SCIENTIFIC AMERICAN

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

Vol. XXVIII.--No. 22. [NEW SERIES.] | NEW YORK, MAY 31, 1873. | [$3 per Annum, IN ADVANCE.

GRAIN BINDER ATTACHMENT TO HARVESTERS.

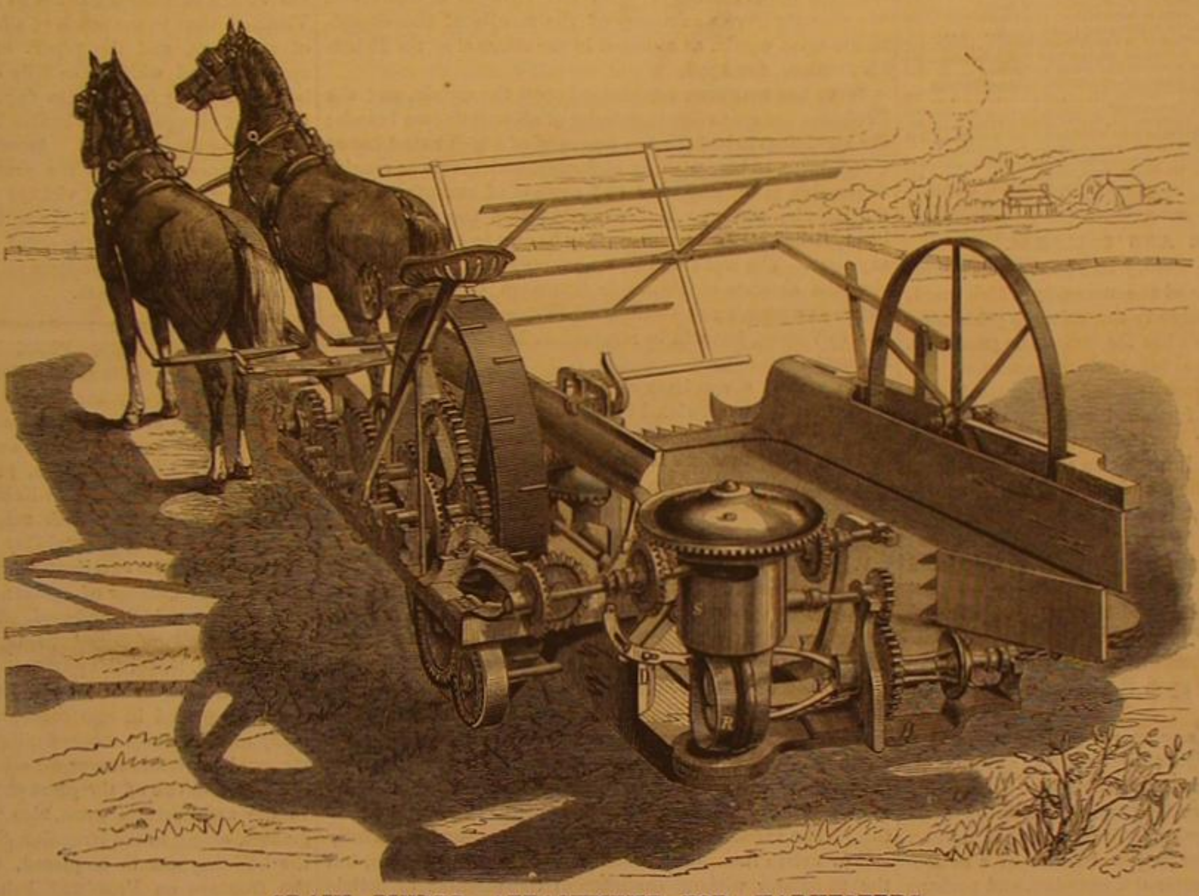
We present, in the accompanying illustrations, a new attachment for binding grain on the harvester, immediately after it has been cut, which, it is claimed, operates without any more attention than is necessary to throw the twisting and binding mechanism into or out of gear. The sheaf is held in jaws until a band is twisted from a portion of its straw, then it is turned, rotated, and the band wound around it, secured, and finally the finished bundle is released from the machine.

Fig. 1 is a perspective view, showing more particularly the devices for holding and manipulating the sheaf. Fig. 2 represents the band gatherer and twister, and Fig. 3 a section of the bundle with the straw rope partially around it. The rake is arranged on the endless chain, A, operated by means of the gearing at H, Fig. 2, in the platform of the harvester. The latter rests on drawing wheels and has suitable cutter and finger bars, with mechanism for operating and adjusting the same. The sickle is placed at B, Fig. 2.

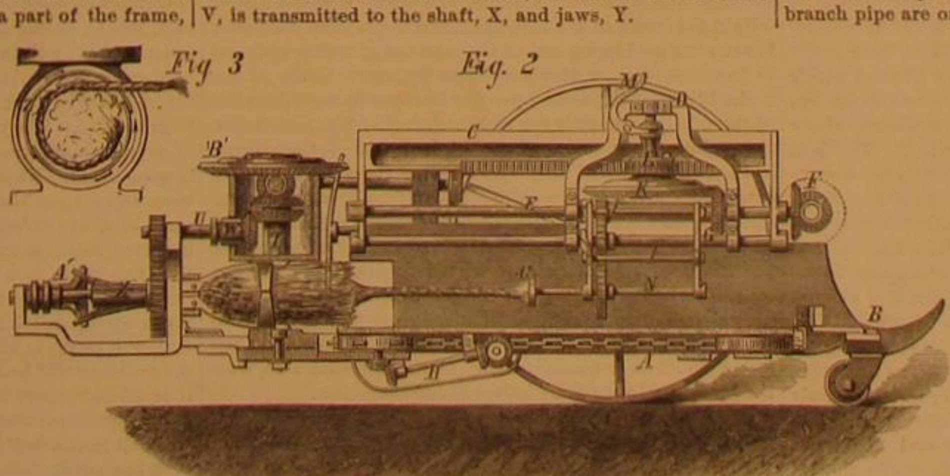
In describing the essential portions of this invention, we shall first refer to the twister, depicted in our second figure. On the ends of the rake platform is supported a longitudinal, horizontal frame, C, for the purpose of holding and guiding a sliding carriage, D. A horizontal shaft, E, is hung lengthwise in this frame and connected by the gearing, F, with the driving mechanism. G is a bevel pinion, which, while fitted upon the shaft, E, so as to slide freely thereon, is connected so as to revolve with it by means of a groove and feather. Between the pendent arms of the carriage, which are fitted over the shaft, E, there is arranged upon the latter, besides the pinion, G, above referred to, a frame, I, and between the parts of this frame another pinion, J, which, with regard to the shaft, E, is connected in the same manner as the first mentioned pinion. The pinion, G, meshes into the teeth of a bevel gear wheel, K, mounted upon a vertical shaft that hangs in the carriage. Loose upon this shaft is a pinion, L, which engages with the teeth of the horizontal rack shown, as constituting a part of the frame, C. Whenever, by means of the clutch, M, the pinion, L, is thrown into gear it will, by its connection with the shaft, E, be revolved and roll on the rack, imparting longitudinal motion to the carriage. In place of this arrangement of rack and pinion, the inventor states that an endless chain may be substituted, thus accomplishing the same object with less working parts. The pinion, J, by the intermediate gearing represented, actuates a horizontal shaft, N, hung in the frame, I, the rear end of which, O, carries a series of hooks or other projections for twisting the straw. The frame, I, is either suspended directly from and hangs with the shaft, N, beneath the shaft, E, or it may be swung to one side by a suitably arranged lever fitting against a rail in the frame, C. By means of a clutch, at P, Fig. 1, which connects with the system of gearing, F, the above described apparatus may be readily thrown into or out of use.

To the rear end of the rear platform, Fig. 1, and about in line with the frame, C, is pivoted a horizontal plate, Q, which is the bed for the sheaf holder. This plate, for purposes to be described, can be swung in a longitudinal direction, as in Fig. 2, or laterally, as in Fig. 1. Above the pivot, and affixed to the plate, is a vertical ring, R, above which again is the turret, S, surrounding an upright shaft, T, Fig. 2, which is in line with the pivot, and which supports two horizontal bevel wheels, as shown. The lower bevel wheel engages with a similar wheel which is on a horizontal shaft, U, which has its bearings in the plate, Q. The upper bevel wheel meshes into another mounted on a horizontal shaft, V, Fig. 1, hanging in the frame of the harvester proper. By means of the clutch, at W, the wheel on the shaft, U, is thrown into or out of gear. X is another shaft connected with the shaft, U, by the vertical gearing shown, which is in line with the center of the ring, R, and holds a pair of jaws, Y Y, which extend within the ring, holding curved clasps, Z, Fig. 3, within the same. On the shanks of these jaws is fitted a slide, A', Fig. 2, by means of which they can be opened or closed at will. On the upper part of the turret is shown a large bevel wheel, B', with which the wheels, C', on the shaft, V, engage whenever the turret, and with it the plate, Q, is to be turned. When the wheels, C', are not in gear, but the shaft, V, is rotated by suitable connection with the main driving gear of the harvester, and the lower bevel wheels on the upright shaft within the turret is in action, the motion of the shaft, V, is transmitted to the shaft, X, and jaws, Y.

The above details being understood, the operation of the machine is readily followed. Grain enough for one sheaf is, by the rake on the chain, A, swept into the cradle while the same is in line with the frame, C, so that the straw will be held in the jaws, Fig. 2. Then the carriage, D, is thrown into action by the clutch, at P, so that it will move forward on the rack; but before so moving the pendent frame, I, hanging straight down, has the hooked end of its shaft, N, inserted in the butt end of the sheaf and revolved. As the carriage is moved ahead, the twisters continue to revolve and draw straw from the center of the sheaf, twisting the same into a band, as represented in Fig. 2. When the carriage has traveled far enough to form a rope of requisite length, the clutch, M, strikes a suitable stop, and is thrown out of gear to release the pinion, L, and arrest the longitudinal motion of the carriage. The wheels, C', are now thrown into gear with the wheel, B', so as to turn the turret and with it the plate, Q, and entire cradle at right angles to the frame, C, as in Fig. 1. The pendent frame, I, is then, by suitable mechanism, swung outward into position, and so supported, by a lever before mentioned, that the shaft, N, holding the band, is thereby thrown higher and in proper line with the middle of the sheaf. The clutch, W, is next moved to throw the shafts, U and X, into gear and have them revolved. Thereby the sheaf is rotated in the direction of the arrow, Fig. 3, winding the band around it and pulling at the same time the carriage, D, back. The end of the band is then tucked under by the tucker, D', Fig. 1, which consists in a slotted plate connected with a lever and arranged in the position shown. When the lever is swung, the end of the tucker, forming a claw for embracing the band, is carried down and ahead, and thus operated. The slide, A', is next moved to open the jaws and discharge the sheaf, the cradle is swung round into line with the frame, C, to receive grain for another sheaf, and the lever holding the shaft, N, outwards, is tripped so as to allow the pendent frame, I, to come in line with the center of the cradle for forming another band.



GRAIN BINDER ATTACHMENT FOR HARVESTERS.



Patented through the Scientific American Patent Agency, May 30, 1871. For further particulars address the inventor, Mr. Charles G. Dickinson, Poughkeepsie, N. Y.

New Watering Cart.

A new watering cart, or van, has lately been put in operation in London. It consists of an iron tank, 7 feet 3 inches long, 4 feet 6 inches wide, and 2 feet 6 inches deep, which holds 450 gallons of water. The tank is mounted on springs and carried on four wheels with light hinged shafts, and the whole of it is painted in bright colors. The distributor and branch pipe are on the improved principle, which admits of the outflow of water being regulated to meet the varying conditions of streets and weather. An interesting competitive trial has taken place in Regent street between this machine and the old watering cart. The pair were filled, and started from a stand post by Hanover church, and the object was to ascertain the area of ground the water from each would cover. The two vehicles proceeded on their way towards the Regent circus till they reached Newman's yard, where the cart, having made all the running it was capable of, "compounded," while the van, "still going well within itself," proceeded as far as the circus, and returned up Regent street to Air street, where it finally gave out. The width of spread of the water from the van was twenty-three feet, that of the water from the cart being sixteen feet. By measurement of the plans at the Vestry Hall after the trial, it was ascertained that the van had traveled 2,640 feet, and had spread its water over an area of 60,720 square feet, while the cart had traveled only 1,440 feet, and had covered only 23,040 square feet. The older machine has thus been signally defeated by its youthful rival.

According to Dr. Wallace, of Glasgow, the mortar used in the construction of the great pyramids of Egypt was composed chiefly of plaster of Paris—hydrated sulphate of lime

Scientific American.

MUNN & CO., Editors and Proprietors

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK

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

TERMS.

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

VOL. XXVIII., No. 22. [NEW SERIES.] *Twenty eighth Year.*

NEW YORK, SATURDAY, MAY 31, 1873.

Contents.

(Illustrated articles are marked with an asterisk.)

MINING SCHOOLS AND COLLEGES.

In view of the vast and apparently inexhaustible mineral wealth of the United States, and the necessity which manifestly exists for wider knowledge in the sciences pertaining to its exploitation, the question has for some time past been under discussion whether the future development of our mines would be materially promoted and the great industries which are based thereon furthered by the establishment of a national school, under government auspices, which should form a nucleus for all information relating to mining pursuits, and thus afford to the student an education which, for practical value and extent, could not be gained in smaller and less favored institutions. The project is one which has met with much approval from a large class who, convinced that the inculcation of sound principles relating to the profession of the mining engineer could be best thus effected and that the present tendency toward wasteful and reckless systems of mining could be thus in a measure averted, have strenuously urged the matter upon the consideration of the general government.

While admitting that such a scheme, based on so broad a foundation, is by no means destitute of material advantages, it nevertheless appears to us more probable that the benefits sought can be attained with greater surety through the establishment, in preference, of local schools of a similar nature. It cannot be doubted that the proper situation of a national institution would form a matter of discussion, and perhaps remain always a mooted point: one, indeed, which would inevitably give rise to sectional dissension between the advocates of the coal pits and the gold mines, the Atlantic and the Pacific slopes.

This, however, aside, it is questionable whether a single institution, necessarily widely separated from the majority of its points of advice, would be able to receive, ordinate and apply information gathered over so large and diverse an area with that efficiency which could be secured in smaller colleges located directly upon the field. Clearly, we think, the latter would in this particular have as decided an advantage as the present numerous local weather stations would possess over a single central bureau for the study of meteorology. The nature and situation of our mines, their mode of exploitation, and the treatment of their several yields widely differ. In varying localities, even where ores are extracted for the same metal, it is more advantageous to study the work in the place where it is to be practised. The best method for obtaining silver from a Nevada ore is not always the most efficacious for one of Colorado; the graduate of one of our eastern mining schools, bristling with theories and crammed with book knowledge, too often finds that he has much to unlearn when he begins his actual experience in the West, and, to him at least, the fact is sufficiently evident that many hours of fruitless toil might have been saved had he acquired the theory of his profession while studying its practical workings. The Royal Schools of Mines at Berlin, at Freiburg in Saxony, and at Clausthal in Prussia, certainly produce men of high culture, but only the latter two graduate really practical miners, metallurgists and engineers. Practice alone degenerates into empiricism, while theory, pure and simple, singly is helpless; hence it is in the combination of the two that the most useful knowledge is to be gained. This learning, through territorial schools, maintained not by national but by state funds, should, we believe, be first acquired. Each institution could then pursue untrammeled that course of study best adapted to its geographical and geological position, transmitting the results of its observations to a central national bureau, for statistical reference and comparison with those of others; while the student desiring to follow any particular branch of mining could select the seminary best situated for the imparting of the instruction required.

These and other considerations have been suggested to us by learning of the foundation of a school of mines at about a mile from Golden City, at the base of the Rocky Mountains (latitude 39°40'), in Colorado Territory. Professor E. J. Mallett, of this institution, whose experience we may here remark leads him to the adoption of views substantially the same as those above advanced, informs us that its site presents every facility for the practical training of the mining engineer. The university, of which this school is an integral portion, comprises three fine buildings; two of which are devoted to theology and the classics and the third is exclusively set apart as an academy of the physical sciences. Being less than a mile from the terminus of the high grade railway, the principal mines and metallurgical works of the territory are within easy communication of the students, thus affording especial advantages for study in the field.

We trust that this institution will be the precursor of many others of its class in every mining district, as we believe that the establishment of such colleges cannot but tend, through the acquirement and dissemination of valuable knowledge, largely to increase the wealth and material prosperity of the nation.

EXPERIMENTS ON THE STRENGTH OF MATERIALS.

Valuable results are anticipated from a series of experiments undertaken by Professor Thurston, at the Stevens Institute of Technology, upon the strength of materials. We recently gave a summary of the results of the experiments upon woods, as reported in the *Journal of the Franklin Institute*, for April.

