saw, should the file be held level across the saw (for cross-cutting), or at an angle? A. At an angle.

1. What is the history of the gyroscope? A. See p. 91, vol. 31. 2. Is $5,000 reward offered for a scientific explanation of it? A. No.

Is there any machine, for cutting up the odds and ends of cigars, that works satisfactorily without first pressing the bulk to be cut? A. We do not know of any.

(26) J. H. H. asks: What is the amount of coal it will require per hour to retain steam in a boiler at a certain pressure per square inch, said steam being first raised to that pressure? In other words, what amount of coal must be used to restore the heat lost by radiation only? A. This is a question that must be determined by experiment for each individual case.

(27) C. E. T. asks: Can malleable cast iron be welded? A. We believe not.

(28) F. L. P. asks: What distance will a boat travel down stream, if she will make eight miles an hour up stream, and the current is four miles an hour? A. Twelve miles an hour.

(29) J. M. C. says: I have a number of loose tiles, in a large tiled floor. I have had them relaid in new cement, after chiseling out the old, which was crumbled to powder; but they loosen again. Can you suggest any composition to reset them in, that would be impervious to water and would harden firmly enough to keep them steady? A. Put a little lime into the cement mortar, that it may not set too soon, and grout it in; that is to say, have it so thin that it will flow into all the interstices of the adjoining tiles. Have plenty of depth of mortar under the tiles; and as you lay the latter, press it down upon the mortar, but leave the face of it projecting about ⅛ of an inch above the other tiles; as the mortar hardens, press the tile down, so as to bring it even with the others at about the time the mortar is set.

(30) C. P. says: Suppose that the roof of a building has a span of 100 feet, length 200 feet, and pitch 45°. The weight of roof is 20 or 30 lbs. per square foot. What is the rule to find the required strength of girders and trusses to sustain it? A. For form of truss and rules to determine the size of the various timbers and bolts of which it is constituted, consult Hatfield's "American House Carpenter," article "Framing."

(31) D. B. T. says: I propose to serve compressed air to customers in the same way that gas is now served, only that the air will be under a pressure of 500 lbs. to the inch, more or less. At this pressure, it will have a refrigerating power far superior to that of ice, when allowed to expand in contact with any article which it may be desired to freeze. The mechanical energy contained in the air may be used at the same time that its frigorific powers are expended, which will make it doubly valuable for domestic purposes. The hottest places in our cities could be rendered delightfully cool, at a small cost compared with the use of ice for the same purpose. It would soon be as common to see persons turn on the air to cool their houses, as it is now to see them turn on the gas to light them. A. If you have such a successful air compressor, you will find a large demand for it for operations in which compressed air is at present employed.

(32) W. J. W. says: I am putting up an engine for the purpose of running a cotton gin. I have a well, but the water is brackish. What effect will it have on the boiler? A. It will probably make scale in the boiler if you do not blow off frequently.

(33) I. H. L. asks: 1. When waterworks have a stand pipe, is the water forced to the top of the pipe to get the necessary pressure, or is the upper end of the stand pipe closed and the water forced through the street pipes (or elevated to a reservoir) by compression of the air in the stand pipe? A. A stand pipe is closed at the top. 2. Can you explain the principle of the Chicago water works, which use a stand pipe and a small reservoir built of boiler iron, but not nearly as high apparently as the stand pipe, nor large enough to contain one tenth of the water used. A. In Chicago the water flows through the mains from the reservoir which is kept full by the pumping engine.

(34) R. B. & R. C. say: We are young men wishing to be mechanical engineers. Is the Cooper Institute of New York a good place to get a thorough training? Could we get employment in the trade to enable us to live in New York, for the purpose of studying at the Institute? A. The instruction at the Cooper Institute is free, and is given in the evening, so that if you could get a situation in this city, you could pursue your studies very well.

(35) F. W. asks: 1. Will you give me a rule ordetermining the pi ch of a propeller screw? A. It must be ascertained by measurement. 2. What sized wheel is suitable for an engine with cylinder of 8 inches bore and 10 inches stroke? A. One about 30 inches in diameter. 3. What sized boat is such an engine capable of driving? A. One 40 feet long.

(36) C. W. M. says: I send you a piece of a flue taken from our engine for you to give your opinion as to the cause of its being eaten away in the manner shown. All the flues and the boiler are more or less injured in the same way. A. We have seen similar action in marine boilers where fresh water from surface condensers with copper tubes was fed into the boilers. You do not send enough particulars to enable us to give an explanation of your case.

(37) L. & V. say: We have a boat 18 feet long by 12 feet wide, with full oval bottom. We wish to run her by steam, in swift water. Can you give us proportions of engines to run her well? A. The boat is too small to make a very efficient steamer.

(38) J. S. W. asks: Can a telescope be constructed to magnify as you draw out the two sections, commencing with the telescope closed and looking at a 50 cent piece 200 yards distant? It will at first appear very small; but if I draw one section out, will the object appear the larger the further it is drawn? A. Such a telescope has the pancratic eyepiece; the pair of eye lenses recede from the inner pair, thus increasing the magnifying power.

(39) J. W. says: I made a telescope on the plan given in the SCIENTIFIC AMERICAN, p. 7, vol. 30. 1. My meniscus is 1¾ inches in diameter, of 48 inches focus. The eyepiece is ¾ inch in diameter, and 2½ inches focus, and is made to slide. I use a 6 inch double convex lens, but I am disappointed, as it does not in any way answer. Would an achromatic objective improve it at all? Is the object lens too small? A. A 3 or 3½ inch achromatic about 4 feet focus is recommended. The best eyepieces do not screw in, but slide into the rackwork tube or sliding tube, as the case may be, and cost $4 each. Powers from 80 to 150 or 200. The foci of the two lenses, in a simple instrument, should meet as you describe. 2. I have a mind to make another telescope; but before I begin, I would like your opinion in regard to lenses. What should be the focus of a 3 or 3½ inch achromatic objective to obtain the best result? Also what is the best kind for an eyepiece, and what should be the focus? A. See our remarks to G. J. J., No. 77, on this page.

(40) A. W. H. asks: Can you give me a recipe for something to mix with plaster of Paris to make it non-porous? A. There is nothing we know of that will render plaster non-porous without injuring at the same time its hardening properties.

(41) J. T. M. says: I have a small refracting telescope, a good one for its size. Could I use the eyepiece (consisting of 4 glasses) in connection with an object glass of longer focal distance, and make a good serviceable glass of it with a longer or larger tube? A. An eyepiece which is adapted for a short telescope may be used for a long one. The converse, however, is not the case.

(42) P. J. K. asks: I propose to make a telescope, and I think that a 4½ inch meniscus lens, with about 72 inches focus, with a ⅜ inch eyepiece, with about 1 inch focus (plano-convex) would make a good instrument. Do you think this would answer? Would an object glass (double convex) of same size and focus, with double concave eyepiece, be better? Would such an instrument show Jupiter's moons and their eclipses, Saturn's rings and moons, and the planets Venus and Mercury? A. You would have to place a cardboard screen over the lens with a hole in it an inch and a quarter in diameter. Get an achromatic spy glass instead, and unscrew the two front lenses of the eyepiece.

(43) C. W. S. asks: I made one of those cheap telescopes that you gave instructions for in your paper last winter, and I now wish to make one with an object glass of, say, 4 or 5 inches in diameter. What would the glasses for such an instrument cost, and what should be the inside diameter of the tube, length of the same, and length of focus? Could I make the tube of wood, as done in the smaller one? A. A fine American instrument in our possession, made in 1866, is 4 inches aperture, 60 inches focus. It is equatorially mounted on hollow cast iron axes, and is adjustable for latitude on a tripod of black walnut 5 feet 2 inches high, with 8 inch circles. The hour circle is divided to minutes, and the declination circle reading, by vernier, to two minutes of arc. Object glass cell is provided with collimating screws. The tube is conical, of polished black walnut in 3 strips glued together, and is 4 feet 2 inches long. Length from cell to end of rack tube, closed, a little less than 5 feet. There is a pancratic terrestrial eyepiece, and five Huyghenian ones, whose powers are 60, 96, 160, 240, and 320; 96 is the power most in use. A diagonal prism, and a finder telescope, one inch aperture, are also attached. The cost was $296.50. The necessary parts would cost: Lens $100, and 2 eyepieces $8, for a skillful mechanic; for the tyro, the tube and rackwork, $80, and tripod with ironwork, $25, should be added.

(44) S. L. G. says: In Spencer's "Psychology," vol. I, p 320, he speaks of the "vast catastrophe of which the star *Epsilon Coronæ* was lately the seat," etc. What was the catastrophe referred to? A. Very hot and therefore dissociated oxygen and hydrogen, suddenly cooled in large quantities, unite to form water, with evolution of heat and light. At one period of its evolution, a star consists of a more or less continuous liquid film surrounding a bubble of glowing gas. If this film be suddenly ruptured by pressure from within or by collision from without, the uprush of gas expands, cools down to the combining or burning temperature, and explodes. Such explosions constantly take place in the sun. Tongues of flame dart 100,000 miles from its surface with a crash that may be dimly imagined by those who have set fire to oxyhydrogen soap bubbles.

(45) W S asks: 1. When, in what constellation, and by whom was the comet lately visible discovered? A. It was discovered by M. Coggia, at Naples, April 7, 1874, in the breast of *Camelus*. 2. Has it ever appeared before? A. No. 3 What is its inclination to the ecliptic? A. 66°. 4. Where does it cross the ecliptic? A. It crossed the ecliptic on July 24, between *Gemini* and *Cancer*. 5 Did it pass through its perihelion before or after crossing the eliptic? If so, where? A. Its perihelion passage was on July 8, 60,000,000 miles from the sun. On November 4 it will be near the star *Alpha Chamæleontis*, in the southern hemisphere, and about as bright as when it was first discovered.

(46) F. D. H. asks: 1. What form of battery is used in exploding powder, gun cotton, etc.? A. The Grove, in connection with a small coil. 2. What is the arrangement of the wires, etc.? A. By arrangement of the terminal wires in such a manner that the spark leaps through the discharge thus igniting it.