Work has now been commenced upon the metals, and the Professor desires to obtain samples of all well known brands; the specimens to be 3¾ inches long, and of 1 inch round bar or ¾ and ⅞ square bar, with, in each case, statements as concise as possible of the ores used and method of manufacture of the sample, with the understanding that the results may be published. The specimens may be sent to the Institute at any time. The work will be interrupted May 24th, and during the absence of Professor Thurston to attend to his duties as a member of the United States scientific commission to Vienna, but will be resumed on his return in September next.

We noticed a specimen of Ulster iron taken from open market, which had twisted to the limit of the machine, over 200°, without breaking off. The specimens are turned down in the middle, the neck being 1 inch long and ⅝ inch diameter, by Whitworth gages.

RIGHTS OF PURCHASERS OF PATENTED ARTICLES.

We published last week the decision lately rendered by Judge Sawyer, of California, in the case of McKay vs. Wooster. Those who are in possession of an exclusive state, county or other territorial right to make, sell and use a patented machine or patented article, of any description whatsoever, will be interested in learning that it is now settled by the decision of more than one United States circuit judge that the purchaser of such a machine or article within the territory of one exclusive licensee may sell or use it within the territory of any other exclusive licensee without liability to an action for infringement. It amounts in a nutshell to this: The exclusive licensee for one county cannot lawfully sell or use in the county of another exclusive licensee, but the purchaser without condition of the machine or article from such licensee can lawfully use or sell it in the territory of the other licensee.

With the present construction of the statute, exclusive licensees may take undue advantage of each other. It would be wise, therefore, in many cases to seek, through the grantors of territorial rights, the placing of restrictions on those working adjoining territory, so that neither licensee would sell to parties whose only intention at time of purchase was to resell or use in the territory of the other.

The decisions so far made on the point proceed on the ground that, the machine or article having passed to the hands of the purchaser without condition, it is no longer within the limits of the monopoly, and hence such purchaser is not restricted in the use of the machine or article either as to duration of time or place. The Supreme Court of the United States has passed upon the lawfulness as to duration of time, in determining the rights of users of patented machines for any extension of the original term of the patent, but not as to place of use. No case has there been decided involving the question whether the purchaser without condition, from a licensee restricted as to place in making, using, and selling, may lawfully use or sell the patented articles so purchased outside of such restricted territory. It is, however, foreshadowed, by those cases which involved the right of purchasers to continue lawfully to use through any extended term of a patent, that the decision of the court of last resort would be in the affirmative on this question also, were the precise point to come before them for review.

THE NEW PHILADELPHIA STEAMSHIPS.

Under the heading of the "Loss of the Steamer Atlantic," we recently printed a *resumé* of the views of several correspondents regarding the construction of sea going vessels, and among others the opinion of one writer signed "A Riveter," in reference to alleged serious faults in the building of the ships of the new American line lately established between Philadelphia and Liverpool. Since the date of the issue containing the above, we have received a communication from Mr. B. H. Bartol, an officer of the company owning these steamers, in which the strictures of our correspondent are explicitly contradicted. We are informed that the vessels have been superintended from the keel upward by an experienced engineer from the Clyde, that $2,500,000 is invested in the enterprise, and that the confidence of the proprietors in the construction of their ships is such that the usual precaution of insurance is deemed unnecessary.

We take pleasure in making this correction, as the statements of our correspondent, doubtless honestly based on a misapprehension of facts, were such as to engender a feeling of public regret that so laudable an endeavor toward the re-establishment of our commercial prosperity should have its inception under such unfavorable auspices. The pioneer vessel of the line, the Pennsylvania, we notice, has recently accomplished quite an extended trial trip, satisfactorily proving her capability and efficiency for transatlantic service.

THE VIENNA EXPOSITION---APPOINTMENT OF A NEW COMMISSIONER.

Jackson S. Schultz, Esq., of New York, an energetic, talented and distinguished merchant, has been appointed United States Commissioner at Vienna, in place of Van Buren, removed. Commissioner Schultz is a gentleman of real ability, and under his auspices the American department will doubtless assume as creditable an appearance as is possible under the circumstances. He is authorized to restore those of the suspended commissioners who were not connected with the disgraceful schemes of corruption.

The New York *Sun* says that, if reports are to be credited, the Vienna exhibition has not so far proved successful. The Viennese were in too much of a hurry to empty the pockets of strangers, and the report of their exorbitant charges spread far and wide. The bills of fare at the hotels have been increasing from day to day, a dollar and a half being the latest charge for a tolerable breakfast, and twenty cents for getting boots blacked. Americans will be interested in the announcement that the proprietor of a hotel built expressly for transatlantic visitors openly avows his intention to get all his money back during the season of the exhibition. Extortion seems to be the order of the day in Vienna, and after all it may not have been all native corruption that infected our commissioners.

THE NEW YORK POST OFFICE.

In the number of its substantial and costly business structures, New York city has always been conspicuous, but the new post office and court house building, now being constructed in the southern portion of what has for years been known as the City Hall Park, promises to overshadow all buildings hitherto erected in New York, if not in the country, when considered with reference to its architectural beauty, its complete adaptability to the purposes for which it is designed, the excellent workmanship put on all its details, and the number of modern improvements which have been and are to be introduced. The Drexel building, at the corner of Wall and Broad streets, which has been just opened for business, is, for the purposes for which it was designed, one of the most beautiful structures in the country, but it could be placed in one corner of the new post office, and many of the arrangements for lighting, heating, ventilation, etc., which would answer for a building of such size, would be useless in one of the great extent of the larger building. In the architectural work, also, the difficulties were much greater, owing to the irregular shape of the land on which the building was to be placed, which is almost a triangle; the frontage on Broadway being 340 feet, looking down Broadway 130 feet, on Park Row 320 feet, and looking toward the City Hall 200 feet. The entire area covered is about one and one quarter acres, and this space, for the cellar, basement, and entrance floors, is unbroken by any interior walls, the supports for the upper stories consisting of 122 cast iron pillars for each (cellar, basement and entrance) floor. These pillars are 18 inches in diameter each, the iron being 2¼ inches thick. There will be four stories from the ground up, beside the high Mansard roof; the cornice will be 120 feet above the sidewalk at the lowest parts, and the front elevations will be considerably higher, according to the elevations of the design on the corners and in the middle of each façade, beside the domes on the northern and southern fronts, which will tower high above the main building.

In every detail of the building, all the latest contrivances for making the work substantial and of the best quality have been studied. The roof will be of copper, with two corrugations in each sheet to allow for expansion and contraction by heat and cold. Numerous substitutes, less expensive, have been urged upon the superintendent, but this was decided upon as most perfect and durable. Each window will have fireproof shutters made of a composition somewhat lighter than fire brick, and which has been tested up to a white heat without showing any change. These shutters will be taken up by cast iron boxes, built in the wall, into which they will be made to slide, and, considering that the rest of the building will be entirely of granite, iron, brick and glass it is tolerably safe to conclude that, isolated as it is from other structures and with granite walls of great thickness, we shall have a building which would be practically fireproof, even in a conflagration similar to those which so recently devastated Chicago and Boston.

In the thorough ventilation of so large a building, where so many are to be employed, and where a large proportion of the work is to be done by gas light, the difficulties presented are of no ordinary nature, and have never yet been entirely overcome in any of our large public edifices. It is believed, however, that the plan for effecting this object in the new post office will be the most perfect of any that has yet been contrived. It is on the principle of that first applied on a large scale in the north wing of the Treasury Department at Washington, under the direction of Supervising Architect A. B. Mullett, who is the architect of the new post office and general superintendent of all new public buildings. For the three lower floors, in which all the post office business will be transacted, there are four ventilating shafts, with an inside area of fifty feet each on the bottom. These shafts run from the cellar to a little above the roof, and in the center of each will be a smoke pipe from the furnaces, thus heating the air so as to make a constant upward current. At the bottom, these shafts are connected with what are called foul air chambers, into which run flues from all the rooms on the ground floor and below. These flues are made to run from openings at the bottom in the hollow cast iron pillars which support the whole interior of the building, so that, by the upward current which is created by the heat in the ventilating shaft, the foul air is drawn down from the bottom of each room to the foul air chambers and thence into the ventilating shafts. In addition to openings into the ventilating shafts, the rooms in the upper stories are provided with flues which terminate in ridge openings at the angle of the pitch of the Mansard roof and the center of the water shed. These openings have what are called pitch top covers, to make a draft, no matter in which direction the wind may be.

In cold weather, the rooms are to be heated by steam coils supplied from the exhaust steam furnished by the boilers which will supply power for the engines to run the elevators. Grave doubts are entertained whether sufficient preparation has thus far been made for properly heating the interior of this vast edifice, but this will be a want which can be easily supplied by additional boiler capacity in the cellar. The steam coils will be placed opposite each window, under which, in the panels, are openings, so that the air will be drawn fresh from the outside. The pipes, however, are protected by a kind of apron from the current of cold air, which is made to pass down and then rise through the heated coil into the room.

The floors, throughout the building, are all made with iron and brick arches. These arches have been built according to a method of Mr. W. G. Steinmetz, the superintending engineer, by the use of center hangers, which has lately become quite popular with builders. It does away with the necessity of building platforms, as formerly, is very simple, and the men can thus readily work on as many floors as desirable at the same time. In many of the arches in the building, where a flat ceiling is wanted, a large sized hollow brick is used, which is molded to make a perfect arch on the top and be level on the bottom. The same end can be attained by filling out under the arches, in the old way, but the work is not so durable. The cost is about the same in one way as in the other, but the hollow brick are lighter, so that the weight on the iron is not so great, and the ceiling is more certain to be dry.

There are to be four large elevators which will afford communication between the basement and top floors, and ten small elevators, of the telescopic style, worked by hydraulic pressure, from the basement to the entrance floor. The latter are to be simply platforms without carriages, for the convenience of the post office business, as the basement will be used for sorting letters and making up mails, the entire north end being devoted to printed matter. On the first floor will be the post office, receiving and money order departments, registering office, stamp and envelope bureaus, and the postmaster's, secretary's, cashier's and book-keepers' rooms. The second, third and fourth floors will be devoted to United States court rooms, examination rooms, etc.

It is difficult, without a personal visit, to obtain an adequate idea of the great amount of work and material which this building, when completed, will represent. The additional story which is now being added, before the Mansard roof is put on, involves no material change in the plan for the whole, although a portion of the cornice which had been placed will have to be taken down until the fourth story is completed. The granite used all comes from Maine, where six hundred men have been employed for many months in cutting and dressing it, so that no work of this kind is done on the ground. There have, thus far, been used 300,000 cubic feet of granite, 10,000 yards of concrete, 27,000 barrels of cement, 9,000,000 brick, and 5,500,000 pounds of iron; and the excavation previous to laying the foundation amounted to 100,000 cubic yards. It is impossible at present to say when the work will be completed, but as Congress at its last session appropriated $2,500,000 to carry on the building, it is now being energetically pushed forward, with a probability that the roof will be on during the present year. New York has waited long for a post office suited to its needs; but with the completion of this building, it will have such an one as befits the importance of the leading city on the continent.

MODERN PRINTING MACHINERY AND APPLIANCES.—HOW A DAILY NEWSPAPER IS MADE.

The use of types and the introduction of the power printing press marked the commencement of a series of improvements in the printing business, no one of which have, subsequently, created a distinctive era in the trade, but the combined results, as seen in the offices of one of our "great dailies," afford one of the most interesting, though not the least complicated, subjects for careful examination. The machines for casting type have worked a great saving to the type founder, and to make, by the old hand process, the great amount of type now used, would require almost as many hands in a type foundery as it takes to run a cotton mill; but, as in the case of the sewing machine, the demand seems to have been thus enlarged only with the increased facilities of production. Of type-setting machines, there have been a great many brought before the public, one or two of which have certainly possessed great merit, but, from one cause or another, they have not been generally adopted, and are not used at all in daily newspaper work. For some kinds of book work they have, however, proved a moderate success, and there is fair reason to suppose that a successful type setting machine, which will accomplish all the labor of the compositor, may, at no distant day, be perfected. It is a field which has long taxed the ingenuity of some of our most skillful artisans, and is one in which success will be sure to bring a rich reward, as by far the greater part of the expense in the mechanical part of the daily newspaper, as in fact of nearly every printed book and paper, is in the type-setting.

The press room, however, is by far the most attractive part of a modern newspaper, and here the improvements made have been constantly in the direction of more rapid, economical, and perfect printing. The Hoe ten cylinder rotary press, which has been and still is used in most of the large newspaper offices, was long thought to be the most perfect machine possible for doing a large amount of work, and doing it well. It is capable of printing twenty thousand impressions per hour, but to do this work, ten feeders are required, beside a pressman, and two or three assistants to take away the printed sheets, and only one side of the paper can be printed at a time. To make a press which will save the work of this number of men, which will print both sides, or a perfected sheet, at the same time, and which will also do the work as rapidly, has long been a problem which inventors have endeavored to solve, and both here and in England have their efforts been crowned with success.

THE WALTER, BULLOCK AND HOE PRESSES.

The Walter press, so named from its inventor, the proprietor of the London *Times*, and the Bullock press, which has been used here for the past four or five years, are each self feeding, and deliver a perfect printed sheet, or one printed on both sides. There are some points of similarity in their construction, both feeding from endless rolls of of paper, with a knife to cut off the sheets at the proper time before they are passed to the "fly" where they are delivered. The Walter press is considerably smaller and more compact than the Hoe ten cylinder press, but the Bullock press is still smaller, occupying a space only ten by six feet and six feet high. The Walter press, it is claimed, will print eleven thousand perfected sheets per hour, which is somewhat faster than the Hoe ten cylinder, when it is remembered that the maximum work of the latter is only twenty thousand copies of *one side*, or half printed papers, per hour, while the average work of the Hoe press will only equal about fifteen thousand impressions per hour. The Bullock press prints ten thousand copies per hour, both sides.

In all of these fast presses, the more rapidly the work is done, the less perfectly are the sheets printed, but the Walter press is especially designed to do better work than any other fast press, and with this idea, the proprietors of the New York *Times*, who are this year expending one hundred thousand dollars in refitting and adding to the facilities of their already admirably arranged office, are about putting up one of the Walter machines in their press room. The press will cost, as put up and ready for work, about $45,000, or about the same as a Hoe ten cylinder press. The paper is taken from a reel and passed through rollers, one of which revolves in a trough, where it is partially immersed in water, thus wetting or damping the sheets, which adds much to the facility of obtaining a clear impression of the types. In the Bullock press the paper is dampened by a separate machine, the rolls of paper being already wet when placed in the press. From the rolls which dampen it, the paper is passed on between cylinders, on one of which are the stereotyped forms, and the other constitutes the impression cylinder, the latter revolving against covered rollers to remove any ink which may have been taken from the printed sheet. To do this perfectly, constant attention is required, and the covers, when soiled, have to be changed. The inking apparatus is quite similar to the fountains used in the Hoe presses, and there is nothing essentially different in the principle of the fly for delivering the sheets. Two men, however, are required at the box where the sheets are delivered, to keep them straight, which, with the pressman and one assistant, make at least four men required to attend one of these machines. The Bullock press does not require more than one man, but it is claimed that the Walter press will do much better work than the Bullock.

NEWSPAPER STEREOTYPING.

Perhaps the greatest improvement for facilitating the rapid production of newspapers, since the introduction of the power press, is that by which newspaper forms are quickly and cheaply stereotyped. In fact, it would hardly be possible to use either the Bullock or the Walter press to print from type, as the cylinder which the stereotype form is made to fit is so small that the type could not well be held in place. Even with the Hoe presses, however, if it were not for the process of stereotyping, great difficulty would be experienced, and was felt in former years, in printing an edition of anything more than twenty or thirty thousand copies with sufficient rapidity to meet the demands of a daily newspaper. To obtain and make ready all the news, and have the types set up and put in the form, requires the full force of editors, reporters and compositors up to 2 and 3 o'clock in the morning. Then stereotype plates are made of each page, for as many presses as desired, according to the number of copies to be printed. If three of the ten cylinder presses are to be used, by making three sets of plates, fifty or sixty thousand copies can be printed per hour instead of only twenty thousand per hour, which was the maximum before the introduction of stereotyping.

Newspaper stereotyping was first made successful about ten years ago. It must not be supposed that this was the first successful stereotyping for any kind of printing, as printing has been done from plates almost as long as types have been used; but by the ordinary method of making stereotype plates from plaster of Paris molds, the time consumed was so great as to render this method totally unavailable for newspaper work. After many experiments, however, what is called the

PAPER PROCESS

of making the stereotype mold was successfully introduced. This consists in beating into the face of the type, with a heavy brush, a prepared sheet, with a body almost like paper pulp, and somewhat thicker than heavy railroad card. The type form, with this wet blanket kind of mold beaten into it, is then placed on a steam bed to drive out the moisture and harden the mold, which, in a few minutes, can be taken off almost as hard as a sheet of card board, but holding a perfect impression of the type. To make and trim a plate, with type metal, is now very simple, and the same mold can be used for as many plates as desired. The shortest time occupied in getting a plate ready, from the time in which the form is ready for the stereotypers, is about twenty minutes, the greater portion of this being taken up in drying and baking the mold, and the difficulty in doing it more rapidly lies in the fact that the type form, when ready for the stereotypers, is very wet, and all must, of course, be made perfectly dry. These stereotype plates are made of type metal, which consists of lead, zinc and antimony, and they may be used to print any number of copies required. The cost of making the plates cannot be said to add anything to the expenses of a large newspaper, as enough is saved in the wear of type to cover the expense of making the plates. The mechanical work of a daily morning newspaper is nearly all done at night, as the copy of the paper which the city subscriber reads at his breakfast table represents the work of printers and editors up to 3 o'clock in the morning, and the pressmen thereafter.