(47) M. B. says: 1. I have a telescope which, besides the objective, has four lenses. These lenses are arranged in couples, in two small cylinders. Please tell me the respective names of each of these lenses. A. The glass nearest the objective is the object lens, the next is the amplifying lens, then comes the field lens, and, finally, the eye lens, next the eye. 2. When the instrument is open as far as possible, the first lens is 2½ inches from the objective. The eye piece has its focus 1⅜ inches distant. Please describe the objective which would give the greatest power, and tell me the required power. The lens should be 1⅜ inches in diameter. How can I estimate the power of a telescope? A. As we have before stated in answers to correspondents, the magnifying power of telescopes is equal to the stellar focus of the objective divided by that of the eye piece, the focus of the common negative eyepiece being equal to half the focus of the field lens. 3. Which is the best way to find the focus of the lens? Is it by getting an inverted image? A. Practically the principal focus is the distance at which the lens gives the sharpest image of the sun.

1. Can surveying and engineering be better learned in college than in an office? A. For civil engineering, both kinds of training are necessary. A knowledge of Gillespie's "Land Surveying" will enable you to survey, with good instruments. Send to Cornell University, Ithaca, N. Y., or to Sheffield Scientific School, New Haven, Ct., or to Rensselaer Polytechnic Institute, Troy, N. Y., for catalogue. 2. What are the requirements of a good civil engineer? A. From 4 to 6 years mental training (with subsequent practice), costing, including board, etc., from $500 to $1,000 per year. 3. Are surveying and engineering generally practised by the same person? A. Yes. 4. What are the wages of a good civil engineer? A. From $2,000 to $6,000.

(48) G. W. L. and others ask: What is an easy way of making mirrors of different sizes? A. The process, improperly called silvering mirrors, is rather a delicate operation; and inasmuch as the chances of failure are so great, as also the amount of time consumed, few amateurs will have their first efforts crowned with success in this direction. The process consists in applying a layer of tinfoil alloyed with mercury to the posterior side of the glass plate. To do this requires a perfectly smooth level table (marble is usually employed). The foil is placed perfectly flat on the table, every wrinkle smoothed out. The plate being in readiness, perfectly clean and polished, a little mercury is at first poured on the foil, and carefully spread with a wooden roller. Mercury is then poured on the foil to a depth of about 1/32 of an inch. The plate is now slid on to the table in such a manner that the supernatant mercury is carried off, thus preventing air bubbles from destroying the coating; at the same time great care must be taken not to disturb the foil. After this, a weight is carefully placed on the plate, and the table slightly tipped so as to allow the superfluous mercury to run off. The plate is then covered with cloth, and very heavy weights placed on it, in which position it is allowed to remain for 24 hours. The weights are then gradually removed and the angle of the table gradually increased, until the glass stands almost vertical, with the amalgam still adhering to it. The edges are then trimmed. Many days are consumed in these operations, especially with large mirrors; in some cases a month is required before the mirror is ready for use.

(49) M. E. L. says: In your answer to G. F. P., July 25, you say that the moist air in the hollow copper lightning rods amounts to nothing. So do I; but is not the copper rod ⅜ inch in diameter, with an outside surface of 1½ inches and the inside surface nearly the same, superior to the ⅜ inch solid iron rod recommended by you? If not, why do you crown your solid iron rod with a copper point? A. Copper is a better conductor of electricity than iron, in about the ratio of its increased cost. The large surfaces you speak of are undoubtedly desirable, but the iron rod referred to fully answers all requirements, at the same time being superior for strength and stiffness. The placing and connections of the rod deserve as much attention as its composition and conductivity. It is desirable to have the rod's connection with the earth as intimate as possible, for, if partly insulated by sticking its end into the surface a few feet, the fluid not finding a sufficient anode to the earth in this direction, will find its path through the building and its metal work, thereby rendering the rod a danger rather than a protection to the building.

(50) T. C. P.—Steam canal boats are in common use.

(51) G. B. S. asks: 1. Are creosote and paraffin made from paraffin oil? A. Creosote is made from wood tar, from which paraffin is also obtained. 2. What is paraffin oil used for? What is its thickness compared with lard oil? A. Paraffin oil is one of the products of the distillation of Boghead cannel coal. It is extensively used for lubricating machinery, for which it is admirably adapted, since it does not become oxidized or thickened by exposure to air, and it evaporates but slowly.

(52) W. P. W. asks: If an underground wooden tank or cistern is filled with common spring water by a force pump from a neighboring pond, how long will it keep good, for stable and barnyard use? Will it spoil under these circumstances quicker than rain water? A. It can be used for your purpose, and it will not spoil more quickly than rain water.

(53) W. L. B. asks: Can I have the same power with my zinc cup by coating it with quicksilver? I have to use the battery so frequently that it is very troublesome to keep it clean, and the sulphate consumes the zinc so fast that it soon eats a cup away. A. Yes. The zinc should be always kept properly amalgamated.

(54) J. A. L. asks: 1. Is it necessary to have a coil and secondary current of electricity to get a spark sufficient to light gas? A. It is not always necessary; but this depends upon the number of cells employed. 2. Is it best to have the secondary current? A. Yes.

(55) N. C. asks: How are carbon plates made for electric batteries? A. They are made either of the graphitoidal carbon deposited in the gas retorts, or by calcining in an iron mold an intimate mixture of coke and bituminous coal, finely powdered and strongly compressed.

(56) J. N. B. asks: What sort of metal can vessels be made of, so as not to be acted upon by sulphurous acid gas and its aqueous solution? A. Vessels made of pure lead can be used for your purpose.

(57) C. M. N. asks: How can I wind a spring and have it tapered to a point at each end? A. Cut a thread upon a lead mandril tapered at each end, wind your spring upon it in the usual way; then, when you heat the spring to harden it, the mandril will melt out.

(58) S. W. asks: In the winter when vegetation is not active, what becomes of the carbonic acid gas which is expired into the air? A. It is retained in the air. Analyses made of the air, during both the summer and winter, show neither increase nor decrease of carbonic acid, the total variation being inappreciable when compared with the incredible bulk of the terrestrial atmosphere.

(59) H. P. asks: What will harden or toughen the skin of the chin, to make it less sensitive when shaving? A. This is due to a very thin and sensitive skin. There is no application of which we are aware that will be of benefit.

(60) G. R. B. asks: Can you tell me of a paint or varnish of a dead black color, which will not glisten in the brightest sunlight? Hunters are often discovered to game by the glistening of their guns, which such a varnish would prevent. A. We know of nothing that will answer your purpose so well as lamp black and turpentine.

(61) H. L. C. asks: If a rubber bag, containing common dry air, be sealed airtight and placed under water, will it be compressed by the water to a smaller bulk than it had before it was immersed? If so, to what extent? A. It would; and the compression depends upon the depth of immersion. 2. Would the uplifting power of air contained in a like bag be greater at a depth of 10 feet than at a depth of only 1 foot? A. No.

(62) J. B. T. asks: If we weigh the materials of which a vessel (containing 60 gallons) is made, then weigh the vessel full of air, what would be the difference in weight? And would not the vessel weigh less if the air was exhausted from it than the materials would weigh before the vessel was made? A. There would be no difference in weight.

Why do springs afford more water in the summer or hot months than they do in the winter? A. They do not.

Are not never failing springs produced by the heat from the central fire, passing through subterranean aqueducts and bringing the water to the surface of the earth? A. No.

Is not the atmosphere produced by the central fire, the heat or cold on any particular part of the surface of the earth being governed by the vertical or oblique rays of the sun? A. No.

1. How long will it take an iron ball 2 feet in diameter, brought to a white heat, to cool down? A. This would depend upon the temperature of the surrounding atmosphere. 2. Is it not the water that it gets from the air and surrounding objects that cools it down? A. Only partially. 3. How long will it take an iron ball 2 feet in diameter, brought to a white heat, to cool down if kept in a furnace where the atmosphere (to use an illustration) is kept to a white heat? A. Under these conditions, the ball would not cool at all.

(63) A. H. K. asks: What will prevent peaches from decaying and falling off just previous to becoming fully ripe? A. The dropping of your fruit is due to the curculio, or more properly speaking, *conotrachelus nenuphar*. The best remedy is jarring the trees, catching the larvæ in sheets, and burning them. See Packer's "Guide to the Study of Insects," pages 489 and 490.

By what means or marks can I distinguish the male from the female mocking bird at the age of about 7 or 8 weeks, fully fledged? A. We cannot tell you how to distinguish them at that age.

(64) R. W. C. asks: If a machine for aerial navigation should be invented, what do you think would be the moral result upon our race? Do you think it would tend to the advancement of light and truth, or that the good would be overcome by the perpetration of crime and misery? A. We think that the result could not be other than elevating.

What is a perpetual motion? Is it a machine that will never wear out, or one that will run until it wears out? A. The latter is probably the better definition.

1. What is the best chemical composition for sensitizing paper for the reception of photographic images? A. The paper is steeped in a solution of chloride of sodium in water, dried, and immersed in a solution of nitrate of silver in water, and dried in a darkened room. 2. What time is required for the impression? A. This is dependent upon the quality and intensity of illumination.

(65) W. D. C. asks: Is a bed, lounge, or chair, standing on glass casters and in the center of the room, a perfectly safe place for a person during a thunderstorm? A. No. The lightning seeks a pathway to the earth through the best conductors; and as the human body is a better conductor than chairs or other ordinary articles of furniture, a person sitting as you suggest will be likely to be struck if the electrical fluid enters. The glass insulators offer no protection. The only real security is a good arrangement of lightning rods upon the exterior of the building to prevent the electricity from entering.

(66) H. L. D. asks: How is the phosphorescent safety lamp, used in powder magazines, etc., in France, constructed? A. Take a piece of phosphorus not larger than a pea, place it in a phial of the whitest and clearest glass, with enough boiling hot sweet oil upon it to fill a third of the bottle; put a cork in and hermetically seal it. To use it, remove the cork and allow the air to enter the phial, then cork it again, and the part of the vessel not filled with oil will become as luminous as a large lamp. It can be used for six months without replenishment. Use white phosphorus and pure oil.

(67) T. S. says: A hot metallic teapot was placed upon a waiter. In consequence of it, the paint or other composition with which the waiter is covered was discolored and blistered. How can I restore it to its original color and brightness? Shall I use ordinary lead paint mixed with boiled linseed oil? What kind of varnish must I add that will neither peel off nor stick when fingers, cloths, or slightly warm dishes are placed upon it? A. First clean thoroughly with soap and water and a little rottenstone; then dry by wiping and exposure at the fire. Mix a quantity of good copal varnish with some bronze powder, and apply with a brush to the denuded parts. After which set the tray in an oven, at a temperature of 212° to 300° Fah., until the varnish is dry. Two coats will make it equal to new.

How can I make labels adhere to tin? A. Use flour paste, with two tablespoonfuls of coarse sugar in every quart.

(68) C. M. H. asks: Can you mention any substance having the following properties: Light in color, soluble or slightly soluble in water, hard at atmospheric temperatures, and capable of liquefaction by a heat from 200° to 300° Fah.? You can perhaps mention some gums or resin, salts or alkalies, etc., possessing those properties. A. Borax, sodic carbonate, potassic carbonate, phosphate of soda and ammonia, gum arabic, etc. all have these properties.

(69) A. G. asks: 1. What is the composition of the tin foil in which tobacco is put up? A. Tin foil is made from tin which is first cast into an ingot then laminated to a certain extent, and afterward beaten out with a hammer. 2. How can it be made into solder? A. The alloy of tin and lead in equal parts forms the plumber's solder. The soft solder is composed of tin 3 parts, bismuth 5 parts, and lead 2 parts.

(70) W. H. H. T. asks: 1. Are there any authenticated cases of petrifaction (of either animal or vegetable matter) which have taken place in historical times? If so, where can some of the specimens be found? A. Such cases are daily occurring. On certain of the Caribbean Islands petrifactions on a large scale have occurred during historical times. 2. In the case of the man who was said to be petrified (mentioned on p. 84 of your vol. 31) would not the weight of the body (if it had not increased in bulk after burial) exclude all idea of it having been turned to lime, silica, or alumina? A. We do not see that it would.

(71) J. F. A. asks: Will an induction coil of ¼ inch spark do for giving shocks? A. Yes.

(72) L. A. G. says: The *Science Record* for 1874 (p. 374), describes a portable field camera oscura and now to make one. I have tried to make one after the method described, but fail to get an image on the paper unless it is held within about 3 inches of the mirror. I want it to cast an image from 18 to 20 inches away from the mirror. The dimensions of my instrument are: Box 4x8 inches; lens 2½ inches in diameter with a 1 inch focus, made to slide in and out of the box distance of box from table, 20 inches. Why do I not get an image farther away from the mirror? What is there wrong about the instrument? A. The distance from the lens to the table, measured along the path of the rays, should equal the conjugate focus of the lens (when it is focussed upon the foreground). Your lens should be of 24 inches focus.

(73) T. A. H. asks: 1. Which is best for a celestial telescope, a lens of 4 inches diameter and 48 inches focus, or one 1¼ inches diameter of 48 inches focus? Would there be any difference except in field? What should be the diameter and focus of the eyepiece? A. The toy you mention is useless if over 1 inch aperture, as the aberrations impair distinct vision See p. 7, vol. 30, and read our answers to correspondents since. 2. Would such a glass show Saturn's rings? A. Not distinctly.

(74) R. asks: What is meant by north, south, east, and west, as applied to the stars? For instance, you say in your last number that Borelli's comet may be found 7° east of *Gamma Ursæ Minoris*; and when I look for this star, some book tells me that it is so many degrees east or west of some other star. A certain star is said, in Burritt's "Geography of the Heavens" to be the westernmost star in the Dipper. Now the Dipper is changing its position relatively to an observer all the time, and the same star which is the westernmost one, when the constellation is low down in the horizon, appears to me to be the easternmost one when it gets to be nearly over our heads. A. The points of the compass should not be used in referring to celestial objects. Right ascension, expressed in time from 0 to 24 hours, indicates distance of a star from the first meridian or vernal equinox, that is, its longitude. Declination, expressed in + or − degrees, minutes, and seconds of arc, indicates the distance of a star north or south of the celestial equator, that is, its latitude. The figures following the letters, R. A. and D, thus define the exact place of a body in the heavens or upon the map.

(75) W. W. E. says: I have noticed that you state that a certain star was moving in the direction of the earth at 54 miles per second. Is the course of that star across the orbit of the earth, or is it in a line with its orbit, or at a tangent, or on a radial line, with its orbit? In six months, the earth will have passed half of the distance around the sun; what direction then to the earth will the falling star have? Will it still be toward the earth? A. All stars are drifting about in space, the sun (at the rate of 4 miles every second) toward *Lambda Herculis*; so that at the very remote arrival of Arcturus, we shall be traveling elsewhere.

(76) T. P. says: A friend of mind positively asserts that no human being can see a cloud 5 miles distant. Will you please give me good authority on the fact? A. The mean hight of clouds is much less than 5 miles, but Dalton says that they have been seen at full 5 miles above the surface, passing over the highest peak of the Andes.

Has a balloon ever ascended to a hight of 10 miles? A. The greatest hight on record is that attained by Mr. Glaisher, who, in 1862, made an ascent to an altitude of 7 miles. At this hight it was difficult to sustain life.

(77) G. J. J. says: 1. I have a meniscus of 48 inches focal length. Which will be the better for an object glass, this, or a double convex lens of 4 or 5 inches diameter? What would be the focal distance of such a lens, and would its magnifying power be much greater than that of the meniscus? A. Both would be useless as object glasses. 2. What kind of an eyepiece would such a lens (double convex) require? A. With a double concave eye lens, it would form the Galilean telescope. 3. Does the focus of an object glass fall before, behind, or on the eyepiece? A. The focus of an object glass falls in front of the Ramsden or positive eyepiece, within the Huyghenian or negative eyepiece, and behind the Galilean or double concave eye lens. 4. Can you recommend me to some treatise which explains the subject of the foregoing? A. See Dick's "Practical Astronomer."

What preparation or starch is used to give a fine gloss to shirt bosoms? A. A lump of paraffin is melted in with the starch.

Can you give a recipe for bleaching skeleton leaves and flowers? A. Bleach with chloride of soda, after macerating the leaves in water, until the epidermis is readily displaced.

(78) T. C. K. says: I have tried the cheap telescope described in your paper. I could see distant objects in the daytime very well, and the moon at night but for the stars it was a complete failure. All that I could see was a little round ball, colored red or blue Can you tell me the cause? An optician says that a double convex lens would be better than the meniscus What should be the size and focus of two double convex lenses, which will show to a certainty Jupiter's moons, Saturn's belt, etc? A. An achromatic object glass of 50 inches focus and 1¼ inches diameter, with a power of 50, will show sun spots (on a white surface), Jupiter's moons, the rings of Saturn, and bright stars and planets in the daytime. A double convex lens of 4 feet focus must not be over 1 inch in aperture. If we increase the aperture to 2 inches, we must lengthen the focus to 14 feet to obtain an image free from prismatic colors. We therefore buy achromatics exclusively.

(79) R. W. says: I have about 4 gallons of sulphate of nickel and ammonia that I spoiled by putting in a vat lined with pine pitch. The cyanide and ammonia seem to be affected, which spoils the conducting power of the solution. When I put articles in the bath to be plated, they all turn black. Is there any way in which I can recover that solution? A. Various methods have been tried, but they are so tedious and require so much labor that you could not recover the nickel and convert it again into the double sulphate economically, on the small quantity of 5 gallons.

(80) W. H. says: You once gave a recipe for waterproof glue as follows: 12 ozs. glue with sufficient water to dissolve it. Add 3 ozs. rosin, melt down in a carpenter's glue pot, and then add 4 ozs. turpentine or benzine. It does not mix well. I also tried softening the glue in water, then dissolving in linseed oil; but it curdled and is too slow in drying. I should like to have a glue as nearly colorless as possible. A. A glue which is said not to be affected by moisture may be prepared by dissolving 1 oz. sandarac and 1 oz. mastic in half a pint of alcohol, and adding 1 oz. white turpentine. A very thick glue is then to be made, to which some isinglass is to be added. The alcoholic solution is to be heated to boiling in a vessel, and poured gradually, with constant stirring, into the warmed glue, until the whole is intimately mixed together. The mixture is finally to be strained through a cloth, and is then ready for use, and is to be applied hot. It dries quickly, becomes very hard, and pieces of wood united with it do not separate in water.

(81) J. H. J. asks: Is there any process by which small iron castings can be changed into malleable iron after they are cast, so that they can be welded or hammered like wrought iron? A. Malleable castings, as made at present, cannot be worked like wrought iron. They are only rendered less liable to crack.

How much coal do ocean steamers, from 3,000 to 4,000 tuns, burn in a day? A. From 40 to 60 tuns.

(82) H. S. asks: How is the brown imitation of bamboo on fishing rods made? A. By charring the wood, and then polishing.

(83) J. E. E. of Pa. says, in answer to A. A., J.'s query as to filtering water for boilers: Build a circular well of very soft-burnt building brick in the center of your water tank; lay the brick (on edge) in water cement (Portland preferred). Select bricks that are sound, having no holes or cracks through them. Fill your tank outside the well; it will readily soak through the brick. Take your water from the inside of the well for your boilers. Should the pores of the brick occasionally fill up so that the water will not soak through fast enough, use a scrub brush to clean off the outside. This makes a cheap filter for almost any impure water.