EDITING A DAILY NEWSPAPER.

All through the twenty-four hours, however, the reporters, correspondents and agents of a daily newspaper are busily engaged in collecting, writing and telegraphing information on every possible subject for its columns. In Washington and San Francisco, in London and Vienna, in China and Japan, and in almost every known quarter of the globe, the agents of the press may be found, whether they act as the direct employes of some particular paper, or send accounts of matters supposed to be interesting, to be paid for only when used. Some idea of the number and activity of these agents may be formed from the fact that, notwithstanding the great amount of matter which a daily newspaper contains, it often occurs that two or three times as much is prepared and paid for as is printed in the paper. This matter is constantly coming in from the telegraph office, from the mails, and from reporters, and the editor and his assistants receive and prepare it for the printer, or consign it to the waste paper basket, writing their comments thereon, witty or wise or commonplace as they may be; but in all cases the news and editorials are intended to represent a day's picture of the world's life, with the reflections which we all, according to our light, gather from reading and past experience, for future guidance.

SETTING UP THE TYPE.

The compositors commence type setting at 6 or 7 o'clock, all letters, editorials, articles of any kind, or advertisements, going to a common desk, where the fifty or more compositors, in regular order, are handed their "takes," or pieces of copy, which are longer or shorter according to the work, and when one "take" is finished another is ready, so that a compositor may first set up thirty lines of one of Tyndall's lectures, then a theater advertisement or a notice of an auction, then a portion of a letter from Vienna, or perhaps an account of a riot in New Orleans; but the work is all so arranged that the labor of these fifty or more compositors represents the steady and orderly preparation of all the articles and advertisements which appear in the paper. The foreman and his assistants receive the editorials, the telegraph, and all the reading matter, from the editor and his assistants, and the advertisements from the counting room, and the work is so divided up as to keep all hands at work until it is time to go to press, or until all the copy is set up. There is a limit to the time, however. The paper must go to press in time for the mails, and so that copies can be sent out by the morning trains. This makes it necessary to have all the type set up and ready for stereotyping by half past 2 or 3 o'clock, and here not a minute is lost. In case, however, of important news coming in after this hour, the men are kept at work and a later edition is printed for the city and near-by circulation.

In the publication of newspapers, as in all other branches of business, there is, of course, an active competition; every reader has his preferences, and each paper has particular qualities or advantages which commend it to its patrons, but all are anxious to get the first and fullest details of all matters of public interest which transpire in any part of the world.

THE Stilwell & Bierce Manufacturing Company, of Dayton, Ohio, add the following postscript to a business letter received from them on May 12: "It may be of interest to you to know that we have received inquiries about the Eclipse water wheel from New Zealand, and about Stilwell's heater and lime extractor from Belgium, as well as a great many about each from nearly all the States in the Union, each, of the parties writing, starting by saying: 'I saw your advertisement in the SCIENTIFIC AMERICAN.'"

ABOUT TEA.

Mr. Chan Lai Sun, Chinese Imperial Commissioner of Education, recently delivered a lecture in Springfield, Mass., on the subject of tea and its culture. He began by stating that tea grows in every province in China except three or four upon the northernmost Siberian border, but the quality and quantity depends largely upon the locality. The leaves resemble those of the willow, and are gathered during the spring and early summer. They are first exposed in a cool dry place for a day or two, then rolled into a ball on a table of bamboo slats, and dried in the sun. The rolling is to extract a portion of the juice of the leaves. After they have been dried in the sun, they are put into an egg-shaped iron pan over a charcoal fire, and incessantly stirred until a certain point of dryness is reached. The operator stirs with his hands, thrusting them in all portions of the pan, and practice enables him to dry the leaves almost exactly alike. The raiser superintends this process, and then brings his tea in bamboo baskets to the tea merchant, who adjudges its quality, and buys it at prices ranging from $15 to $20 per picul, equal to 133⅓ pounds. The merchant mixes his purchases together in a large reservoir, and at his convenience weighs out a number of pounds of tea leaves, and women and children spread them upon a large stage, and separate the leaves into grades according to quality. The tea stalks are the lowest grade, and the sorters are paid by the number of ounces of stalks they bring in. Children earn from 4 to 5 cents a day; the very best workers rarely earn as much as 10 cents a day. Americans could hardly live upon such wages, and until other nations can raise tea for 12 cents a pound they cannot compete with China in its production.

After the sorting each grade is packed by itself in chests or bamboo baskets, the first for exportation and the latter for home consumption. It is ordered by importers abroad through a tea taster, who receives a salary of some $3,000 a year and operates as follows: He has a long, narrow table, on which 60 or 70 cups are set; a boy weighs exactly one ounce from a small box into one of these cups, and if he has samples enough, all the cups are used. Hot water is then poured into each cup, and after five minutes the boy calls the master, who sips from every cup, holds the liquid in his mouth a moment, then ejects it and notes in his book the quality of the tea. The purchaser orders upon his taster's estimate, and when his packages arrive at the warehouse, about one in twenty is opened for comparison with the sample. If it proves of inferior grade, a material reduction is at once made in the price, so that without connivance with the tea taster the adulteration of tea is next to impossible in China.

The tea is always examined to determine its age, as it is choicer when young. It is a vexed question whether black and green tea belong to the same species; it is probable, however, that they are branches of the same variety, and the color depends upon the locality. If a seed of black tea be planted in the green tea region, a few generations will make them both alike. When black tea is high, green can readily be turned into black, but black cannot be made to appear green. The latter obtains its bluish color artificially, Prussian blue being used in the coloring, but in such small quantities as to be harmless. The annual average yield of a tea plant is about twenty ounces, and too much rain affects the quality as well as the amount. The plants live from 20 to 30 years, and, when old, are frequently cut down, and a young shrub grafted into the old stock. Quicker returns are thus obtained, but the plant does not last so long.

Tea is drank pure in China, but there are very different ways of preparing it. The Chinese tea connoisseur purchases an article costing variously from $16 to $20 per pound. If he uses this choicest kind, which is only grown on the tops of mountains, and of which only ten or fifteen piculs are produced in the kingdom, he has a baby teapot, an inch and a half high, and about an inch in diameter. A pinch of tea is put in, about twenty drops of hot water turned on, and it is ready to sip. It would be very intoxicating to drink much; even the taste of a sip will remain in the throat for hours after the tea has evaporated. The more common way of tea drinking is to have a teapot six feet high and three feet in diameter, kept warm, ready for any one to drink who chooses.

The speaker considered that, as long as the tea is of good quality, it matters little how it is prepared. The best way is to warm the pot with boiling water, then put in the tea and pour the water upon it. It should never be boiled.

The seeds of the plant are about the size of a small cherry; and from those not wanted for planting, oil is expressed, used for cooking purposes. The tea in this country is generally much injured by long conveyance by sea, and has a moldy taste to one who has drunk it in its freshness. The individual consumption of tea is much greater in China than here.

FIG. 1.—BRIDGE AT ALBANY.

IRON BRIDGE CONSTRUCTION.

In our preceding article, we traced the manufacture of iron bridges from the state of crude ore to the finished fabric, ready for shipment to the locality where it is permanently to remain. We will now give our readers views and particulars of some of the most important bridges erected by Clarke, Reeves, & Co. The view of the Albany bridge (Fig. 1) will show the style which is technically called a through bridge, having the track at the level of the lower chords. This view of the bridge is taken from the west side of the Hudson, near the Delavan House, in Albany. The curved portion crosses the basin or outlet of the Erie canal, and consists of seven spans of seventy-three feet each, one of sixty-three, and one of one hundred and ten. That part of the bridge which crosses the river consists of four spans of one hundred and eighty-five feet each, and a draw two hundred and seventy-four feet wide. The iron work in this bridge cost about $320,000.

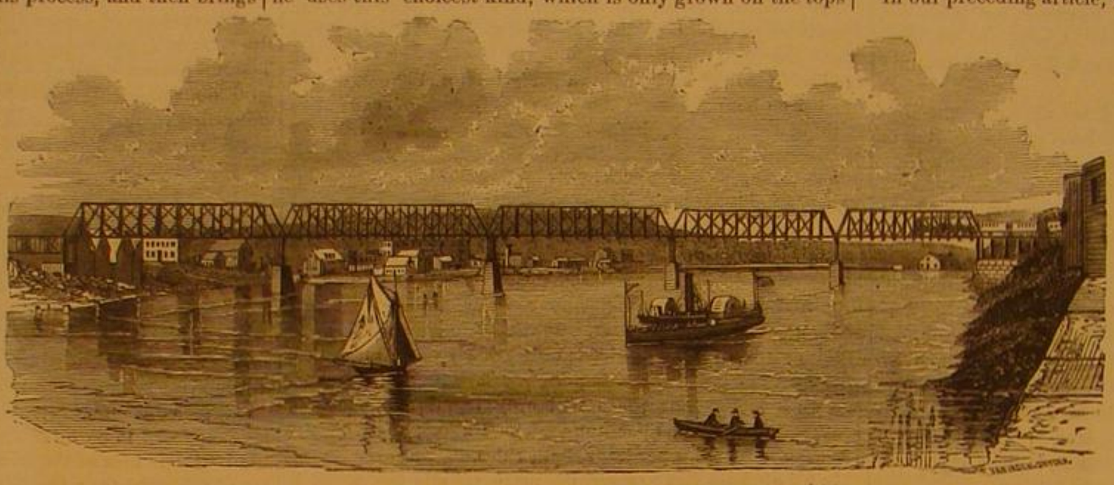


FIG. 2.—BRIDGE AT AUGUSTA, MAINE.

The bridge over the Kennebec river (Fig. 2), on the line of the Maine Central Railroad, at Augusta, Maine, is another instance of a through bridge. It cost $75,000, has five spans of one hundred and eighty-five feet each, and was built to replace a wooden deck bridge which was carried away by a freshet.

FIG. 3.—LA SALLE BRIDGE.

The bridge over the Illinois river, at La Salle, on the Illinois Central Railroad, shows the style of bridge technically called a deck bridge, in which the train is on the top. This bridge consists of eighteen spans of one hundred and sixty feet each, and cost $180,000.

The bridge on the Portland and Ogdensburgh Railroad, which crosses the Saco river, is a very general type of a through railway bridge. It consists of two spans of one hundred and eighty-five feet each, and cost $20,000.

The Lyman Viaduct (Fig. 5), on the Connecticut Air Line Railway, at East Hampton, Conn., is one hundred and thirty-five feet high and eleven hundred feet long.

The New River bridge, in West Virginia (Fig. 6), consists of two spans of two hundred and fifty feet each, and two others of seventy-five feet each. Its cost was about $75,000.

Before the erection can be begun, however, a staging or scaffolding of wood, strong enough to support the iron structure until it is finished, has to be raised on the spot. When the bridge is a large one, this staging is of necessity an important and costly piece of work. In Fig. 6 is shown the staging erected for the support of the above mentioned New river bridge, which is on the line of the Chesapeake and Ohio Railway, near a romantic spot known as Hawksnest. About two hundred yards below this bridge is a waterfall, and while the staging was still in use for its construction, the

FIG. 4.—SACO BRIDGE.

river, which is very treacherous, suddenly rose about twenty feet in a few hours, and became a roaring torrent.

The method of making all the parts of a bridge to fit exactly, and securing the ties by pins, is peculiarly American. The plan still followed in Europe is that of using rivets, which makes the erection of a bridge take much more time, and costs, consequently, much more. A riveted lattice bridge, one hundred and sixty feet in span, would require ten or twelve days for its erection, while one of the Phœnixville bridges of this size has been erected in eight and a half hours.

These specimens will show the general character of the iron bridges erected in this country. When iron was first used in constructions of this kind, cast iron was employed, but its brittleness and unreliability have led to its rejection for the main portions of bridges. Experience has also led the best iron bridge builders of America to quite generally employ girders with parallel top and bottom members, vertical posts (except at the ends, where they are made inclined toward the center of the span), and tie rods inclined at nearly forty-five degrees. This form takes the least material for the required strength.

FIG. 5.—THE LYMAN VIADUCT.

The safety of a bridge depends quite as much upon the design and proportions of its details and connections as upon its general shape. The strain which will compress or extend the ties, chords, and other parts can be calculated with mathematical exactness. But the strains coming upon the connections are very often indeterminate, and no mathematical formula has yet been found for them. They are like the strains which come upon the wheels, axles, and moving parts of carriages, cars, and machinery. Yet experience and judgment have led the best builders to a singular uniformity in the treatment of these parts. Each bridge has been an experiment, the lessons of which have been studied and turned to the best effect.

There is no doubt that iron bridges can be made perfectly safe. Their margin is greater than that of the boiler, the axles, or the rail. To make them safe, European governments depend upon rigid rules, and careful inspection to see that they are carried out. In this country government inspection is not relied on with such certainty, and the spirit of our institutions leads us to depend more upon the action of self-interest and the inherent trustworthiness of mankind when indulged with freedom of action. And so we find that the best security for the safety of iron bridges is to be found in the self-interest of the railway corporations and others, who certainly do not desire to waste their money or to render themselves liable to damages from the breaking of their bridges, and who consequently will employ for such constructions those whose reputation has been fairly earned, and whose character is such that reliance can be placed in the honesty of their work.

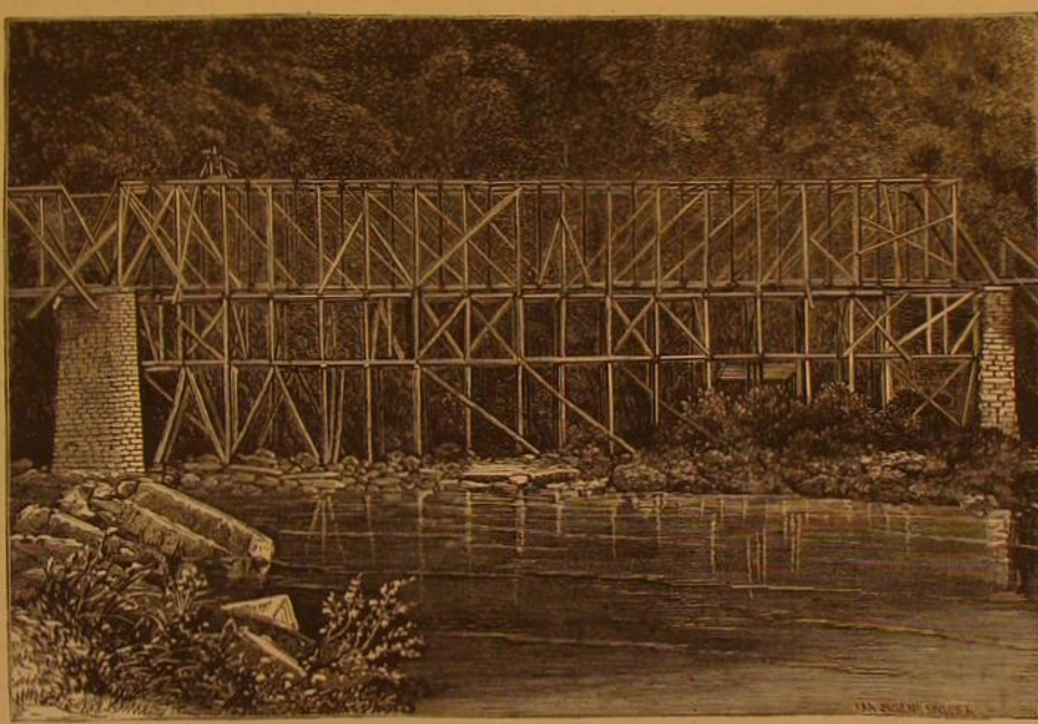


FIG. 6.—NEW RIVER BRIDGE ON ITS STAGING.

The fall of the Dixon bridge, with its three score of victims, and similar disasters which have, from time to time, shocked the community, go far toward proving the truth of this proposition. Experience, we trust, has fully demonstrated the futility of intrusting the construction of fabrics, to which the lives of hundreds may be confided, to parties whose sole claim to consideration is a plausible-appearing invention on paper or in the model, but whose ideas have never withstood any prolonged or severe ordeal of practical use.

We close our description in presenting a general view of the Phœnix Works (Fig. 7). From this a good idea of the large extent of the establishment may be gained.