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

C. W. J.—Your impressions are very imperfectly made, especially the Roman coin. The one of the date 1811 is a Spanish coin, but doubtless not as old as the Roman. Their age shows nothing very important. Coins older than these are to be found in circulation at this day. They were doubtless brought over long after Columbus discovered America, and obtained in traffic by the Indians; and, being considered of value by them, were buried with them, as was their custom.—J. W. H.—The specimens are magnetic oxide of iron, mixed with some quartz, etc. The pure magnetic oxide of iron should contain over 72 per cent of iron. What it does actually contain, whether it has any constituent which would unfit it for iron-making, and what is the value and extent of the ore, must be ascertained by a technical chemist.

W. W. says: In the locality of Binghamton, N. Y. (lat. 42° 06' N., long. about 76° 14' W.) I prove conclusively that, for a long series of years previous to 1806, the declination of the magnetic needle was eastward, at the average ratio of 3·72' per annum, that at that period (variously and indefinitely stated by authors) the eastern motion ceased, while the directive tendency of the needle was 2° 48' west of the pole. Subsequent to that, the declination has been westward, at about the same ratio, showing now an accumulated secular variation of 7° west, as deduced from my last astronomical experiment. Now what I wish to learn is this: Whether the period of revolution of the needle, from east to west and *vice versa*, is a regular or uniform period, I mean of about the same number of years? If it is, what is the extent of that period? For your scrutiny and criticism, allow me to state that the diurnal westerly motion of the needle is only to be discovered in full force between the vernal and autumnal equinoxes; and that this variation amounts to about half as much in winter as in summer (as several authors of celebrity have stated) seems to be doubtful: as from the most minute observations I have been able to make during the time I have mentioned, the diurnal variation has been found to be 15' or 14'; while between the autumnal and vernal equinox, variation has been *nil*, or scarcely appreciable. (Will some of our readers who have investigated this subject in particular or have made it a study, please answer this question?—EDS.)—M. V. H. asks: What do sign painters use to produce that brilliancy in gold letters or gold leaf which they apply on shop and store windows?

COMMUNICATIONS RECEIVED.

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

On Tender Bones. By Z. M. P. K.

On Railroad Rolling Stock. By F. G. W.

On Measuring the Width of a Stream. By W. H.

On Creeping Rails. By A. S. M.

On a Novel Projectile. By C. R. S.

On Practical Mechanism. By T. W. P.

Also enquiries and answers from the following:

S. B.—E. E.—L. F.—C. G.—X. Y.—N. F. P.—D. T. W.—L. M. B.—Q.—F. R. S.—M. A.

HINTS TO CORRESPONDENTS.

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

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

Hundreds of enquiries analogous to the following are sent: "Please to inform me where I can buy a machine for turning broom handles, also for cutting barrel heads? Where can I purchase the best water wheel? Which work on modern architecture is considered the best? What are the prices of best German silver instruments? Where can I obtain printed sheets of playing cards?" All such personal enquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED IN THE WEEK ENDING

August 25, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Alloy, anti-friction, M. H. Campbell 154,317
Animal fats, etc., treating, Churchill *et al.* 154,372
Auger, earth, J. O. Smith 154,528
Axle box self-oiling cup, B. S. Hyers 154,487
Baker, J. T. Wilson 154,535
Bed bottom, spring, J. W. Case 154,454
Bed bottom, spring, Grafton & Crane 154,388
Bed bottom, spring, C. Miller 154,329
Bedstead, sofa, J. McGrath 154,504
Bell ringer, steam, C. H. Hudson 154,394
Blackboard rubber, J. B. Walker 154,357
Boat-detaching hook, G. Utley 154,533
Bobbin, W. Ingham 154,332
Boiler leg, Taylor & Quinn 154,355
Boot heel rotary tip, G. Shuttleworth 154,525
Boot and shoe last, J. K. Felck 154,326
Bottle stopper, W. Morgenstern 154,510
Bottles, etc., packing for, O. Long 154,498
Brick, I. Gregg, Jr. 154,474
Bridge, iron truss, Z. King (r) 6,026
Broiler, J. Wilging 154,361
Bronzing machine, D. Heston 154,480
Brush, paint, F. H. Jordan 154 397
Buckle loop, metallic, H. A. Pott 154,341
Candle safes, pocket, A. Barbarin 154,442, 154,443
Car axle, J. M. May 154,503
Car brake, A. Robb 154,419
Car coupling, A. Kimber 154,491
Car coupling, H. E. Smith 154,423
Car, sleeping, J. T. and D. R. Leighton 154,496
Car spring, W. P. Hansell 154,478
Car wheel gage, F. Collins 154,457
Cars, etc., extra seat for, C. E. Baldwin 154,313
Carbon black, making, A. Farrar 154,467
Carriage, child's, J. A. and G. W. Conover 154,458
Carriage hub, S. Mitchell 154,508
Caster, furniture, C. B. Sheldon 154,421
Chair, W. W. Crawford 154,375
Chicken coop, J. H. Van Arnum 154,524
Chuck for holding nipples, A. Saunders 155,345
Clothes dryer, C. A. Meekins 154,409
Clothes pounder, Sheldon & Reynolds 154,524
Coal, etc., screen for, P. and W. B. Hayden 154,391
Column, composite, C. E. Hill 154,393
Corset, J. L. Follett 154,383
Counting apparatus, R. H. Webb 154,358
Cultivator, J. Lux 151,404
Cultivators, evener for, V. K. George 154,472
Curtain fixture, A. H. Knapp 154,400
Dentist's use, gold leaf for, C. E. Blake 154,446
Drill joint, J. H. Bauser 154,444
Eaves trough, C. D. Woodruff 154,537
Egg beater, J. F. and E. P. Monroe 154,411
Egg carrier, J. Perkins 154,517
Electric commutator, W. Robinson 154,520
Elevator, hay, W. Adams 154,364
Elevator, windlass water, J. Keith 154,333
Engine governor, steam, J. Judson 154,490
Engine governor, J. D. Lynde 154,405
Engine cut-off, D. A. Woodbury 154,363
Engine piston, J. M. Palmer 154,516
Engine slide valve, O. J. Byrud 154,370
Fan attachment, W. S. Burton 154,316
Fan, automatic, P. Magnus 154,406
Fan, automatic, Smith & Bogy 154,349
Fare box, W. S. Clapp 154,373
Faucet, L. J. Birgier 154,367
Fence, flood, D. T. Deffenbaugh 154,378
Fence, iron, J. B. Maurer 154,502
Fence, portable, J. Hafer 154,329
Fire arm, breech-loading, E. F. Gunn (r) 6,025
Fire extinguisher, F. Latta 154,495
Fire extinguishing machine, A. E. Hughes 154,395
Flat iron heater, C. A. Stevenson 154,425
Flour bolters, W. F. Cochrane (r) 6,029, 6,030
Fork, manure, J. G. and J. G. Rankin 154,417
Furnace grate bar, Hanford & Holladay 154,330
Furnace, annealing metal, etc., C. Marshall 154,334
Furnace blast valve, J. M. Hartman 154,390
Furnaces, delivering piles into, S. W. Kimble 154,492
Gage, bevel, W. E. Skinner 154,526
Gage for shingles, J. M. and C. T. Schramm 154,522
Gas, purifying, W. H. St. John 154,350, 154,351
Gas carbureting machine, B. F. Grimes 154,475
Gas holder, portable, J. McHenry 154,505
Gas purifier, W. H. St. John 154,352
Gas, purifying, S. O. Rockwell 154,344
Gate, W. Flynn 154,382
Grate bar, G. M. Ball 154,440
Hame, S. Thornton 154,428
Harvester, H. F. Long 154,499
Harvester binder, B. F. Witt (r) 6,033
Heater, washstand, Herlehy & Johnson 154,392
Heater, steam air, J. T. Bon 154,368
Hemp brake, Dean & Forward 154,375
Hook, sister, T. Witmer 154,360
Horseshoe, L. W. Griswold 154,389
Hose coupling, H. Wolf 154,536
Hose couplings, band for, E. Rath 154,518
Hose spanner, D. U. Beecher 154,445
Hydrant cover, J. McKnight 154,408
Hydronette, etc., W. B. Robbins 154,343
Indicator, low water, C. N. Myers 154,513
Injector, steam, J. Trees 154,356
Insect destroyer, W. G. Swartz 154,530
Iron and steel, annealing, J. E. Atwood 154,438
Iron plates, straightening, H. J. Merrens 154,338
Jack, drilling, Metcalf & Regan 154,506
Jack, hydraulic, E. Biddle 154,366
Journal box, etc., self-oiling, Chapman *et al.* 154,455
Keyhole guard, E. Most 154,410
Knitting machine, stop for, R. and F. J. Cooke 154,374
Knob or closet pin, C. H. Thurston 154,429
Lamp bracket, C. H. King 154,399
Lamp, cooking, G. P. Houston 154,484
Lamp lighter, J. C. Gould 154,328
Latch, locking, Sherman & Hamann 154,420
Lathe dog, J. H. Stimpson 154,426
Locks for sliding doors, D. H. Detterer 154,462, 154,463
Lock, seal, J. Sweeney 154,354
Loom, R. W. and G. P. Andrews 154,436
Lubricator, Reed & Osborn 154,478
Marble sawing machine, L. B. Clogston 154,320
Medical compound, J. P. Edinger 154,465
Meter, fluid, B. Huber 154,486
Milk cans, washing, G. L. Chadborn 154,318
Mill roll shaft box, W. Garrett 154,386
Millstones, tool for dressing, J. Norman 154,514
Miter box, E. Knock 154,402
Mitering machine, T. E. King 154,493
Molding machine, W. F. Wolf 154,454
Nail plate feeder, J. Cornforth 154,321
Nut lock, W. Duncan 154,325
Nuts, die for making, J. H. Sternbergh 154,424
Oakum, making, T. H. Dunham 154,464
Ordnance projectile, R. P. Parrott (r) 6,027
Organs, pneumatic action for, T. Winans 154,359
Overalls, J. Greenebaum 154,478
Paper box, T. J. Waters 154,433
Paper, perforating, W. Braidwood 154,450
Petroleum, refining, R. D. Turner 154,430
Piano, C. Boerner 154,447
Piano strings, covering, C. Rienwarth 154,342
Pipe cut-off, J. Hambitzer 154,477
Planing machine, W. C. Margedant 154,501
Planter, corn, Askew & Sangster 154,365
Planter, corn, G. W. Brown 154,452
Planter, corn, Miller & Wright 154,507
Planter, corn, H. Olson 154,515
Planter, corn, J. Selby 154,347
Planter, corn, H. A. Thomas 154,531
Plate lifter, O. I. Foster 154,384
Plating, nickel, I. Adams, Jr. 154,435
Plow, R. W. Banks 154,315
Plow, Fulk & Good 154,470
Plow clearer, Deal & Hobbs 154,323
Plow, rotary, Jones & Yard 154,489
Plow, sulky, M. Grove 154,476
Press, cotton, P. Byrne 154,453
Printing roll, F. E. James 154,396
Propeller, screw, J. M. Dodge (r) 6,031
Pump, W. Adair (r) 6,028
Pump, J. P. Flanders 154,468
Pump cock, B. S. Church 154,319
Purifier, middlings, G. W. Dellinger 154,379
Railway wheel fender, Fulk & Good 154,327
Railway cattle guard, Ruth & Wenger 154,521
Railway rail, compound, I. Thomas 154,427
Railway switch, B. Bacon 154.439
Rake, horse hay, A. P. Massey 154,335
Rein holder, A. K. Smith 154,422
Sash holder, J. M. Horne 154.482
Scales, platform, W. B. Wood 154,362
Screw cutting die, A. Saunders 154,346
Seed drill, E. Mosher 154,511
Sewing machine, G. Frame 154,385
Sewing machine hem stitcher, E. L. Howard 154,485
Sewing machine ruffler, W. H. Lewitt 154,497
Shackle for blocks, elastic, J. Edson 154,381
Sheep-shearing machines, M. C. Davis (r) 6,023, 6,024
Shoe, woven, E. B. Phillips 154,415
Shutter fastener, C. S. Van Wagoner 154,431
Sled, T. G. Boon 154.448
Sleigh, Sumner & Small 154,353
Sluiceway, adjustable, J. L. McDonald 154,337
Smoke stack and spark arrester, J. W. Nesmith 154,412
Soda water bottle stopper, H. S. Carley 154,371
Soda water retort, O. Knapp 154,401
Soldering iron tip, J. Sears 154,523
Stair rod holder, I. Banister 154,314
Steam and water power, A. Huffer (r) 6,032
Steel for agricultural implements, J. E. Atwood 154,437
Stockings, darning, O. S. Hosmer 154,483
Stove foot, E. Smith 154,527
Stove grate, G. R. Moore 154,340
Stove, heating, J. E. Kendall 154,398
Stove, heating, S. Cook 154,459
Stove, magazine, E. Smith 154,348
Swine, marking and ringing, A. C. Decker 154,460
Swing, J. R. Davis 154,322
Telegraph, duplex, C. H. Haskins 154,479
Telegraph insulator, H. Brooke 154,451
Toy pipe, soap bubble, A. Barbarin 154,441
Trap, animal, A. Davis 154,376
Trap, animal, J. Dildine 154,461
Trap, mouse, O. S. Watrous 154.432
Trap, pigeon, H. Knapp 154,494
Track, T. J. & G. M. Clark 154,456
Trunk fastening, W. J. Henry 154,331
Tyre tightener, S. H. Hodge 154,481
Valve, balance slide, A. J. Stevens 154,529
Valve, safety, P. Mooney 154,509
Vehicle running gear, C. M. Murch 154,512
Vehicle spring, S. E. Foster 154,469
Vehicle, traction, C. V. B. Reeder 154,519
Velocipede, P. J. Marqua 154,500
Ventilator register, H. A. Gouge 154,387
Vessels, propelling, E. Matteson 154,336
Vessel, wave power utilizing, P. S. Devlan 154 324
Wagon, etc., dumping, G. Peterman 154,413
Wagon body, B. Rankin 154,416
Wagon running gear, W. L. Booth 154,369
Wagon tongue support, E. Jarrell 154,488
Warping machine stop, T. C. Entwistle 154,466
Watchmaker's tool, J. C. Link 154,403
Watchman's time check, C. Pfisterer 154,414
Water wheel, F. W. Tuerk, Jr. 154,532
Water wheel, current, D. Bowles 154,449
Whiffletree, A. J. Dibble 154,380
Windmill, R. E. Mason 154,407
Wrench, pipe, C. H. Fulmer 154,471

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:

30,719.—PAPER FOLDING MACHINE.—C. Chambers, Jr., November 11.

31,330.—COLLARS FOR CARRIAGE WORK.—M. Seward, January 20.

EXTENSIONS GRANTED.

29,917.—DRAW BRIDGE.—L. Schneider & J. A. Montgomery.

29,920.—MORTISING MACHINE.—H. C. Smith.

29,923.—PLANING MACHINE.—H. D. Stover.

DESIGNS PATENTED.

7,709.—HARNESS ROSETTE.—J. V. Waldron, N. Y. city.

7,710.—STOVES.—T. F. Hamilton, Geneseo, Ill.

7,711 to 7,714, inclusive.—TASSEL DROPS.—R. K. Slaughter, Brooklyn, N. Y.

TRADE MARKS REGISTERED.

1,945.—BAKING POWDER.—Cloud & Co., Evansville, Ind.

1,946.—MEDICINE.—Frese & Co., Hamburgh, Germany.

1,947.—CLOCKS.—F. Kroeber, Hoboken, N. J.

1,948.—GIN.—M. Lieman & Co., New York city.

1,949.—PLOWS, ETC.—A. Speer & Sons, Pittsburgh, Pa.

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
AUGUST 22 TO 31, 1874.

3,776.—T. A. D. Forster and E. L. Stowell, Philadelphia, Philadelphia county, U. S. Improvements on tooth paste, called "The Sphinx Tooth Paste." August 22, 1874.

3,777.—W. Robertson, Yorkville, York county, Ont. Improvements on cloth shrinking and drying machines, called "Robertson's Cloth Shrinker and Dryer." August 22, 1874.

3,778.—L. Richards, Philadelphia, Philadelphia county, Pa., U. S. Implement for cutting and gaging butter and lard, called "The Complete Butter and Lard Cutter and Gage." August 22, 1874.

3,779.—J. Johnson, Brooklyn, Kings county, N. Y., U. S. Improvements in ball casters, called "Johnson's Universal Caster." August 22, 1874.

3,780.—W. H. Weagant, Morrisburgh, Dundas county, Ont. Improvements on window blinds, called "Weagant's Improved Window Shade." August 22, 1874.

3,781.—E. Osborn, Spencer, Tioga county, N. Y., U. S. Improvements on running gear for wagons, etc., called "Elijah Osborn's Cross Platform Gear for Wagons, etc." August 22, 1874.

3,782.—H. B. Sherwood, Mill Point, Hastings county Ont. Improvements in tool handles for files, chisels, drawing knives, etc., called "Sherwood's Improved Tool Handle." August 24, 1876.

3,783.—H. P. Becker and N. Underwood, Jr., Dixon City, Lee county, Ill., U. S. Improvements on machines for scouring and polishing grain, called "Becker's Grain Scouring and Polishing Machine." August 22, 1874.

3,784.—W. H. Taylor, Baldwinsville, Onondaga county, N. Y., U. S., and C. Potter, Schenectady, Schenectady county, N. Y., U. S. Improvements on harness pad trees, called "Taylor's Harness Pad Tree." August 24, 1874.

3,785.—D. W. Bailey, Watertown, Middlesex county, Mass., U. S. Improvement in concrete, adapted to roads, walks, floors, water works, etc., called "Improved Composite Concrete and Mode of Applying the Same." August 24, 1874.

3,786.—T. Sparham, Brockville, Leeds county, Ont. A fireproof paint, called "Sparham's Fireproof Paint." August 24, 1874.

3,787.—O. Thompson, East Flamborough, Wentworth county, Ont. Improvement in railway car couplers, called "Thompson's Railway Car Coupler." August 22, 1874.

3,788.—E. L. Fenerty, Halifax, N. S. Improvements on the heel fastenings of his improved skate fastenings under letters patent No. 180, bearing date Dec. 15, 1869, called "Canadian Club Skate." August 24, 1874.

3,789.—J. Sharp, Horton, Renfrew county, Ont. Improvements on spinning fibrous materials, called "Sharp's Improvements in Spinning." August 24, 1874.

3,790.—G. R. Prowse, Montreal, P. Q. Improvements on the construction of fire extinguishers, called "Prowse's Improved Fire Extinguisher." August 24, 1874.

3,791.—G. K. Smith, Waterloo, Black Hawk county, Iowa, U. S. Improvements in the composition and process of making a metal for casting plows, called "Smith's Composition for Plows." August 24, 1874.

3,792.—S. Moore and H. Rogers, Sudbury, Mass., U. S. Useful manufacture of preparation of leather or leather board for use in making shoes or various other articles, called "Resinated Leather or Leather Board." August 24, 1874.

3,793.—K. Corbet, Owen Sound, Grey county, Ont. Improvements in the art or process of raising, heating, and distributing hot water simultaneously, called "Corbet's Process of Raising, Heating, and Distributing Hot Water." August 24, 1874.

3,794.—William Harkness, Providence, Providence county, R. I., U. S. Improvements on apparatus for and methods of making illuminating gas, called "Harkness' Gas Apparatus." Aug. 24, 1874.

3,795.—H. W. Spratt, 4 Lee Road, Lee Parish, Kent county, Eng.—Improvements on voting apparatus, called "The Voting Machine." Aug. 31, 1874.

3,796.—T. Rowan and J. R. Reid, Glasgow, Lanark county, Scotland. Improvements on floor cloths, called "Rowan & Reid's Carpet Floor Cloth." Aug. 31, 1874.