The extent of this important center of industry fully justifies us in giving the public this ample and detailed description of one of the most interesting of American manufactures. For the engravings we are indebted to the publishers of *Lippincott's Magazine.*

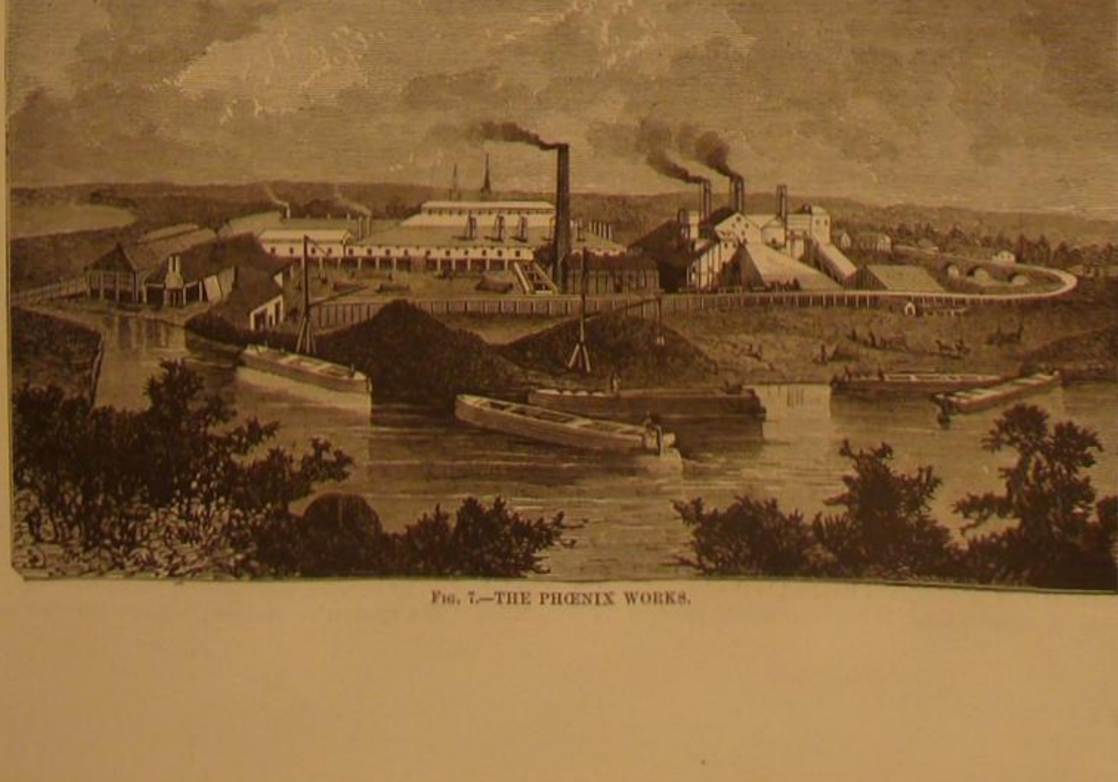


FIG. 7.—THE PHŒNIX WORKS.

Recent Life Boat Experiments.

Experiments recently made at Liverpool with an iron life boat, constructed from the designs of Mr. Hamilton, of the Windsor Iron Works, have given some very satisfactory results as far as its strength and stability are concerned. The boat is 25 feet long, with 7 feet beam, and 3 feet 3 inches inside depth. She is double bowed, with side and end air chambers. The boat, when empty, had 2 feet 8 inches free board amidships. Eleven men were made to stand upon the edge of the gunwale until the water just touched the edge of the gunwale on the loaded side. The boat was kept in this position for five minutes. Twenty-one men then jumped on board, and the boat being trimmed level, the freeboard was found to be 2 feet 1¼ inches, or only 6¾ inches deeper in the water than when empty. The boat was then tested as to her carrying power. She was filled with as many men as she could conveniently hold, and her ample accommodation for passengers, in proportion to her width and length, and her remarkable air buoyancy, were shown by the fact that, with forty-seven men on board, the boat preserved a freeboard of nineteen inches. With this number of men on board the boat was rocked heavily from gunwale to gunwale, but shipped no water. The men were then ordered out, and told to jump into her hurriedly, in order to realize the behavior of a life boat under circumstances of confusion or emergency arising from fire, collision, etc. The steadiness and buoyancy of the boat enabled her to stand this test also satisfactorily. The boat was then filled to the outside level with water, and with twenty-one men on board she had still a freeboard of 16½ inches. She was again rocked heavily, when it was seen that the water acted as ballast and promoted steadiness, the motion of the water being checked and confined to the center of the boat (in conformity with the requirements of the Ships' Life Boats Committee) by the perpendicular shape of the inner sides of the side and end cases or compartments. As another test of buoyancy, the boat was filled to the outside level with water, but with no one on board, when the freeboard showed 20¼ inches. The boat was then filled with water to the thwarts, in order to show her manageability in the event of being filled by a heavy sea. Two plugs in the bottom of the boat were then drawn, and the boat gradually relieved herself of the water until it had subsided to the level of the water in which she floated. The last test of buoyancy was to fill the boat with water to the outside level, and then to direct twelve men to stand on the gunwale. The water of the dock thereupon just touched the edge of the gunwale, showing that the water ballast gave her really greater buoyancy and stability. Lastly, to test the enormous strength of iron boats constructed on this principle, a dingy of a size suitable for coasting vessels—12 feet long by 5 feet beam, and 2 feet 4 inches in depth inside—was dropped from the crane bodily into the dock—a hight of upwards of 21 feet. It fell perfectly flat, with a tremendous force of impact and a noise as of thunder. On examination it was found that the bottom of the dingy ,on the starboard side, was slightly flattened, but that not a single joint or rivet had been started, and that the buoyancy of the boat had in no wise been affected.

The London *Times* says that the impression made by these crucial trials was that Messrs. Hamilton & Co. have, in their patent life boat, in the words of Captain Ward, Inspector of Life Boats to the National Life Boat Institution, provided a "*bonâ fide* life boat for passenger ships and merchant vessels, and that if the Northfleet and Atlantic had been supplied with these boats and a proper boat lowering apparatus, hundreds of lives might have been saved." The extra buoyancy of these boats, which secures their manageability after being filled by a heavy sea, is obtained by means of inclosed air. The lateral stability and steadiness in a heavy sea are secured by distributing this air buoyancy along the sides of the boat, while an ample amount of end buoyancy gives longitudinal stability and prevents the water being shipped in a heavy sea from rushing to either end of the boat. This side and end buoyancy is obtained by means of a series of portable watertight cases or boxes, conforming to the boat's sides, and fitting close to them. When in harbor, and the boat is required to carry cargo, these water-tight portable cases can be removed, and easily and quickly replaced on a vessel going to sea.

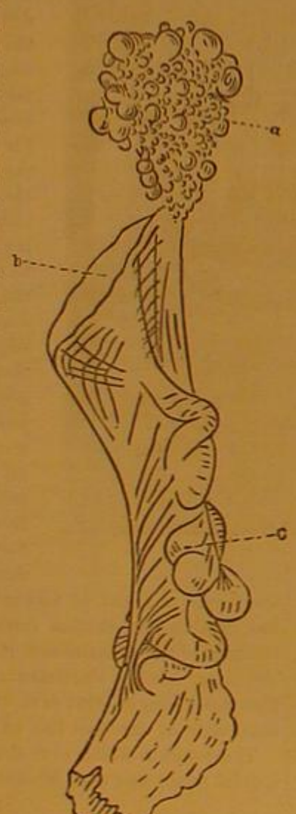
THE WONDERS OF THE EGG.—IV.

[LECTURE BY PROFESSOR AGASSIZ.]

We continue the publication of Professor Agassiz' interesting lectures on embryology, for the reports of which we are indebted to the New York *Tribune:*

You may open dozens of eggs brought for sale from the country, and find that not one is in a perfectly natural condition, because the careless transportation has changed the relation of parts. I have told you, on a former occasion, that the white speck marking the spot where the germ begins its development (what naturalists call the blastoderm) would always be found floating on the top of the yolk, being kept in that position by the strings of albumen by which the yolk is suspended, as it were, in the egg. I opened a number this morning without finding what I wished to show you, all the eggs I had for examination having been jerked in market carts and exhibiting torn chalazes (the strings of albumen by which the yolk is held in position), and I only succeeded by borrowing eggs from a neighbor who keeps hens. I now pass you one in which you see the little speck floating on the surface of the yolk, the beginning of the germ. Here is another egg prepared in the same way and showing the same thing, though in this specimen one of the strings is broken. It is not so easy to prepare an egg for investigation as you may suppose. [Here Professor Agassiz showed how to open an egg from the side so as to cut the shell longitudinally. Various specimens of open eggs were passed around.] In one of these two eggs, you can see the membrane which lines the shell and covers the white; in the other the membrane is removed, together with part of the white, in order that you may see how the white is deposited in layers. Here are two hard boiled eggs cut longitudinally, so as to show the position of the yolk, exactly in the center of one, while in the other it is on one side. The first has felt no influence from the hen; in the second the yolk has been drawn on one side by the warmth of the hen as she brooded upon it. You also see in these eggs the air chamber at the blunt end of the egg, and you will observe that these air chambers are lined by two membranes which are seen to be distinct at that end of the egg, but which unite to surround the white.

In order that you may have some idea of the growth of an egg before it reaches the stage in which we usually see it, I have brought the ovaries of two hens, taken from the animals this morning, and the oviducts—that is, the passage or channel into which the eggs are dropped from the ovaries after they have reached a certain phase of development. In the oviduct the egg receives its final envelopes, and in that organ is secreted whatever is needed to form the shell and the white. I was fortunate in my selection this morning, for the two ovaries showed successive phases of growth in great perfection. In one all the eggs are small, the largest hardly the size of a pea, others that of a pin's head, others hardly visible to the naked eye. The oviduct is empty and collapsed; its share in the work is not yet begun. In the other we have eggs of all dimensions, up to the full sized mature egg of the fowl; a yolk just ready to be dropped into the oviduct which gapes to receive it, and at the lower end of the oviduct a perfectly formed egg with a perfect shell, just about to be laid.

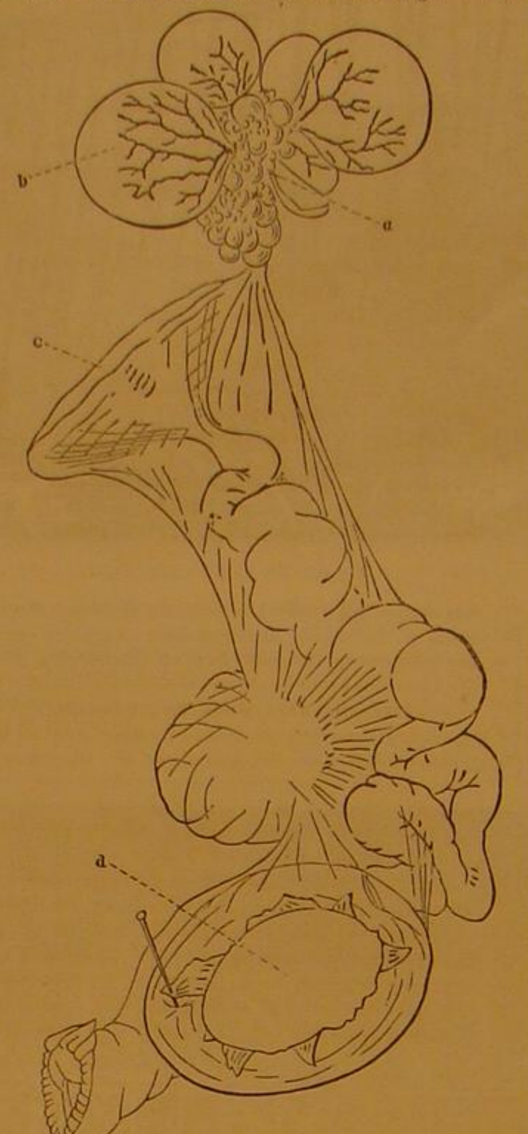


EARLY STAGE OF OVARIAN EGGS OF HEN (NATURAL SIZE.)

a. Immature ovarian eggs; b. Opening of oviduct; c. Empty oviduct.

In this second ovary, then, you have all the successive phases—eggs so small as to be hardly perceptible with the naked eye; others as large as a pin's head; others the size of a pea; others about the dimensions of a hazel nut; others as large as a walnut, and finally one complete, mature egg. The first of these hens had not yet begun laying, while the second was already sitting upon eggs. My finding of these ovaries in the right condition was a mere chance; and, indeed, when you consider how many fortunate circumstances are essential to a successful investigation in embryology, the wonder is that we know so much rather than that we know so little. Indeed, nothing better rectifies a tendency to over hasty conclusions than an attempt to observe.

Let us now return to the subject where we left it in the last lecture, and consider especially the process of reproduction in vertebrates. I choose that type because vertebrates have no other mode of multiplying than by eggs, and I wish now especially to dwell upon the history of the egg, and its importance as such in the problem of reproduction. I told you that all eggs were alike up to a certain point in their development. By this I mean that the essential characteristics of all eggs in their incipient condition are the same. But the yolks of different eggs produced by different animals may differ in color and size. The yolk may be light, almost white in some; dark yellow, orange or reddish, greenish or



OVARY AND OVIDUCT FROM A LAYING HEN. ($\frac{2}{3}$ NATURAL SIZE.)

a. Immature ovarian eggs. b. Mature ovarian eggs. c. Opening of oviduct which receives the egg when it drops from the ovary. d. Egg with shell, in lower part of oviduct.

brown in others. It may have the size of a hen's yolk just ready to drop into the oviduct, such as you have seen in the specimen just passing, or it may be so small as to escape the unaided vision; but the elements composing the yolk and the membrane surrounding it are the same in all—at least, no power of the microscope has ever yet revealed any difference in these parts. Yet no naturalist would confound the egg of a mammal with that of any other vertebrate. The vitelline membrane of the mammalian egg seems thicker in proportion to the size of the egg than the membrane surrounding the hen's yolk. In examination it is found to be a very complex apparatus. The mammalian egg has, indeed a a kind of membranous shell, called by naturalists the chorion or *zona pellucida*. It is made of special cells, and might at first be taken for a part of the yolk membrane, and thus lead to the impression that the vitelline membrane of mammalia is much thicker than that of birds. There is also a great difference in the tenacity or elasticity of the yolk. The yolk of a hen's egg is so plastic that I can press it with my finger and yet not break the membrane; others are hard to the touch, and others so soft they can barely be handled. Eggs differ greatly in transparency at different periods of their development. A hen's egg is at first so transparent that the whole interior may be seen under the microscope; later, when mature, the whole yolk is, as you all know, yellow and opaque. The different parts of an egg may differ with reference to one another. The germinative vesicle may be, for instance, nearer the center or nearer the side. It may even be drawn so near the vitelline membrane as to touch it. This is especially the case among turtles' eggs. Let it be understood, then, that when I speak of the identity of egg structure I allude to the correspondence of essential parts, overlooking those differences which are indeed of secondary importance and of no value with reference to the part played by the egg in the economy of reproduction.

THE FECUNDATION OF THE EGG.

In what now does fecundation consist, and what is the substance whose contact with the egg contributes to the formation of the new being? When entering upon this subject, let us not forget that some eggs undergo all the necessary phases of growth without any such influence from the male organism, and that this occurs even among animals whose structure is highly complicated, as with the bees, among whom unfecundated eggs produce males or drones, while fecundated eggs produce females or working bees. Among vertebrates no egg has ever with certainty been known to produce a new being without fecundation; but in numerous cases the eggs enter upon the processes which lead to the formation of the new being, as, for instance, segmentation, previous to fecundation. The spermaries are organs of exactly the same structure as the ovaries. In the spermary, cells are formed which may be compared to those peculiar cells of the ovary which we have called eggs. These sperm cells do not produce yolk, but gave rise within themselves to peculiarly constructed particles usually called spermatic particles. Previous to the formation of these particles a kind of segmentation of the substance filling the cell takes place, which may be compared to the segmentation of the yolk in an ovarian egg. This kneading process ends in forming bundles of little bodies (the so-called spermary particles) which, on closer examination, resembles tadpoles, and have indeed been compared to them, not inaptly. They are long in comparison to their width, almost thread-like, and have a blunt end with a tail-like appendage. When highly magnified, the edge of this tail-like appendage seems very thin and resembles a fin. When the cell breaks, which occurs under somewhat different circumstances in different animals, these particles move with astounding rapidity, producing a commotion in the liquid in which they are held, and having every appearance of animated beings. Indeed, when these phenomena were first observed by microscopists of the 17th century, the spermatic particles were supposed to be little animals. What they are, and the part they play in the process of fecundation, has been learned only within a few years, if indeed we know even now what their function truly is. That they exist throughout the animal kingdom is an ascertained fact, and they can be observed under the microscope without a very high power. A magnifier of a few hundred diameters will bring most of them, though not all, into view, and will show their rapid motions. These motions cannot be better compared than with those of the tadpole, the chief movement being a wriggling, rapid vibration of the tail-like portion. A great many theories have at different times been current respecting these particles, but it is useless to recall them, since they have been found to be wholly incorrect. At one time physiologists did not doubt that these particles were actually the beginning of the new germ; they went so far as to assume that they constituted the portion of the body known as the axis, the backbone or nervous center. We are sure now that all these theories were unsound. But it cannot be doubted that these particles play an important part in the economy of reproduction, since, under investigation of the most minute and difficult character, they have been seen to reach the egg and penetrate into its interior. This is an accepted fact, though not all embryologists who admit it as such have had the good fortune to see it themselves.