3,797.—I. E. Moye, Clifton, Welland county, Ont. Composition of matter to be used as a liniment for the cure of rheumatism, sprains, etc., called "Moye's Star Liniment." Aug. 31, 1874.

3,798.—C. Hoffman, New York city. Improvements on grates, called "Hoffman's Furnace Grate." Aug. 31, 1874.

3,799.—J. Thompson, Bramley, Simcoe county, Ont. Improvements on gates, called "Thompson's Improved Gate." Aug. 31, 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.

CABBAGE, TURNIPS, POTATOES, Apples, &c., can be cut nice and rapidly with Lusher's Patent Cutter, price $1.25, post paid. JOHN LUSHER, La Porte, Ind.

SET OF SWISS DRAWING INST'S & ARCHITECTURAL Books for Sale Cheap. Box 386, Peekskill, N.Y.

Phrenology. How to Learn it. Send stamp for circular to S. R. WELLS, 389 Broadway, N.Y.

SMALL INVESTMENTS PAYING ENORMOUSLY; will surprise you; pamphlets free. RUMBLE & CO., 52 Broadway, New York, P. O. Box 4,905.

EDISON'S INDUCTORIUM—A powerful electrical induction-coil for giving shocks. Useful for medical purposes and amusement. Price only SIX DOLLARS. Sent, C.O.D., by express. Send for circular. EDISON & MURRAY, 10 & 12 Ward St., Newark, N. J.

WOODWORTH SURFACE PLANERS, $125. Planers and Matchers, $350. S. C. HILLS 51 Courtlandt street New York.

FOR SALE,

THE manufacturing property, known as the PARIS FURNACE COMPANY, in Clayville, Oneida Co., N. Y., 10 miles south of Utica, upon Sauquoit Creek and the line of the D. L. & W.R.R. It consists of two large, substantial frame factory buildings, with distinct water privileges of about 50-horse power each, built and fitted up expressly for the manufacture of scythes, forks, and similar implements. There are 20 trip hammers, with all their necessary forges and fixtures for punching, shearing, grinding, and polishing, all in perfect running order. Also, 20 neat tenement houses. Also several storehouses and stable. The factories can be adapted to the manufacture of paper, cotton, or woolen goods; but they offer unusual advantages in the line for which they were designed. They will be sold separately if desired. Address PARIS FURNACE COMPANY, Clayville, N.Y., or A.H. PATCH, 34 Central wharf, Boston.

Water Wheel. The best in the Market, and sold at less price than any other first-class Wheel. Send for a Pamphlet and be convinced. N. F. BURNHAM, York, Pa.

THE CHAMPION SILVER-STEEL SPRING MATTRESS, now greatly improved, has been before the public for several years, and continues to occupy its unrivalled position in the trade, as the BEST BED ever produced. It presents the rich and elegant appearance of silver, and is the softest, easiest, cheapest, and most durable Spring Bed in market. Wholly composed of tenacious tempered steel springs, so united that the pressure is equally distributed. Easily lifted, turned, or rolled up. Both sides alike. No frame, no wooden slats, no tow stuffing, no straps. May be used on floor without bedstead. No under bed required. Needs only half the thickness of hair mattress. More springs for your money in this bed than in any other. Unequalled for hotels. Any sizes made to order. Send for pictorial circular. Retail price of double bed, $13. Shipped, by single bed or quantity, to all parts of the world. Liberal discount to the trade. Sold by leading dealers in all parts of the country. Refer to Phelps, Doremus & Corbett, J. T. Allen & Co., New York, Gould & Co., Philadelphia, Pa., Gilbert & Sons, Norwich, Conn, Bowditch & Co., New Haven, Conn., and many others. CHAMPION SPRING MATTRESS CO., Makers, 346 Canal St., near Broadway, New York.

OVER 7,000 IN USE.
BLAKE'S STEAM PUMP
Send for catalogue. GEO. F. BLAKE M'F'G CO., Boston, New York—Chicago, Ill.

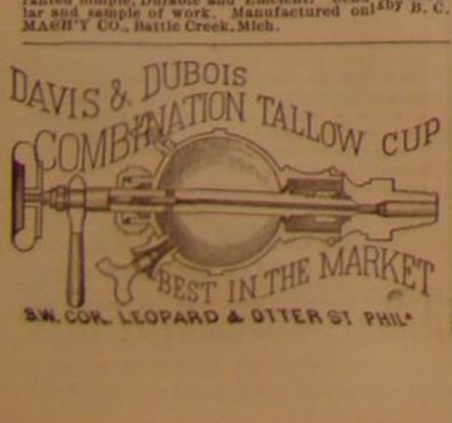
FOR SALE—Very low—An 80 H.P. Steam Engine, 18x36 in. Cylinder, with 8 tuns band wheel 26 in. face, Governor, and all complete. Our own build but little used, in perfect order. Apply to TODD & RAFFERTY MACHINE CO., 10 Barclay St., New York.

IMPORTANT FOR ALL LARGE CORPORATIONS AND MANUFACTURING CONCERNS.—Buerk's Watchman's Time Detector, 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.

THIS MONTH A WELL KNOWN FIRM of Engineers and Machinery Agents, with large connections at home and abroad, will open a ground-floor Warehouse, having windows fronting Queen Victoria Street and Cannon Street, City, London, England. The firm is prepared to accept the agency for special machinery, tools, etc., and to exhibit a choice selection of these and of working models. Advertisers' travelers canvass Great Britain and the whole of Europe. For terms, apply to W. P., Box 773, New York City.

FOR LEGAL ADVICE CONCERNING Infringements and Patents, consult R. B. McMASTER, Counsellor at Law, 9 & 11 Nassau st., Room 26, New York. Counsellor and Advocate in Patent Cases.

BOULT'S PATENT Reverse Motion, Paneling Variety Moulding, and Dovetailing Machine, cuts Panels of any design or style of Mould in the solid wood, with neatness and dispatch. Routes and grooves for Windows—Car Stairs—Car—Bridges &c., &c. Moulds fine bracket and general Scroll Work. It is a first class Shaper and Moulder. Dovetails all kinds of Drawer and Joint Work with thick or thin stuff. Warranted Simple, Durable and Efficient. Send for circular and sample of work. Manufactured only by B. C. MACH'Y CO., Battle Creek, Mich.



BOOKWALTER ENGINE. The lowest-priced good Engine ever constructed; Boiler and Engine made of the best Charcoal Iron. Compact, substantial, economical, and easily managed; Boiler, Governor, Pumps, and all Trimmings complete for running at low price of
3 Horse Power . . . $251 50
4½ " " . . . 303 50
☞ Delivered on Cars, Boxed, at Shops.
FOOS & JAYNE, 109 LIBERTY STREET, NEW YORK.

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

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

FLUORSPAR, FELSPAR, Soluble Glass, Tungstate, Asbestos, Silex, Zaffre, Nickel salts and Anodes, Fluoric Acid, and all rare metals, for sale by L. FEUCHTWANGER & CO., 180 Fulton St., New York.

STONE SAWING MACHINERY. Merriman's Patent. Also, Hand and Steam
DERRICKS & TRAVELLERS, THOMAS ROSS, Rutland, Vt.

FORGING & FINISHING MACHINERY, Fixtures and Tools complete for making guns, sewing machines, etc., to model, furnished to order by THE PRATT & WHITNEY CO., Hartford, Conn.

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.

A FORTUNE FOR ALL in the Rubber Stamp Business. Address DORMAN'S STENCIL AND STAMP WORKS, Baltimore, Md.

Geo. W. Read & Co.,
Manufacturers of and Dealers in
ALL KINDS OF HARD WOODS, IN LOGS, PLANK, BOARDS, & VENEERS,
186 to 200 Lewis St., Foot 5th & 6th Sts., East River, New York.
Attention is especially invited to our Stock of French Walnut and Ash Burls, Birds-Eye and Curly Maple, Satin Wood, Tulip, Rosewood, and Hungarian Ash. Also, Seasoned Mahogany, Walnut, White, Spanish and Red Cedar, and White Holly.
☞ Orders by mail have prompt and careful attention. Send for Catalogue and Price List.

$475 A MONTH TO AGENTS. Address C. M. LININGTON & BRO., New York or Chicago.

PATENTS Sold and Introduced. F. T. H. RAMSDEN, Bryan Block, Chicago, Ill. Mechanical Engineer and Manufacturers' Agent.

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

FOR SALE—AN UNFINISHED IRON, TWIN SCREW STEAM VESSEL, having double bottom and water-tight compartments.

Length between Perpendiculars	390 feet.
Breadth of Beam	45 "
Depth to Main Deck	24½ "
Displacement at 22 feet draught	6,000 tons.
Area of Midship Section	890 sq. ft.
Number of Transverse Bulkheads	
ENGINES.	
Two pairs, each pair driving one Screw.	
Diameter of Steam Cylinder	72 inches.
Stroke of Piston	45 "
Surface Condensers, area	12,560 sq. ft.
SCREWS.	
Diameter	feet
Pitch	27 "
Number of Blades	3
BOILERS.	
Ten in number; Ordinary Horizontal Fire Tubular Type.	
Total Heating Surface	28,000 sq. ft
Grate Surface	876 "

This vessel was intended to be completed for the State of New Jersey as an Ironclad. The plans were prepared and the work was carried on under the direction of General GEORGE B. McCLELLAN, U. S. A. All materials, and the workmanship are guaranteed to be of the best possible description.
The funds appropriated for the purpose of completing the vessel not proving sufficient, the Legislature of the State of New Jersey has directed that a sale be made to the highest bidder. A Commission, consisting of *His Excellency Gov.* JOEL PARKER, of Trenton, *Vice-Chancellor* AMZI DODD, of Newark, *Honorable Messrs.* W. W. SHIPPEN, and S. B. DOD, of Hoboken, has been appointed to effect such sale.
Bids endorsed "PROPOSALS FOR THE PURCHASE OF IRON STEAMER, OR OF PARTS THEREOF," may be addressed to the GOVERNOR OF THE STATE OF NEW JERSEY, by whom they will be received at Trenton, N. J., until 12 o'clock, M., on the second day of November next, at which time they will be publicly opened.
Blanks for proposals, and a pamphlet containing a detailed description of the vessel, as nearly completed, except as to armor and armament, may be obtained by addressing either member of the Commission or the undersigned.
Permission to examine the vessel, and to inspect the premises, may be obtained (by intending purchasers) on application at the Dry Dock, where the ship now lies, or to the Consulting Engineer to the Commission, who will be prepared to exhibit drawings, to explain the structure of hull and machinery, and to give any other information respecting the vessel.

R. H. THURSTON,
Consulting Engineer to the Commission
Hoboken, New Jersey,
United States of America.

5000 AGENTS WANTED. Samples sent free by mail. Two new articles, saleable as flour. Address N. H. WHITE, Newark, New Jersey.

WE MAKE TO ORDER IRON AND STEEL DROP FORGINGS of every description. R. A. BELDEN & CO., Danbury, Conn.

$77 A WEEK to Male and Female Agents, in their locality. Costs NOTHING to try it. Particulars FREE. P. O. VICKERY & CO., Augusta, Me.

FIRST CLASS STATIONARY ENGINES, all sizes—Cast Steel Cylinders, Rods and Straps. Finest Vertical and Portable Engines, 3 to 25 H.P. Address BLOOMINGTON IRON WORKS, Bloomington, Ill

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.

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

PORTABLE STEAM ENGINES, COMBINING the maximum of efficiency, durability and economy, with the minimum of weight and price. They are widely and favorably known, more than 1,000 being in use. All warranted satisfactory or no sale. Descriptive circulars sent on application. Address THE J. C. HOADLEY CO. Lawrence, Mass.

IRON BRIDGES—CLARKE, REEVES & CO., PHOENIXVILLE BRIDGE WORKS. Office, 410 Walnut Street, Philadelphia, Pa. Specialties—Accurate Workmanship—Phoenix 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.

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

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

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

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

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

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.

Small Tools of all kinds; also GEAR WHEELS, parts of MODELS, and materials of all kinds. Castings of Small Lathes, Engines, Slide Rests, &c. Catalogues free. GOODNOW & WIGHTMAN, 23 Cornhill, Boston, Mass.

BANKRUPT'S SALE OF HORIZONTAL and Vertical Steam Engines. Also, new and second hand Machinist's Tools. Send for circulars at THE YALE IRON WORKS, New Haven, Conn.

SHINGLE & BARREL MACHINERY
EVART'S IMP. HEADING AND SHINGLE SAW, STAVE CUTTERS, JOINTERS, EQUALIZERS, AND HEADING TURNERS. BAILEY GAUGE LATHE—For turning all kinds handles and Cabinet work. Simplest and best in use. We manufacture a full line of Wood and Iron Working Machinery, Steam Engines, &c. Address T. R. BAILEY & VAIL, Lockport, N. Y.

A Set of 12 Steel Lathe Dogs,

From ⅜ to 4 inch	$17.80
" ⅜ to 2 "	$ 8.00
Iron, from ⅜ to 2 inch	$ 6.50
" " " to 4 "	$15.00
1 Set of Steel Clamps	$12.50
" " Iron "	$10.00

Expanding Mandrels taking anything from ¼ to 4 inches, &c.
Send to C. W. LE COUNT, South Norwalk, Conn. for Circular.

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., 263 Broadway, New York. Makers of the celebrated Tom Thumb and Miniature Telegraph Instruments.

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; ¾, 69.64; ⅞, 78.78; ⅞, 82.53; ⅞, 82.90. Per cent. of Whole Gate: 83.14.
A full report may be obtained of STOUT, MILLS & TEMPLE, Dayton, Ohio.

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

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

E. M. MAYO'S PAT. BOLT CUTTER. ☞ Send for Illustrated Circular, Cincinnati, Ohio.

Andrew's Patents.
Noiseless, Friction Grooved, or Geared Hoisters, suited to every want.
Safety Store Elevators. Prevent Accident, 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.

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

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

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.

A CHEAP MUCILAGE, for Pasting Labels and U.S. Revenue Stamps on Beer Barrels, Segars, Tobacco, &c., for Trunks, Bookbinders and tin cans for paints and preserving in all quantities, for sale by L. FEUCHTWANGER & CO., 180 Fulton St., New York.

HUSSEY'S NATIONAL
Cottage Architecture.
New and Original Designs, Working Scale Drawings, and Details for all Styles of low-priced Houses, with Specifications and Cost. *Just Published.* Royal quarto. Post-paid, $6.

WOODWARD'S NATIONAL ARCHITECT } 1,000 WORKING DRAWINGS Plans, Details, Specifications & Estimates TWELVE DOLLARS, post-paid.
MONCKTON'S NATIONAL STAIR-BUILDER. } Six Dollars, post paid.
MONCKTON'S NATIONAL CARPENTER & JOINER. } Six Dollars, post paid.
ORANGE JUDD CO., 245 Broadway, N.Y

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

FOR SALE—TWO VALUABLE INVENTIONS, Cheap Address J. B., No. 7 N. Ford St., Rochester, N.Y.

ANOTHER CHANCE
Fifth and Last Gift Concert
IN AID OF THE
Public Library of Kentucky
POSTPONED TO
November 30, 1874
DRAWING CERTAIN AT THAT DATE.

LIST OF GIFTS.

One Grand Cash Gift		$250,000
One Grand Cash Gift		100,000
One Grand Cash Gift		75,000
One Grand Cash Gift		50,000
One Grand Cash Gift		25,000
5 Cash Gifts,	$20,000 each	100,000
10 Cash Gifts,	14,000 each	140,000
15 Cash Gifts,	10,000 each	150,000
20 Cash Gifts,	5,000 each	100,000
25 Cash Gifts,	4,000 each	100,000
30 Cash Gifts,	3,000 each	90,000
50 Cash Gifts,	2,000 each	100,000
100 Cash Gifts,	1,000 each	100,000
240 Cash Gifts,	500 each	120,000
500 Cash Gifts,	100 each	50,000
19,000 Cash Gifts,	50 each	950,000
Grand Total, 20,000 Gifts, all cash,		2,500,000

PRICE OF TICKETS.

Whole Tickets	$50 00
Halves	25 00
Tenths, or each Coupon	5 00
11 Whole Tickets for	500 00
22 1-2 Tickets for	1,000 00

For Tickets or information, Address
THO. E. BRAMLETTE, Agent and Manager.
Public Library Building, Louisville, Ky or THOMAS H. HAYS & CO. 609 Broadway, N.Y.

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.

R. BALL & CO.,

WOOD WORKING MACHINERY
For Planing Mills, Car Shops, Sash, Blind and Door Makers, &c., &c. Send for Illustrated Catalogue and price list. Factory, at Worcester, Mass. Salesroom, at 121 Chambers & 103 Reade Sts., New York

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

Advertisements.

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

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

THE
Pants' Stretcher
(OVER 20,000 IN USE).

A new and simple device for taking out knee forms and wrinkles from pantaloons. Every gentleman, with this article, can always have his pants smoothly pressed and in proper shape. No trouble, convenient, satisfactory, and neat. Liberal discount allowed to the trade. Great inducements to Agents. Circulars free. Enclose $2 for sample.
P. DEL VALLE HALSEY, 122 Church St., New York.

PRATT'S ASTRAL OIL.
Safest and best Oil ever made—burns in any lamp—for sale everywhere. CHAS. PRATT & CO. Established 1770. 108 Fulton street, N. Y.

EVERY VARIETY STEAM PUMPS. SEND FOR ILLUSTRATED CATALOGUE COPE & MAXWELL MFG. CO. HAMILTON, OHIO.

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* Mechanics' Tools and Light Machinery, Buffalo, N. Y.

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.

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.

The Chilean Exposition
THE NEW YORK COMMISSION for this Exposition calls especial attention to the fact that articles will be received at Santiago till August 25, 1875, but that *applications for space must leave here by December 1st, 1874*. In all matters pertaining to railroads and machinery generally, parties, desiring more definite information, are referred to Mr. W. W. Evans, 63 Pine St., Inspecting Engineer for the Government of Chile; in matters of shipping and our Commercial relations with Chile, to the well known Merchants Ribon and Muñoz, 52 Pine Street, Fabbri and Chauncey, 48 South Street, L. del Monte, 50 Exchange Place, C. Carranza, 25 William Street, or J. B. Casablanca, 45 Beaver Street; in patent and other laws, institutions and general information of and about Chile, to Mr. A. Villarroel, 52 Pine Street, Secretary of this Commission and Corresponding Agent of Chile, who will furnish blank forms of applications, pamphlets, etc.
STEPHEN ROGERS, Consul for Chile in New York, and President of the Commission.

PATENTS
The publishers of the SCIENTIFIC AMERICAN have acted as solicitors of patents in the United States and foreign countries for more than a quarter of a century. More than FIFTY THOUSAND inventors have availed themselves of their services. All patents secured through this agency receive a special notice in the SCIENTIFIC AMERICAN, which frequently attracts purchasers for the patent.

Inventions examined, and advice as to patentability free. Patents obtained in the best manner, and with as little delay as possible.

Caveats prepared from either model or drawings, and filed in the Patent Office at short notice.

Special examinations as to the patentability of inventions made, at the Patent Office, on receipt of model or drawing and description; cost for this search and report, $5.

Trade Marks.—The necessary papers for securing protection to manufacturers and merchants in this country and abroad are prepared at this office.

Design Patents, for protecting artists and designers of any new ornamental work, are quickly and cheaply obtained through this office.

Copyrights obtained.

Foreign Patents are solicited in all countries where patent laws exist. Pamphlets, containing the cost and full particulars, mailed on application.

Canada Patents.—Canada is one of the best countries for patents. The cost depends upon the length of time for which a patent is desired. Full particulars by mail on application.

We shall be happy to confer with inventors, examine their models and drawings, and advise with them as to obtaining patents without consultation fee. Every kind of information pertaining to patents, at home or abroad cheerfully given.