Controlling Sex in Butterflies.

A suggestive article as to the possibility of controlling sexes in butterflies has been communicated to *The American Naturalist* by Mrs. Mary Treat, and from the results of numerous experiments she finds occasion to believe that the larvæ to which the freshest and most tempting food was supplied in unlimited quantity nearly always developed into female butterflies while those for which the supply of food was limited almost as uniformly proved to be males. Dr. Packard is, however, inclined to think that the sex of this insect, as well as that of all animals from eggs, is determined at or about the time of conception, or at least, early in the embryonic condition. In the honey bee, especially, it has been proved that the sex is decided at the time the egg leaves the oviduct. The sex in man, according to Koelliker, becomes fixed toward the end of the second month of œtal life.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the month of March, 1873:

During the month, 1,056 visits of inspection were made, and 2,254 boilers examined, of which 720 were examined internally, and 214 were tested by hydraulic pressure. Defects in all discovered, 1,207, of which 314 were of a dangerous character. These defects were mainly as follows:

Furnaces out of shape, from overheating and other careless management, 86—16 dangerous; fractures of plates, 106—52 dangerous. (These fractures, in many cases, come from carelessness in blowing out boilers when hot and immediately filling them again with cold water. It is safe to say that one half the boilers with fractured plates have become so from this practice. It will be readily seen that boilers set in brick must retain their heat for a long time after the fires are drawn and water and steam blown out; hence the introduction of cold water before the boiler is cool is very hazardous. The strength of the iron is not only impaired, but serious fractures and bad strains are the results.) Burned plates, 89—47 very bad; blistered plates, 162—34 of which were reduced to a dangerous thinness. The outer leaves were burned and contained no strength, and the inner one was of insufficient thickness to sustain safely the pressure carried. Deposit of sediment, 176—20 very bad, with great danger of burning the fire sheets so that they would become contorted and dangerously fractured. Incrustation and scale, 232—24 dangerous; external corrosion, 72—12 dangerous. This trouble usually comes from defective boiler fittings. Internal corrosion, 33—7 dangerous; internal grooving, 12—5 dangerous; water gages defective, 42—4 dangerous; blow-out defective, 31—9 dangerous; safety valves overloaded and out of order, 23—3 dangerous; pressure gages incorrect and defective, 106—of which 19 were so unreliable as to be very dangerous indicators; boilers without gages, 103—1 was running at very high pressure and was regarded as in dangerous condition; cases of deficiency of water, 15—10 dangerous; braces and stays broken and loose, 47—24 dangerous; boilers condemned as unsafe to use, 16.

A Gigantic Newspaper Establishment.

The proprietors of the New York *Tribune* are about to erect a new building for the better accommodation of the wants of the establishment, and in announcing the fact the editor says:

The *Tribune* has outgrown its cradle, and requires a home more in harmony with its wider plans and greater influence. The building from which Horace Greeley for a quarter of a century led the free thought of the country will be long remembered. The room in which he labored has been kept sacred since his death. No lesser presence has ever broken the spell his memory left there. And now that we are about to erect on the old site the largest and most imposing newspaper office in the world, the controlling thought of the proprietors of the *Tribune* is that here is his true monument. The great journal which he founded, animated by his spirit and faithful to his teachings, will, we trust, keep his memory green in every region upon earth, and the massive pile, reared upon the scene of his labors and his glory, will speak continually of him and his work to the millions of citizens and strangers who shall traverse for centuries to come the broad avenues of Manhattan Island, and the noble rivers that wash it on either hand. The space we have formerly occupied being much too narrow for our uses, we have acquired property on every side of us, until our front extends upon Printing House Square over 60 feet, upon Spruce street 100 feet, thence north to Frankfort street 165 feet, with a frontage upon that street of nearly 29 feet. This liberal space is to be covered with a building nine stories high, surmounted by a lofty tower, which in beauty and elegance as well as in bulk will be the most considerable business edifice in the southern part of the island. Some of the most eminent architects of the day have competed in furnishing designs for the building, and the result is one upon which all who take pride in the architectural adornment of the great metropolis may justly congratulate themselves. It will be not only a superb and artistic monument; it will also be as perfect a business house as the skill and experience of the most competent builders can devise. It will be absolutely fireproof in every part, and built to last for ever.

The New Water Tunnel at Chicago.

Our readers will remember that the city of Chicago is supplied with fresh water by means of a tunnel, built under the bottom of Lake Michigan and extending out under the lake, two miles from the shore to a crib where the water is let in and flows to the shore, being then pumped and distributed through the city. Its capacity is only 54,000,000 gallons a day, a quantity insufficient for the rapidly growing demands of Chicago. Contracts for another tunnel have been accordingly made, and this new work is now in process of construction. The new tunnel will be seven feet in diameter and six miles long, of which two miles will be under the lake and four miles under the city. A correspondent of the New York *Times* says that "the laborers on the shore end have progressed some 2,000 feet out under the lake, while from the crib end another body of men are working steadily forward to meet them. The limited diameter of the bore renders it impossible for many to work at once, but they are at it night and day, averaging at each end a progress of perhaps twelve feet in twenty-four hours. The masons keep as close behind the diggers as possible. The soil penetrated is a hard blue clay, and such a thing as a caving in has not happened so far. A tin tube, eight inches in diameter, is constantly advanced with the workmen, thus furnishing a circulation which prevents the accumulation of foul air. It is hung in the top of the tunnel, and, when necessary, is worked with a fan at the outer end. This new tunnel runs parallel with the old one, distant from it about fifty feet. It enters the same crib, and strikes the shore at the same water works, but will deliver its supply at the new works, at the corner of Ashland and Blue Island avenues, three and five-sixths miles from the old ones; and to reach it the new tunnel is to be extended under the city, river, large business houses and all. It is estimated that the cost will be somewhere in the neighborhood of $1,000,000.

From the tunnel there are to be nine or more shafts reaching to the surface of the ground for fire purposes. The water, of course, will rise in them to the level of the lake, and, should the pumping works give out, will be easily accessible to the engines. This land tunnel, as well as its lake connection, is to have a vertical diameter in the clear of seven feet and two inches, and a horizontal diameter of seven feet. Its capacity will be over 100,000,000 gallons per day. It will be lined with heavy masonry, a foot thick, and of the best materials. January 1, 1875, is specified as the date of its completion.

New Electrical Instrument.

Among the recent patents granted here is one to F. H. Varley, of London, England, for a novel portable electrical machine. It consists of a glass or rubber rod, having upon it an exciting band or girdle of suitable cloth. A small Leyden jar is attached to the girdle. The rod is held in one hand and the girdle moved with the other. The friction of the girdle upon the rod excites electricity which passes to the jar, and thus a considerable quantity of electricity may be collected. It is a simple and apparently an effective instrument.

ALL new subscriptions fo the SCIENTIFIC AMERICAN will be commenced with the number issued in the week the names are received at this office, unless back numbers are ordered. All the numbers back to January 1st may be had' and subscriptions entered from that date if desired.

Correspondence.

Deep Sea Sounding.

To the Editor of the Scientific American:

Allow me to suggest a further improvement in the deep sea sounding apparatus suggested by Dr. George Robinson, and commented upon by Mr. C. F. Lewis, on page 277 of your current volume.

The gage suggested by Mr. Lewis may have a weight attached to its lower part by a pair or more of clutches, reverse of those used in pile drivers, to release the hammer at the requisite height, and an air chamber, or, still better, a cork float, at the upper part. The weight must be sufficiently heavy to rapidly sink the whole apparatus, while the cork float or air chamber must have sufficient buoyancy to sustain the gage on the surface of the water when the weight is detached; thus, instead of letting down and hauling up the gage with a rope (an operation always troublesome in deep waters and difficult in any but calm weather), it could simply be thrown overboard; the weight (a stone or a couple of bricks would answer just as well) would carry it to the bottom, upon contact with which the hooks would let go the hold on the weight, and the gage, thus released, would speed to the surface, carried by its float and bearing on its register the pressure of the water on the very bottom of the sea.

Mr. Lewis is certainly correct in saying that, should the gage be carried a certain distance away from the vertical line of its descent or ascent, it would not materially alter the pressure on the same; but my opinion is that, for great depths, a correction for the compressibility of the water, however small, would have to be made. An objection seems to suggest itself. A gage, as described, would sometimes be carried, by the under currents of the sea, out of sight and thus be lost. This could probably be remedied in the following manner: Let the weight be considerably large relatively to the surface which the body of the gage presents to the current, and let its shape be that of two cones joined by their bases, or of pyramids, or of some similar form. Thus by facilitating the descent of the gage by augmenting its velocity, the deviation from a vertical line will partly be remedied. Besides, to the upper part of the gage a small flag can be attached, or still better, a phosphide of calcium tube, such as was described several weeks ago in the SCIENTIFIC AMERICAN. Such tube, bursting into flame upon contact with air when the gage has returned to the surface, would, at night, show its whereabouts at a considerable distance; or the phosphide of calcium tube may be so constructed as to emit a thick, black smoke, easily perceptible at a distance in day time, while its flame would be visible at night.

New Orleans, La. A. R.

To the Editor of the Scientific American:

The object of an article by Dr. Robinson on "Deep Sea Soundings without a Rope," on page 244 of your current volume, seems to me to be to invite discussion rather than to suggest a means of accomplishing the object. In the first place, it would be impossible to time it, on account of currents and counter currents. Secondly, no vessel could be made strong enough to withstand the pressure of water at 2,000 fathoms; and should the gases condense, a vacuum would consequently be produced within the vessel; and if the vessel were made strong enough, it would be too heavy to rise. The powder and fulminate would be liable to ignition from the immense pressure before reaching the bottom. It would be liable to stick in a soft bottom, and, if charged too heavily, it would produce rupture, or too lightly, it would force out the piston.

The great and insurmountable obstacle, in my opinion, is the low temperature of the sea at great depths, which has been found, by actual tests, to be as low as 34°; consequently the gases must condense, if not liquefy, under the pressure; and either a collapse of the instrument, or loss by displacement, would prevent its rising. All the other obstacles can be overcome. If any way could be devised to keep up the temperature of the gases and consequently the expansion, so as to balance the pressure of the water, it would be feasible. The suggestion of a pressure gage by Charles H. Lewis, of Albion, N. Y., is perfectly practical and reliable, so far as a line could be made to reach.

Grand Rapids, Mich. HAWLEY N. CARGILL.

Remarkable Astronomical Phenomenon.

To the Editor of the Scientific American:

On May 6, at 8 P. M., the 1st and 2d satellites of Jupiter were observed so close together (having only about the distance of the radius of the planet between them) that, if the direction of their motion was favorable, contact seemed likely. Upon further observation, both were found to be receding from the planet, but the one near to it, being the 1st, had the more rapid motion, and at 9.30 had approached so near to the other that they seemed to be separated only by the space of a satellite's diameter

At 9.45, the contact was almost nearly perfect. At no time did they present the appearance of a single spherical body, but that of an elongated disk, with a faint shadow where one satellite overlapped the other, appearing to cover one half its surface. The instrument used was a Dollond glass of four inches aperture.

An instance of two satellites having come in contact, so that one completely covered the other, is recorded in the memoirs of the Royal Astronomical Society, but is of rare occurrence. The observation was made by the Rev. R. Main, at Radcliffe Observatory, Oxford. He writes: "I observed that the 1st and 2d satellites were approaching each other, and it appeared to me that they would pass very nearly, if not exactly, over each other. I therefore continued to watch them until conjunction took place, and was not disappointed, as they came in actual contact and covered each other so completely that only one single body, with perfect sphericity, was visible."

Vassar College. JUNIOR.

The Million Dollar Telescope.

To the Editor of the Scientific American:

Before we make the telescope, let us have some ideas of what may be expected to be discovered by its use. Judging from the remarks of some of your correspondents, they probably calculate to see, on the distant planets, mountains and valleys, rivers and lakes, cities and towns, and even the sort of inhabitants who occupy them. Now if we admit that all these things are there, and that we have a telescope powerful enough to see objects at that distance which are no larger than a man, is there not still a difficulty to be overcome, which has escaped attention? This difficulty is readily understood when we consider the immense velocity of the earth in its daily revolution, and also that of the planet under view. It is easy enough to see the planet whirling in space, but we may probably require something more than the powers of an instantaneous photographic machine to form any proper idea of the particular objects on its surface; though with our moon, which mostly has but one side towards us, it may be somewhat easier. If any one doubts, let him place himself on the periphery of a wheel which is turning round at the rate of five thousand revolutions per second, and then try to discover the beauties of a flea which is revolving on another wheel at the rate of ten thousand revolutions in a second, in a contrary direction. After this experiment, let us hear what he has to say on the subject.

New York city. D.

A Voice from the South.

Messrs. Munn & Co.:—GENTLEMEN:—

Please accept my thanks for the prompt attention which you have paid to my application for a patent, and the persevering energy which secured it.

I think that the SCIENTIFIC AMERICAN is the great patron of inventors, and is worthy of its name and reputation. I will endeavor to obtain subscribers.

Rosedale, La. CHAS. H. DICKINSON.

Manufacture of Whiting and Paris White.

At the Plymouth works of Raynolds & Co., Bergen, N. J., four huge grinding mills are constantly running, breaking up the chalk and mixing it with water, which is constantly flowing in as the chalk mixture flows on. On leaving the mills, the mixture passes along a series of wooden troughs, where the sand, which has a greater specific gravity than the chalk, is deposited, the chalk passing on into the settling pits, of which there are twenty-four. On being taken from the pits, the whiting is partially dried on a flooring, under which hot flues run. It is then cut up into large rough lumps and placed in racks on cars which run round on tramways into an immense oven. The heat from the flues in this oven is greatly increased by an air blast, which also carries off the moist exhalations from the drying whiting. Twelve hours on the heated floor, and twelve hours in the oven, thoroughly dries the whiting, and it is ready for packing or the putty factory. The old process of drying, first for twenty-four hours on chalk stones, and then for thirty-six hours on open racks, was not only more tedious, but, from the variations of the temperature, was bad for the whiting for some purposes. These Plymouth works turn out about twelve tuns of whiting a day—between 3,000 and 4,000 tuns a year.

Paris white, of a fine quality, is used for finishing parlor walls, adulterating paints, making paper heavier and whiter, etc. For this purpose, what is called cliff stone, a better and harder quality of chalk, is used. Paris white is made much on the same principle as whiting, only being more carefully washed and more slowly dried. Many thousands of tuns of cliff stone and chalk, imported from England, are worked up every year.

Patent Medicines.

Dr. Pierce, proprietor of Dr. Sage's "Catarrh Remedy" and Dr. Pierce's "Golden Medical Discovery," takes exception to our publication of the analyses of his medicines, as translated from the Berlin *Industrie Blätter* in this journal of April 26. He admits that the description of the ingredients of the "Catarrh Remedy" is correct as far as it goes, but states that some of the most important are omitted, and that the proportions are not correctly stated. In respect to his "Golden Medical Discovery," he asserts that it "contains not one single drug, medicinal agent, nor poisonous ingredient mentioned in the said analyses."

THE contract for the supply of the letter carriers' summer uniforms, for the New York post office, has been awarded to Messrs. Freeman & Burr, of Fulton street, New York city. The dress is a gray flannel blouse braided with black, with vest and pants of the same material. The contractors' system of making clothes to order by mail is described on our advertising pages.

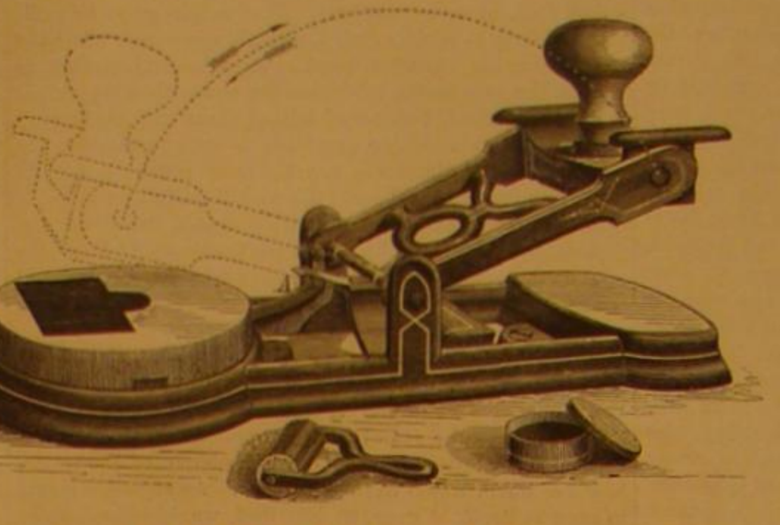
S. A. T. says: "I am an amateur mechanic, chemist, and a little of everything, or what is termed a 'jack of all trades'; and I must say that I owe the SCIENTIFIC AMERICAN for nearly all my knowledge. I would not be without it, as I constantly receive from its columns ideas and information which are of benefit to me in my large manufacturing business."