Send for pamphlet, 110 pages, containing laws and full directions for obtaining patents. Address
MUNN & CO., Publishers SCIENTIFIC AMERICAN, 37 Park Row, N. Y.
BRANCH OFFICE—Corner F and 7th Streets, Washington, D. C.

TANNATE OF SODA,
BOILER SCALE PREVENTIVE—Jos. G. ROGERS & Co., Madison, Ind. *Agencies*: R. H. Lee, Titusville, Pa.; Owens, Lane & Dyer Machine Co., St. Louis, Mo.; Whitman & Burrell, Little Falls, N. Y.; Warden, McLelland & Co., Cincinnati, O.; H. H. Harrison, Nashville, Tenn.; Stinzich, Rankin & Co., Evansville, Ind.; H. Dudley Coleman, New Orleans, La.

SUPER-HEATERS
Save fuel, and supply DRY steam. Attached to boilers or set in separate furnace. 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.

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

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.

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.

S ☞ EMERSONS PATENT PLANER SAWS ARE SUPERSEDING ALL OTHERS. *SEND FOR ONE TOOTH FREE.*
A ☞ EMERSONS PATENT CLIPPER SAWS EXPRESSLY FOR VERY HEAVY FEED AND HARD TIMBER.
W ☞ EMERSONS PATENT FLANGE TOOTHED SAWS. SAME PRICE OF SOLID SAWS.
S ☞ EMERSONS PATENT UNIVERSAL AND ADJUSTABLE SAW SWAGE. SENT PREPAID ON RECEIPT OF PRICE $5.00.
N.B. *SEND POSTAL CARD FOR CIRCULAR AND PRICE LIST TO* EMERSON, FORD & CO. BEAVER FALLS, PA.
PLANER SAW TOOTH 3 CENTS EACH

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

THE TANITE COMPANY
Emery Wheels TANITE 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.

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

MACHINIST'S TOOLS,
EXTRA HEAVY AND IMPROVED PATTERNS.
LUCIUS W. POND, MANUFACTURER, Worcester, Mass.
WAREROOMS, 98 LIBERTY ST., N. Y.
☞ *Lathes, Planers, Boring Mills, Drills and Gear Cutters a Specialty.*

BOGARDUS' PATENT UNIVERSAL ECCENTRIC MILLS—For grinding Bones, Ores, Sand, Old Crucibles, Fire Clay, Guanos, Oil Cake, Feed, Corn, Corn and Cob, Tobacco, Snuff, Sugar, Salts, Roots, Spices, Coffee, Cocoa-nut, Flax seed, Asbestos, &c., and whatever cannot be ground by other mills. Also, for Paints, Printers' Inks, Paste Blacking, &c. JOHN W. THOMSON, successor to JAMES BOGARDUS, corner of White and Elm Sts., New York.

Rifles, Shot Guns, Revolvers
of every kind. Send stamp for Illustrated Price List to Great Western GUN WORKS, Pittsburgh, Pa.

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.

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

A NEW METHOD PHOTO ENGRAVING CO. RELIEF PLATES for Newspaper, Book & Catalogue Illustrations at prices much less than Wood Cuts. 62 COURTLANDT ST. NEW YORK.
Send Stamp for Illustrated Circular.
The "Scientific American" uses our plates.

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

OUR COVERING FOR BOILERS AND PIPES saves Twenty per Cent in Fuel.
OUR FELT, CEMENT, AND PAINT FOR ROOFS is the best in the market.
Asbestos Felting Co. 316—322 Front St., N. Y.

THE HEALD & SISCO
Patent Centrifugal Pumps,
VERTICAL & HORIZONTAL.
First Premiums at New Orleans, Cincinnati, and New York. "*Medal of Special Award*," American Institute, 1872.
Perfect satisfaction guaranteed. The cheapest, most durable, popular and successful Pump known, for Paper Makers, Tanners, Contractors, Brick Makers, Distillers, etc. Pumps with engine on frame, complete, at low figures, for Wrecking, Dredging, Irrigating, etc. Illustrated pamphlet, free. 800 references to parties actually using the Pump. 24 pages of the strongest possible testimony. Address HEALD, SISCO & CO., Baldwinsville, N. Y.

New York, 30 Gold St. Boston, 13 & 15 Custom House St. Chicago, 146 Lake St.
HUSSEY, WELLS & CO.,
OFFICE AND WORKS, PENN AVENUE & 17TH ST., PITTSBURGH, PA.,
Manufacturers of all descriptions of
CAST STEEL,
including the "Granite" brand for Edge Tools. Particular attention given to the manufacture of Cast Steel Teeth of any pattern for Horse Rakes, for which orders are solicited. All Rake Teeth will be manufactured under the Simonds and Ferson Patents, recently purchased, by which process perfect uniformity of shape and superior excellence of temper are attained.

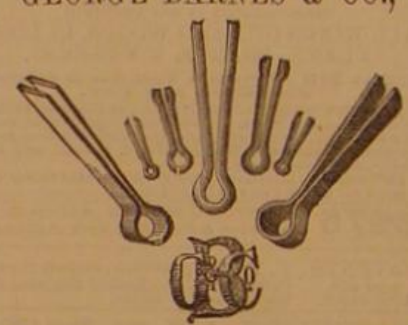
HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. P't. J. M. ALLEN, Pres't. J. B. PIERCE, Sec.
HARTFORD CONN.

BUY A SWAIN. The Most Powerful, and the Only Tight Shutting, Good Part Gate Turbine ever made. Prices of small wheels to suit the times. Send address to A. M. SWAIN, *North Chelmsford, Mass.*

AMERICAN SAW CO.
TRENTON, N. J.
GREAT REDUCTION IN PRICES OF MOVABLE-TOOTHED CIRCULAR SAWS.
JULY 1st, 1874.
☞ Send for new Price List.

THE CELEBRATED DIAMOND SOLID EMERY WHEEL, Pat. Emery Wheel Machinery and Automatic Knife Grinders, for the rapid and perfect grinding of Planer, Paper Cutter, and Leather Splitting Knives, manufactured by the AMERICAN TWIST DRILL CO., Woonsocket, R. I. N. Y. Office, 17 New Church St., W. S. JARBOE, Agent.

GEORGE BARNES & CO.,



Manufacturers, Syracuse, N. Y.

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

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

GREATEST INVENTION of the AGE.
ELECTRIC & VAPOR CHAIR.
See engraving and description in the "Scientific American" of March 7. The greatest known cure for rheumatism and sciatica. No physician should be without one. Send for circular.
C. R. TOWNSEND, SOLE AGENT, Medical Institute, 168 Cumberland St., Brooklyn, N. Y.

FOR SALE—2nd hand Portable and Stationary Engines and Boilers, good as new, at half of Original Cost. For description, address BINGHAM & RICH, Oil City, Pa.

HOISTING Machinery, Crane Bros. Mfg. Co., CHICAGO.

BABBITT METALS "THE BEST." *CONARD & MURRAY*, 30th & Chestnut, Philadelphia, Pa.

KEYSTONE PATENT FORGES (FAN BLAST.) Large or Small, Portable or Stationary, for Hand or Power. Best and Cheapest for every class of work. Keystone Portable Forge Co., Philadelphia.
H. S. MANNING & CO., Agents, 111 Liberty St., N. Y.

BESSEMER Steel Wire Ropes
IMPORTED TO ORDER.
One third Stronger than Iron.
PHILIP S. JUSTICE, 14 N. 5th, Philadelphia—42 Cliff, New York.

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

In the test at Holyoke, in 1873, 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.

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

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.

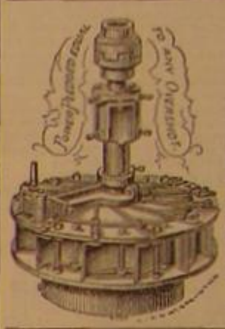
MANGANESE OF HIGH GRADE—Crystallized, lump, powder, and granulated for Varnish, Linseed Oil, Steel, Glass Makers and Chemists, at low prices, by L. FEUCHTWANGER, 180 Fulton St., N. Y.

Engines and Boilers,

SPECIAL PRICES ON BOILERS TO Engine Builders.
Stationary and Portable, to 60 H. P., kept in Stock; also, Circular Saw Mills and Power Hammers. ERIE CITY IRON WORKS, Erie, Pa.

Asbestos Materials.
ASBESTOS ROOFING, PAINTS, CEMENTS, ROOF COATING, SHEATHING, &c. H. W. JOHNS, 87 MAIDEN LANE, N. Y., Patentee & Sole Manufacturer. Established 1858.

TURBINE
Water Wheels.



More than four times as many of James Leffel's Improved Double Turbine Water Wheels in operation than any other kind. 24 sizes made, ranging from 5½ to 96 inches diameter, under heads from 1 to 240 feet. Successful for every purpose. Large new pamphlet, the finest ever published, containing 160 pages and over 30 fine illustrations, sent free to parties interested in water power.
JAMES LEFFEL & CO., Springfield, Ohio, & 109 Liberty St., New York city.

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

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.

JIG SAWS, by the gross or dozen, made to order, by A. COATS, 108 Hester St., N. Y. Send for a dozen.

PROSPECTUS
OF THE
SCIENTIFIC AMERICAN. FOR 1875.
THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.

THIRTIETH YEAR.

VOLUME XXXII.—NEW SERIES.
The publishers of the SCIENTIFIC AMERICAN beg to announce that on the first day of January, 1875, a new volume commences. It will continue to be the aim of the publishers to render the contents of the new volume more attractive and useful than any of its predecessors.

It is the Most Popular Paper in the World!

having the large circulation of nearly 50,000 per week!

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.

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.

By the new law, the postage must be paid in advance in New York, by the publishers; and the subscriber then receives the paper by mail free of charge.

TERMS.

One copy, one year (postage included)	$3.20
One copy, six months (postage included)......	1.60
One copy, three months (postage included)....	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.....	5.50

Remit by postal order, draft or express.

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.