SIMPLE HAND STAMP.

Our illustration represents a new hand printing stamp which seems excellently adapted for use in printing cards, envelope advertisements, ticket marks, and similar purposes. It consists of a stand, one end of which is made circular and is filled with ordinary printer's roller composition, the other contains a pliable material upon which to place the paper to be imprinted. At the middle of the stand are upright projections, to which is pivoted the inner end of the stamp lever. To the outer extremity of the latter is pivoted the stamp holder, which thus, when held by the wooden handle shown, always retains its horizontal position. On the lower end of this appliance is detachably secured a small electrotype or other reproduction of the desired inscription. Directly under the lever are springs which serve to raise it a little after the end is brought down, and also a receptacle for holding the small roller shown in the foreground. Ordinary printing ink is used, a small quantity of which is supplied in the circular box represented, which is furnished with the apparatus.

To operate the device a portion of the ink is distributed over the bed of roller composition by means of the small roller. A metal cap, in which is made an opening of suitable size, is then placed over the inked surface, as represented in the engraving. The end of the lever is next turned in the direction indicated by the dotted lines, and the stamp pressed down upon the ink, when the lever is then carried over, ready to make an impression. As this motion takes place by means of the rod, A, connected with the end of the lever and actuating suitable mechanism, the ink slab is rotated so as to present a fresh surface of ink for the next impression.

Any colored ink may be employed, and the pad and type easily cleaned by a little oil of turpentine. The inking surface, it is stated, will last for years, and may be renewed for a few cents. The device is of convenient size and strongly constructed, and will doubtless form a convenient article for employment in counting houses, ticket offices, and similar localities. Patented March 4, 1873. For further particulars address the inventor, Mr. Geo. H. Rountree, Milwaukee, Wis.



ROUNTREE'S HAND STAMP.

RAG CUTTING ENGINE.

The invention herewith illustrated is an apparatus for holding the bed cutters of a rag-cutting engine, and adjusting them up to the cylinder. It is claimed to obviate the use of wedges, and to admit of applying a set of cutters and removing them in the most ready manner, thus forming an important improvement over the rude devices in common use.

Fig. 1 is a perspective view of the invention, and Figs. 2, 3, and 4, sectional, plan, and detail drawings. A is a metal box fitted in the bed frame of the machine immediately under the cylinder, indicated by the dotted line, B, Fig. 2. This box serves to hold the case, C, in which the cutters, D, are confined. Its sides are made slightly wider apart at one end and bottom than at the other end and top, so that the case, C, which is correspondly fitted, will wedge in tight when shoved therein. The cutters, D, are fitted to bars or saddles, E, Figs. 2 and 3, placed in the bottom of case, C, transversely. The bars have temper screws, F, passing down through them to the bottom of the case, by means of which they may be raised or lowered. In Fig. 2 a transverse view, and in Fig. 3 an end view, of one of the saddles and its screws is clearly represented.

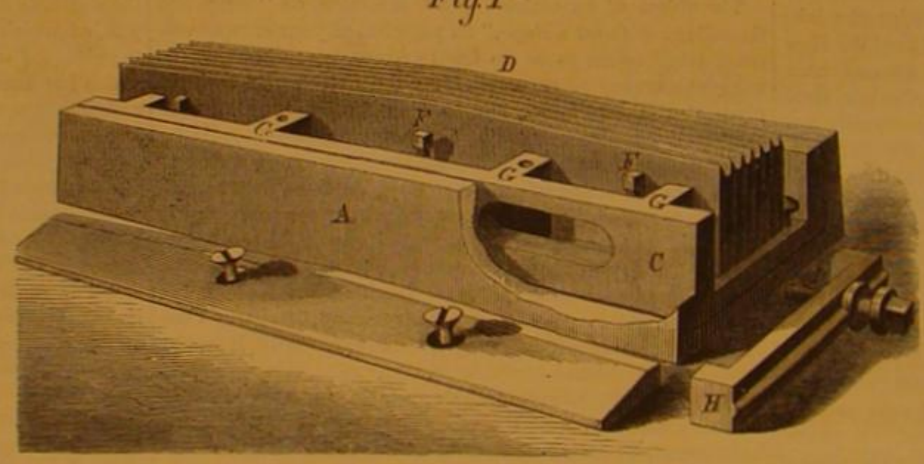
The cutters are also secured between the crossbars, G, Figs. 1 and 4, which hold them to the work while being adjusted up and down. Two or more cases, C, with sets of knives, may be employed, so that when one gets dull it may, through the above arrangement, be readily removed and another substituted. If the case, C, be difficult to start when wedged in, a bar, H, Figs. 1 and 4, and screw, I, may be employed for the purpose the screw passing through said bar, which is placed against the end of box, A, and screwing into the case, C.

For the convenience of parties preferring to grind their cutters, the bars or saddles are inserted with a dovetail, so that the knives may be easily removed for that purpose and again adjusted. The bedplate is firm and does not vibrate.

It is further claimed for the invention that all steel knives may be used up much closer than by the old process, thereby effecting a saving in both time and material. It is stated that actual experience has shown that the blades, through this mode of adjustment, will last at least twice as long, and that the device has been tested by three years' use in binders' and trunk board making, working up tarred rope and performing other heavy work.

Patented through the Scientific American Patent Agency by Edward Wilkinson, Sept. 5, 1871. For further particulars address W. O. Davey & Sons, 117 Wall street, New York city, or Cyrus Currier, 290 Market street, Newark, N. J.

Fig. 1



WILKINSON'S RAG CUTTING ENGINE.

Fig. 2

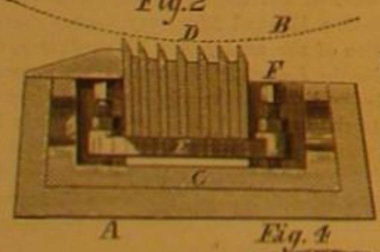
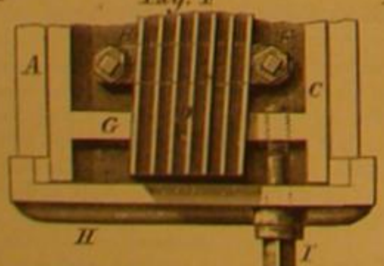


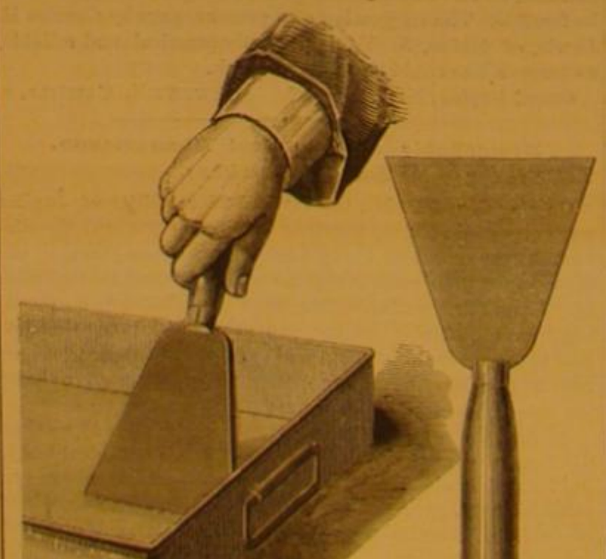
Fig. 3

Fig. 4



SCRAPER FOR HOUSEHOLD USES.

We presume that every housekeeper, of however short experience, has at some period discovered that dirt has an unexplainable and withal a marvelous affinity for inaccessible corners: that, with remarkable pertinacity, it seeks out odd angles of staircases, and mop boards, and doors, and corners of cooking utensils after grease has been in them, and cakes itself there, and declines to come out under the persuasions of the sharp end of the dust pan, or the point of a spoon, or frantic slashes with a broom; and it wears a woman's soul out, and then she gives it up, and her husband comes home and



immediately perceives it, and says she isn't half as neat as his mother was, and makes other and similar brutal remarks. Well, the object of the instrument represented in our engraving is to obviate all these difficulties. It is simply a blade of thin plate steel, having a shank which is fixed in an ordinary wooden handle. The edge is made sufficiently sharp to scrape and loosen the dirt from griddles or bake pans, and the corners may be poked into angles and used to dig out the deposit. It was patented Feb. 11, 1873, and further information regarding it may be obtained by addressing the patentees, Messrs. V. N. Davis & Son, Stoneham, Mass.

THE SIGL MITRAILLEUSE.

A new mitrailleuse, invented by M. Sigl, of Vienna, has recently been experimented upon at the camp of San Maurizio, Italy. The weapon, we learn, has already been adopted by Austria and that government has ordered 140 to be constructed for its use.

The *Revista Maritima* says that the barrels are 37 in number, of a caliber similar to that of the new Wernelli breech-loading musket used in the Austrian army, that is ·432 inch, with six grooves of rifling. The weight of the charge is 61·7 grains, and of the ball 312·1 grains. The essential portion of the device lies in the firing mechanism. A lever, placed in line with the axes of the barrels, serves to draw to the rear the breech arrangement containing needles, spindles and their springs. This portion moves upon two slides applied laterally to the posterior edge of the bundle of barrels. By placing the lever straight, the device is drawn away from the rear face; by pushing the lever down, the movable part is carried in close contact with that surface. While the parts are separated a charged chamber is dropped in two vertical grooves in the frame. The lever is then brought down, the mechanism is pushed forward, the cartridges enter the bores, while the movable breech, fitting firmly against the rear of the barrels, closes that portion and prevents ail escape of gas.

The firing apparatus is contained in the fixed or rather sliding portion, between which and the barrels the magazine of cartridges is placed. First, and nearest the cartridge chamber, is a disk containing movable needles; next in rear is a simple plate, which may be freely moved in a vertical direction. This plate lies between the needles and the spring spindles, when the machine is being charged and before firing (Fig. 1). After the breech is loaded and closed, by pressing firmly on a charging lever, a cylinder of bronze, in which are 37 cavities, is pushed forward. In each cavity is a spindle with its spring. The plate interposed between the needles and spindles hinder the latter from moving, and consequently, the containing cylinder being pushed ahead by the lever, the spindles are forced back in the sockets, at the same time pulling upon and extending their springs.

To fire the piece, an articulated lever, placed in the direction of its axis, is lifted, the interposing plate is drawn down as shown in dotted lines, Fig. 2, when the spindles, set at liberty, are thrown forcibly, by their springs, against the needles. These carry on the motion to and explode the cartridges in the chamber. After the spindles are drawn back after the round has been fired, the simple weight of its lever causes the interposing plate to return to its former position. The cartridges are arranged with central priming, and the needle has sufficient play to be disengaged from the cylinder and thrown back by the action of the gases. Dispersion of the balls is effected by giving the bundle of barrels both a lateral and a vertical movement on a suitable pivot. The firing lever is connected with graduated mechanism, by means of which motion may be imparted to the machine coincident with the discharge, so as to scatter the balls according to the distance they have to traverse. The weight of the whole machine, with appendages, is 3,275 lbs.

Fig. 1.

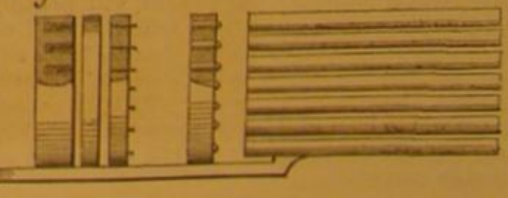
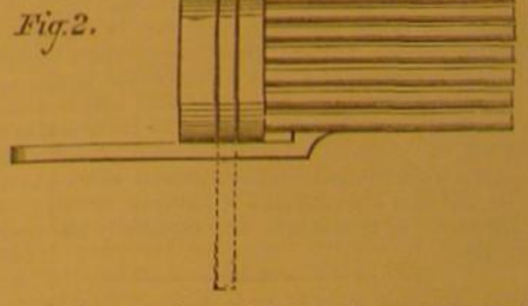


Fig. 2.



In the absence of special information, we presume the cartridges are forced back into the chamber by the explosion, and removed with it. A very slight recoil was noted. The most effective firing and dispersion of balls took place at 3,608 feet distance. The average rapidity of fire was 500 shots, or 15 filled chambers, per minute.

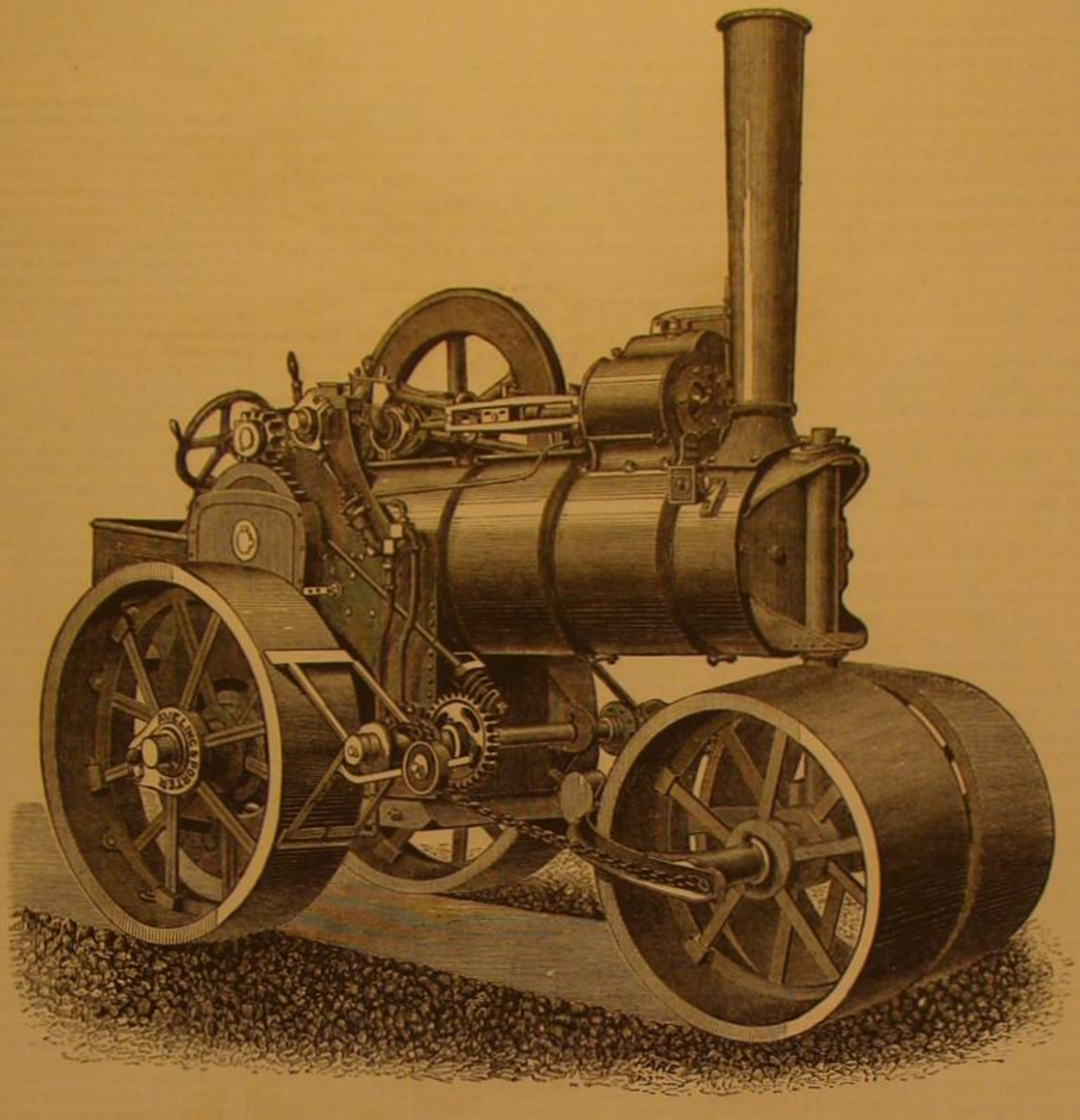
NEW STEAM ROLLER.

We illustrate a new steam roller, constructed by Messrs. Aveling and Porter, of Rochester, Eng., which has, for some weeks past, in company with another roller by the same makers, been doing excellent work at Vienna, rolling the roads in the Prater, and preparing the approaches to the Exhibition. The steering wheels are at the back of the fire box, and carry that end of the boiler without the intervention of any framing. The machine is, in fact, as nearly as possible a traction engine with very broad wheels, those at the leading end being placed close together, so that they roll the space which would otherwise be left between the tracks of the hind wheels.

The leading wheels are, as will be noticed, made somewhat conical, and they are mounted on a dead axle of which the ends are deflected downwards, so that the wheels are brought together at their lower edges and spread at their upper ones. This arrangement enables a strong center pin, bolted to the leading axle, to be carried up between the wheels as shown, this center pin passing through brackets projecting from the smoke box. A collar on the pin takes a bearing against the lower bracket, and the holes in the latter are formed so that the center pin can not only rotate freely, but can rock to a limited extent, so as to allow the leading wheels to adjust themselves to the curve of the road surface. The outer ends of the leading axle are connected by a bow or frame, as shown, which serves to receive the steering chains, the engine being steered by the driver from the foot plate.

At the trailing end the arrangement of the machine is similar to that of the agricultural locomotives of the same firm, the crank shaft, etc., being supported by wrought iron brackets formed by extending upwards the side plates of the fire box casing This mode of carrying the crank shaft bearings saves much dead weight, and substitutes simple riveted work for brackets bolted to the boiler.

This roller weighs 7½ tuns; but machines of the same type, of much larger sizes, are made by the same manufacturers. We are indebted to *Engineering* for our illustration.



NEW STEAM ROAD ROLLER.

STEVENS INSTITUTE LECTURES.---FLUORESCENCE.

BY PRESIDENT HENRY MORTON.

The spring course of lectures at the Stevens Institute o Technology, which we have reported in full, closed with a brilliant lecture on "Fluorescence," by President Henry Morton.

Like a traveler on the surface of the earth, so the pilgrim of science will pass through regions where he is familiar with every inch of ground, catching now and then a glimpse of inaccessible hights, which he can approach, by a steep ascent, sufficiently near to obtain a basis for conjecture as to their nature, but which he cannot reach with the means at present at his command. After having frequently acted as a guide to his audiences through well known regions, the lecturer requested his hearers this time to set out with him on a journey to one of those inaccessible uplands of science.

Before entering upon the study of fluorescence, we must clearly bear in mind the nature of light and color. White light is a compound wave motion containing waves of various lengths or colors. Those of red light, for instance, might be compared to the billows of the ocean, while blue would correspond to a ripple upon the surface of a lake. When light waves strike obliquely upon a body differing in density from the one they are passing through, to reach it their direction is changed unequally, the little waves being affected more than the large ones. They were therefore separate, and such separation of waves or colors is called dispersion.

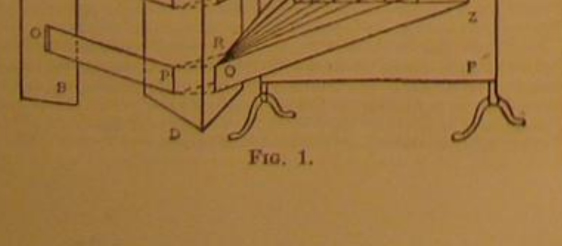


FIG. 1.

Through the slits G, H, and O in the screen, A B, are passing rays of different kinds which strike upon the prism, C D. Those coming through G are all of one wave length, and are consequently all bent equally by the prism and form one line of light on the screen, E F. This is called refraction. Those coming through H are composed of waves of two different kinds; they are bent differently and appear separated on the screen as two different colors at L and M. Finally those coming through O are composed of many colors or waves of many different sizes; they are separated and appear so on the screen at S Y. Such a band of colors is called a spectrum. When a beam of pure white light is passed through a prism or is analyzed, as we call it, we get the well known series of colors: red, orange, yellow, green, blue, indigo, violet. Beyond the violet, however, there are invisible rays for a distance more than five times as great as the length of the visible spectrum. They are called actinic rays, and produce photographic and chemical effects. The lecturer exhibited a drawing of the invisible spectrum by casting on a screen the greatly magnified image of Fig. 2.

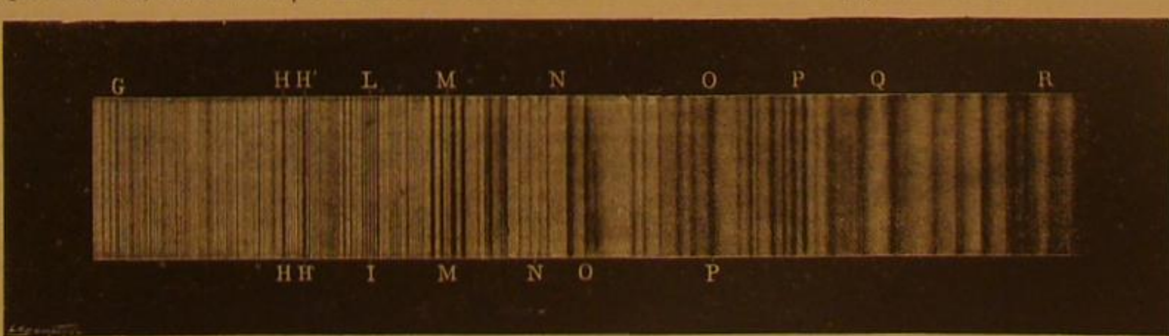


Fig. 2.

Although the difference between the colors seems but slight: only a difference in the length of the wave; yet each element of the most composite beam of light is so unalterable that the least change of tint never takes place. Red light, through it were passed through a hundred lenses or prisms, cannot become one atom more or less red, and still less can it be changed to another color.

What then is the cause of color in Nature? Is not white light changed to green when it falls upon a leaf, or to red when it strikes a brick wall? No; white light contains all colors; when it falls on a leaf, all rays of light except those producing green are absorbed by the leaf or converted into other forms of force, while only the green are reflected. On the other hand, red objects absorb all but the red rays. To prove this, a cluster of banners of various bright colors was illuminated successively by light of different tints. The banner having the same color as the light remained bright, while all the others appeared black. If colored objects changed the color of the light, a red banner, for example, would have remained red even in a green light.

Do not colored glasses and solutions modify the lengths of the waves or the colors of the rays which they transmit? No; they check the passage of some rays, while they permit others to pass through them. To demonstrate this, the lecturer produced a splendid spectrum on the screen by means of the electric light. On interposing a plate of red glass, the red of the spectrum was not made brighter, but all the other colors were extinguished. A green solution interposed extinguished all the colors of the spectrum but the green, and a blue solution all but the blue. A solution made by extracting boiled tea leaves with alcohol, absorbed entirely the violet and also certain shades of crimson, orange, and green. The colors which passed through formed a combination of olive green. A solution of permanganate of potash produced five dark bands in the green of the spectrum, nearly obliterated that color, and consequently the light it allowed to pass through was reddish purple.

Such being the universal laws of color, it must have been a matter of no little surprise to the first observers when they discovered substances which, on being illuminated with one kind of light or color, exhibited another. To illustrate this phenomenon, the lecturer exhibited two pictures of a flower with leaves and buds. The colors of one appeared brilliant by ordinary light, while the other was of a yellowish hue, so pale as almost to escape notice. On illuminating both with a bright yellow light, the highly colored one faded and became as dull as its companion; but in substituting violet light, a remarkable change took place. The colored picture remained dull, but the pale one seemed to glow with splendid red, blue, and green hues. Here, then, substances receive violet light; they neither absorb nor reflect it, but change it to red, blue, and green. What does this mean?

The lecturer then interrogated a large screen, which seemed perfectly white when illuminated by the electrical light, as to what property it possessed in reference to light. With green light and red light, the screen gave no answer; but with blue light, the word

FLUORESCENCE

flashed out in large luminous green letters.

In the experiment just performed, it was only violet light or a mixture of blue and violet that produced the effect. Thousands of experiments go to show that violet light alone developes fluorescence in all bodies capable of exhibiting this phenomenon, but any color may cause some body to fluoresce. In the picture of the flower, the blue color is only excited, so to speak, by violet light, the green by blue rays, and the center, which was red, was excited by the violet and also by the red rays, but not by the intermediate ones. From hundreds of such observations, Professor Stokes deduced the law that the exciting light is always of a less wave length than the fluorescent light which it developes.

To show that the invisible or actinic rays of the spectrum also excited fluorescence, the professor projected a spectrum from the electric light on a screen coated with some fluorescent substance, in such a way as to cause the extreme violet and ultra violet rays to strike it. Far beyond the visible violet rays, the substance fluoresced with green light. Here, then, we have a method of rendering that region of actinic rays visible and amenable to experiment.

In spectrum analysis, the metals are recognized by bright lines in different localities of the spectrum. Silver, for example, gives two bright lines in the green. Stokes discovered that it as well as other metals gave lines in the actinic spectrum also. The lecturer exhibited these lines on the screen by burning bits of different metals in the electric arch, when they came out beautifully in the fluorescent spectrum of the invisible rays. It seems to us that, by means of this extension of the spectrum, the utility of that wonderful instrument, the spectroscope, has been extraordinarily increased.

It follows from these experiments that light rich in short waves, such as that produced by the electric discharge in rarefied nitrogen, is the most effective for showing the beauties of fluorescent substances. The lecturer had accordingly arranged a number of Geissler tubes, containing pure nitrogen highly rarefied, through which he passed the electric discharge of the enormous Ruhmkorff coil, represented in the SCIENTIFIC AMERICAN of December 28, 1872.

Sulphate of quinine solution, illuminated by these tubes, glowed with a milky blue light, although it is perfectly transparent.

Æsculin, a substance contained in the decoction of horse chestnut bark, produces the same effect. By means of this property, the one twenty-millionth part of æsculin can be detected in water.

An extract of the seeds of stramonium glows with a green light.

Morin, a substance extracted from Brazil wood, lights up with a brilliant green.

"Canary" glass, which contains uranium, fluoresces with a splendid green color.

Many other substances were exhibited with beautiful effect by Professor Morton; the most remarkable, however, were two recently discovered by himself, and which he named thallene and petrollucene. To these was due the striking beauty of the flower exhibited in the early part of the lecture. Messrs. Hawkins and Wale, instrument makers in the Stevens Institute building, have made a very neat portable arrangement for showing these substances. A small folding pocket of blue glass contains a design painted with fluorescing substances. This can be carried in one's pocket and exhibited by daylight.

In order to study the properties of fluorescent bodies, the lecturer had examined by means of a spectroscope the light emitted by a great number of fluorescent substances, which were illuminated by a beam of sunlight deprived of all but the blue and violet light by passing through a solution of ammonio-sulphate of copper. He found that æsculin, quinine, morin, and many other bodies gave continuous spectra, while those of the salts of uranium, thallene, petrollucene, etc., were characterized by bands of great regularity but differing with different substances and resembling their absorption spectra. Curious connections have been found between the latter and the luminous bands of fluorescence in certain cases, as, for instance, with thallene and petrollucene, as had indeed been already observed in other substances by Stokes and Hagenbach?

What, then, is fluorescence?

In answer to this question, the lecturer projected on a screen the image of a little pith ball suspended by a thread so as just to touch a tuning fork. Then taking another similar tuning fork, he went off to some distance and sounded it. The vibrations from this fork traveled through the air, set the other one in motion, and this motion was communicated, though with far inferior rapidity, to the pith ball, whose swinging to and fro was plainly visible to the audience. In a similar manner the vibrations of light might be conveyed by the luminiferous ether to a fluorescent body, whose particles would set in motion, though with diminished velocity, the ether filling up the interstices between them, thus giving rise to a color of lower order.

Railroads and Bridges.

During a recent lecture at Cooper Union, in this city, by Professor Plimpton, of the Stevens Institute, he described the wonderful influence railroad power had upon commerce and all descriptions of industry in this country, and stated that the United States had more miles of railroad than Great Britain, France, Spain, Italy, Switzerland, United Germany, Austria, Turkey, and Russia combined. The London *Engineer* recently asserted that in the world there were 130,000 miles of railroad, and America had 60,000, but the fact was that this country had no less than 68,000 miles, and this year would have 76,000 miles of railroad. The lecturer described the formation and materials composing the four great descriptions of bridges—the arch, truss, suspension and tubular, their relations to each other, the amount of pressure they could bear, and what strain they should be expected to resist, by comparison with the work they would be required to perform.

The Hydra.

This is an instrument for obtaining samples of the ocean bottom, the invention of a blacksmith on board of the British ship Hydra. The Challenger, the English exploring ship now on a voyage of discovery round the world, is supplied with quite a number of these instruments. The machine consists of a hollow metal rod, fitted with valves, and on which are rove cast iron weights of 100 pounds each, one for every 1,000 fathoms of estimated depth. The whole is so adjusted that the weights detach themselves on striking the bottom, and only the rod, with the soil within it, is recovered. When the Challenger started on her voyage three months ago, she had thirty of these weights, which will probably have to be replenished before she has completed her work.

A much better instrument for deep sea sounding is that invented by Sidney E. and G. L. Morse, brother and nephew of the late Professor S. F. B. Morse, patented here in 1866. This machine consists of a rod containing a series of hollow glass balls, by means whereof, the number of balls being increased or diminished, any desired degree of buoyancy may be imported to the instrument. Bags of sand or stones are attached by which the rod is carried down and the lower end made to scoop up a portion of the ocean bottom. The sand bags become detached when the rod strikes bottom, and the rod then rises with amazing velocity to the surface, shooting up into the air as if discharged from a gun. This instrument is also provided with glass pressure chambers, and mercury, so arranged that the pressure of the water will drive the mercury from one chamber to the other. The depth of the ocean bottom will be indicated by the quantity of mercury so exchanged. The register of depth is very exact. This sounding instrument requires no line, and is, we believe, the first of the kind ever invented.

DECISIONS OF THE COURTS.

United States Circuit Court,---Nineteenth District, California.

TRADE MARK INFRINGEMENT.—HARDY AND MOORMAN *vs.* CUTTER *et als.* WHEELER, J.:

This action is brought to perpetually enjoin the defendants from infringing the trademark of the plaintiffs, and for damages.

The substantial allegations of the bill are that one John H. Cutter, in his lifetime, was the manufacturer and vendor of an article of whisky known as "Cutter Whisky;" that it was a superior article, and acquired great reputation throughout the United States; that said Cutter adopted and used certain trademarks to designate said article, and which are set out in the complaint; that in July, 1860, said Cutter assigned and transferred to the plaintiffs his stock of whiskies, and also the exclusive right to use his said name, trade mark and brands. *

Exhibit "B" of the complaint is a copy of the wrapper used by plaintiffs on their bottles containing Bourbon whisky; the other, "C," is used on the bottles containing "Rye" whisky; and, save in this particular, the wrappers are precisely alike. I will therefore examine "B" only. This wrapper or label is of a light brown color, and about six by twelve inches in its dimensions. Near the top are printed in large black letters the words, "J. H. Cutter, Old Bourbon Whisky." Immediately under this lettering is the representation of a barrel, on the head of which are printed the words "J. H. Cutter, Old Bourbon." Under the word "Bourbon" is a representation of the British crown, and under that the words "A. P. Hotaling & Co., sole agents for the Pacific Coast." Underneath the barrel, in black shaded letters, are the words "C. P. Moorman & Co., distillers, Louisville, Kentucky." Beneath all this are eight additional lines of printed matter, in type of various sizes, and occupying a space of about three by five inches. The whole is surrounded by an elaborate border, also in black.

Copies of the labels or trademarks alleged to have been employed by defendants, and which, it is claimed, are a simulation of the plaintiffs' trademark and labels, are also annexed to the complaint, marked Exhibits "D" and "E," and these Exhibits "D" and "E" are the only trademarks that the defendants are alleged to have used or employed in and about their business.

I will first examine "D." This label is about two inches shorter and one inch narrower than Exhibit "B;" indeed, the difference in the dimensions of the two labels is so great as to be detected at a glance. In color, instead of being a light brown, it is a bright yellow. Near the top are printed the words and letters "J. F. Cutter, Extra," and immediately under the word "Extra" is a yellow star within a shield. On the left of the shield is the word "Trade," and on the right the word "Mark;" and under the shield the words "Old Bourbon." This label contains no other device, letters, words, figures, or emblems. The whole is surrounded by a black border, much less elaborate than that surrounding Exhibit B, and only about half its width. This Exhibit D is used by defendants on their boxes, barrels, and casks.

Next in order is Exhibit "F." This is used by defendants on their bottles. In size it is about three by four inches. In color it is pure white, surrounded by a plain and very narrow border of black. The device and lettering are precisely like those contained in Exhibit D, except that the star within the shield is white upon a field of gray. Underneath, and within a separate border, are these words: "Notice.—This whisky has been distilled from selected grain, and is bottled expressly for medicinal and family use. None genuine without the fac-simile signature of the subscriber covering the cork. J. F. Cutter, son of the late J. H. Cutter, of Louisville."

To say that either D or E is a simulation of B is, to my mind, the utterance of an absurdity that the senses of the most ordinary observer would at once rebuke. To say that a star within a shield is a simulation of the British crown is no more absurd than to contend that the American eagle is an imitation of the British lion, or that the crescent of the Turk is a simulation of the cross of the Christian. The only words used by the plaintiffs, and which have been adopted by defendants, are "Cutter" and "Old Bourbon." As shown above, defendants have an unquestioned right to the use of the words "Old Bourbon;" and this brings us to the second inquiry, namely: Has the defendant used his own name, J. F. Cutter, improperly? Several cases have been cited where a party has been restrained from the use of his own name in connection with his own goods, but in all these cases he was guilty of appropriating the whole or material portions of the plaintiff's trade mark in addition to the name.

In the case of *Croft* vs. *Day*, decided in the English Chancery, the defendant not only used the name, Day & Martin, under which plaintiff's business was conducted, but the colors of his labels were of the same nature as plaintiff's colors; his labels were of exactly the same size; the letters were arranged in precisely the same mode; and the very same name appeared on the face of the jars. In deciding the case the Master of the Rolls says: "The defendant has a right to the use of his own name; * * but I must prevent him from using it in such a way as to deceive and defraud the public, and to obtain for himself, at the expense of the plaintiff, an undue and improper advantage." It is unnecessary to refer to the cases in detail, as the one cited above lays down the doctrine that has been uniformly followed.

J. F. CUTTER'S WHISKY.

It may be true, and probably is, that the profits of the plaintiffs have been diminished by the defendants embarking in a similar business; and this remark will apply with equal force to thousands of other cases where competition has lessened the income of established houses; and yet the law does not afford a remedy. J. F. Cutter has the same right to manufacture and vend Bourbon whisky that the plaintiffs have, and so long as he refrains from simulating their trademark, and uses only his own proper name, together with the name of the article in which he deals, with an emblem or device in no way resembling plaintiffs', clearly he is acting strictly within the rights guaranteed to him by the law of the land. From these views it follows that the demurrer must be sustained, with leave to the plaintiffs to amend within ten days, if they shall be so advised.

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

From April 18 to May 1, 1873, inclusive.

BRUSH MAKING MACHINE.—H. C. Covert, New York city.
CAR COUPLING.—E. H. Janney, Alexandria, Va.
CLEANING WASTE.—S. S. Lewis *et al.* (of New York city), London, England.
DYEING INDIGO.—J. Marble, Worcester, Mass.
ECONOMISING FUEL, ETC.—E. F. Griffin, Chicago, Ill.
FRUIT CAN, ETC.—W. H. I. Howe, New York city.
GAS PURIFIER.—E. Duffee, Haverhill, Mass.
MAKING METAL TUBING.—S. R. Wilmot, Bridgeport, Conn.
ORDNANCE, ETC.—J. P. Taylor, Elizabethton, Tenn.
PILED FABRIC.—A. Warth, Stapleton, N. Y.
RAILWAY CARRIAGE.—W. B. Rogerson, Paterson, N. Y.
REED ORGAN.—G. Woods, Cambridgeport, Mass.
SHAPING STONE, ETC.—C. W. Lewis, New York city.
TELEGRAPH.—T. A. Edison, Newark, N. J.
TELEGRAPH.—W. F. Coffin, New York city.

Recent American and Foreign Patents.

Improved Heating Stove.

William R. Akers and James E. Johnson, Malcolm, Iowa.—This invention consists in the arrangement of an air chamber at the base of an air heating stove, to receive the foul air from the room and discharge it into the smoke chamber to be carried off with the smoke, so as to maintain a purer atmosphere in the room and regulate the draft, the construction of the whole being simple and cheap, and calculated to be very efficient and serviceable.

Improved Cradle.

David Souder, Houston, Ohio.—This invention consists, mainly, in a folding frame, to which is suspended by suitable means the bottom frame, with some strong fabric stretched over it, which frame rocks readily on the folding or supporting frame, and may be adjusted on it to any desired hight. By disconnecting one side of the bottom frame, the supporting frame may be folded up to be carried about or stored, without taking up unnecessary space.

Improved Grain Dryer.

Edwin S. Forgy, Dayton, Ohio.—This invention is an apparatus for drying grain and other similar substances which can be moved from place to place, and which will fully utilize the heat generated. A stove is arranged in the base of a casing of sheet metal with which is connected a pipe which passes through the casing and extends upward on the outside to conduct off the smoke and gaseous products of combustion. A zigzag, which consists of a frame in which is fastened a series of inclined plates, is so arranged that grain placed upon the upper plate will, when the zigzag is vibrated, descend from one plate to another, or from the top to the bottom of the zigzag, and be discharged near the bottom of the casing. The zigzag has room to play laterally within the case, and is vibrated by means of an eccentric rod which is supported on eccentric journals in boxes on the sides of the case, a rotating motion being given the eccentric rod by means of a crank, so that hand or other motive power may be applied. By this arrangement the grain is subjected to a gradually increasing temperature as it descends. The vibrations of the zigzag will evenly spread the grain over the plates and set it in motion.

Improved Cloth Measuring Register.

Samuel Crocker, Port Allen, Iowa.—This invention has for its object to furnish an improved device for attachment to a merchant's counter, which shall be so constructed as to count and register the number of yards measured, thus rendering a second and third measurement of the goods unnecessary. In using the machine, a bar is adjusted to the division marks of the scale of a plate that indicates the number of yards to be measured off, where it is held by a spring catch. The end of the edge of the cloth to be measured is then brought by the right hand of the operator to the button on the upper end of a stop. The left hand is then slipped along the edge of the cloth to the last fret of the scale. The stop is then pressed downward by the thumb of the right hand, and a spring revolves a wheel half a tooth. As the pressure upon the stop is removed, the said stop is forced upward by another spring, and the wheel is revolved another half tooth, bringing a pointer to the division mark marked 1 on the scale of the plate, and so on, the pointer always registering the number of yards measured off. As the pointer in its movement reaches the bar first mentioned, the further operation of the machine is stopped, and the operator knows that he has measured off the required quantity.

Improved Boiler Tube Scraper.

John B. Christoffel, Williamsburgh, N. Y.—This invention has for its object to improve the construction of the boiler tube scraper for which letters patent No. 62,816 were granted to the same inventor on March 12, 1867. Upon a rod are placed two movable collars. On these are formed as many radial pins as there are designed to be blades in the scraper. The blades are made of light spring steel, are arranged spirally, and have holes in their ends to receive the pins of the collars. To the rod at the inner sides of the collars are secured stops, to prevent said collars from moving toward each other while allowing them to move outward freely. Upon the rod at the outer sides of the collars are placed washers, against which rest the inner ends of the springs which are coiled around said rod. This construction enables the scraper to adjust itself to the size of the tube to be operated upon, and adapts it to be used either end forward, as may be desired.

Improved Invalid Bedstead.

Oscar G. Cosby, Richmond, Va.—This invention consists of a bed with canvas above the mattress on rollers extending from head to foot, one on each side, arranged as to stretch the canvas tight and hold the patient on it: while the mattress and its frame, which are suitably arranged and provided with devices for lowering it, are lowered to allow a vessel to be presented under the mattress. The rollers are jointed near the head, and provided with devices for raising and lowering that portion to support the patient in a sitting or reclining position. Gears and cranks are employed to raise and lower the mattress and its frame, also the head portion of the canvas and the rollers on which it is stretched, and ratchets and holding pawls are used to hold them in position.

Improved Trimmings.

Wellwood Murray, New York city.—The above inventor has patented two inventions. The first consists of a bias box plaited trimming of plain lace alone, or the same with the edges trimmed with figured lace, or figured lace or other goods trimmed with figured lace or other suitable trimming on the edges, folded longitudinally a little one side of the middle, so that one edge trimming comes a little higher than the other, showing two rows of edging or trimming. The bias box plaits of one part cross those of the other diagonally. This trimming it is proposed to use for making collarettes for ladies' neck wear, also cuffs and other light articles, and also trimmings for various purposes. The second invention, called collarette trimming, is composed of a combination of plaited ruching of net, with narrow plaited and pointed muslin, the net being placed on one side only, or on the front and back of the muslin, and sewed along the middle of the front piece and upper edge of the back piece when a back piece is used, to the plain edge of the muslin. There may be one or two strips of the latter, one placed above the other when two are used, and made narrower than the bottom piece so that the points of the latter will not be covered. The back piece of net will be wider than the widest strip of muslin so as to project below the points, thus making the said trimming of one or two rows of points, and with or without a margin of net projecting below the points.

Improved Carving Machine.

Henry Grubenbecher, New York city.—The invention consists in the improvement of carving machines. The supporting table furnishes bearings for the spindle of the cutting tool and for the gage pin, and also a support for the sliding carriage, to which the jointed block and pattern holding frame are attached. The spindle is revolved with a suitable driving shaft. The tool can be applied to and removed from the spindle, so that it may be replaced when desired. The gage pin is fastened in the support, which is laterally adjustable on the table and can be set at any suitable distance from the tool, according to the dimensions of the articles to be cut. It can also be longitudinally adjusted in the support, so that its point can be set and held exactly in line with the point of the tool. The slide can move back and forth, but not sidewise, or up and down. To its front end is secured a cross arm. The block to be carved, and the pattern to be imitated, are fastened to the face of a plate which has ears at its ends, which are pivoted to the ends of a bar. The plate can be swung to hold the block and pattern at any suitable angle to the tool and gage pin, and can be locked at any desired angle to the bar. The whole frame can moreover be vibrated so that the block and pattern can be swung on two different curves. A spring connects with the slide and tends to draw it back, away from the tool and pin. Another spring serves to balance the frame and to hold it nearly horizontal. The operator, after the block and pattern have been properly secured to the plate, and the tool and pin being adjusted, has only to vibrate the plate up and down, and draw it back and forth, and swing it sidewise so as to bring every part of the pattern in contact with the pin, which will cause the tool to reach corresponding depths and parts of the block, and to reproduce the pattern. When work is to be cut on more than one side, namely, when it becomes necessary to turn the pattern, in order to bring all parts of its surface in contact with the pin, a holder is used in which laterally adjustable brackets are fastened to the face of the plate. The block to be cut is centered between the brackets, and the pattern between the brackets. When the pattern is turned, the block will also be turned in the same manner and degree by virtue of a swivel connection.

Improved Furniture Spring.

William T. Doremus, New York city.—This invention has for its object to furnish an improved spring for chairs, bed bottoms, and other articles of furniture. The invention consists of an improved spring formed by the combination, with each other, of the case, made in two parts oscillating upon each other. To one part are attached rigid blocks, and in the face of the other part is formed a recess to receive them. In the inner part of the latter plate is also formed a transverse groove to receive a cross bar, between which and the blocks rubber springs are interposed. Open metallic bands pass around the rubber blocks and the projections to prevent the former from spreading when under pressure, and also to prevent the wear of said rubber blocks by friction. By this construction, as the one part of the case is oscillated or turned back and forth upon its pivoting point, the rubber blocks will be alternately compressed by the bar.

Improved Boiler Fire Extinguisher.

John D. Bresnihan, Montgomery, Ala.—The object of this invention is to supply steam boilers with an instrument by the use of which the fire may be expeditiously reduced or extinguished, curtailing thereby expenses and diminishing accidents. The invention consists of a hollow tube extending through both sheets of a steam boiler, with lateral perforations. The aperture of the tube toward the fire may be opened or closed by a movable bolt acting as a valve, which either allows the admission of the water from the boiler or shuts off the same, giving thereby perfect and quick control over the fire in the fire box.

Improved Lock Hinge.

Mortimer C. Lee, New York city.—The invention relates to an improved hinge for locking window blinds and shutters, the lower or plate portion having two shoulders or footholds, with which a pawl, pivoted to the upper portion of the hinge, engages when the blind is swung open. It is adapted for use upon either side of a window. The patentee would like to correspond with manufacturers of hinges in regard to introducing his invention. Address 258 East 62d street, New York city.

Improved Paper File.

Robert Henning, Ottawa, Ill., assignor to himself and J. D. Caton, same place.—The invention consists in the improvement of paper files having guards to prevent the loss of the filed bills or other papers. A rectangular plate of brass, bronze, or other suitable material is applied by screws or otherwise to the walls or other convenient place within reach of the operator. A flattened conical shoulder is cast to the plate, and has screwed into its lower end the file hook of strong metal wire, which bends upward and terminates in a sharp point so that the papers may be placed over the same. At the upper end of the shoulder the guard lever is pivoted with its arms to a quadrantal projection, and rests, when closed, on the projecting shoulder. The lever, by its weight, drops down on the hook as soon as the message files are placed thereon and the pressure for holding up the lever is relinquished. The guard lever thereby effectually closes the file, and prevents the loss of messages.

Improved Machine for Dressing Stone.

George B. Ray, Bridgeport, Conn.—This invention relates to improvements in stone dressing machines, in which steel or other cutters or chisels are mounted in a rotary cutter head, which is mounted on a support on the ends of radial arms, by which it is adjusted vertically to the work which is automatically fed along under the cutters. The said cutter head is caused to traverse laterally on its support by a feed screw, and the radial frame is adjusted vertically by screws geared with a worm shaft for turning said screws; and the worm shaft is mounted on bearings so pivoted as to allow the screws to oscillate while working in nuts pivoted to the radial frame, to admit of the vibration of the screws necessary for the working of the radial frame.

Improved Snow Shovel.

Henry C. Cole, Wallingford, Vt.—The invention consists in the improvement of snow shovels. A thin blade of wood is arranged at right angles to the handle and parallel with the edge, so that the handle, which is attached to the front or upper face, extends across the grain, which is the best way of connecting them and arranging the grain for the prevention of splitting. The cutting edge of the blade is beveled and shod with a thin plate of metal on the bevel face, the edge, and a narrow margin of the upper side, to make a strong edge, capable of cutting hard snow, and protecting the wood from splitting. U-shaped thin metal bars strengthen the ends of the blade. This arrangement is designed to avoid having the upper surface of the blade incumbered by the edge of the protecting strip, which is liable to spring up and be pushed off by objects catching against the edge.

Improved Fireproof Floor and Chimney Connection.

William Neracher, Cleveland, Ohio.—For the connection of floors with chimneys, so as to insure the protection of the wood work from fire when the chimneys are overheated, the inventor proposes to shoe the joists at the ends and some distance therefrom with cast iron socket pieces, thereby wholly inclosing the ends of the joists which enter the brickwork of the chimney, and the sides exposed to the heat outside thereof for a suitable distance. The sockets are to be much wider than the joists, with holes through the upper sides through which the spaces not filled by the joists are packed with cement or similar material, the said spaces being on the sides exposed to heat. In case of chimneys having fire places, metal bars extend from one socket piece to another in front of the brickwork, and rest on a rib in each socket piece a little below the surface of the floor, so as to support a hearth of cement or other non-combustible material as far from the brickwork as the hearth need extend for safety.

Improved Wash Boiler.

Philip Krumscheid, Boston, Mass.—This invention has for its object to improve the construction of wash boilers. Two plates are secured to the sides of the boiler, near its ends, so as to form tubular spaces between said plates and the ends of the boiler. The upper ends of the plate are bent outward and are secured to the ends of the boiler so as to wholly close the upper ends of said tubular spaces. In the plates, just below the flanges, are formed a number of small holes for the water to escape through. The lower ends of the plate, a little above the bottom of the boiler, are bent inward. Other plates have their outer edges secured to the sides of the boiler in a horizontal position, and are bent downward and outward till they reach or nearly reach the sides of the boiler, so that the water can readily pass into the space between the plate and the boiler. Another plate is arranged the side parts of which rest upon the last mentioned plate, and the end parts of which slip in beneath the flanges, so that it can be readily removed and inserted when desired. In the middle part is formed a hole, which is covered upon the under side by a cap plate, the ends of which are bent upward and are secured to the under side. With this construction the clothes are kept from getting *into the* hole in the plate and thus impeding the operation of the boiler by the cap plate, and the water is kept from boiling up through the hole in the plate, while it can flow down freely to be heated and forced through the tubes and again discharged upon the clothes. By this construction the boiling water cannot be forced up around the false bottom, but must always be forced up through the tubes.

Improved Bolt Mechanism for Prison Doors.

Thomas B. Pullis and John Pullis, St. Louis, Mo.—The object of this invention is to provide a mechanism by which the doors of prison cells may be locked simultaneously, allowing at the same time the opening and closing of each door separately. The invention consists of a horizontal bar, placed above or below the doors of a series of cells on one side of the passage, provided with pivoted arms and horizontal friction rollers, locked to the bar by a padlock, the whole bar traveling horizontally in suitable guide supports by means of a screw end and female screw applied in proper manner to the wall, or partition, or frame at the end of the passage. By taking out the padlock, the arm with friction roller may be swung outward from the horizontal bar, and each cell door opened and closed by itself.

Improved Car Coupling.

John P. Whipple, Whitewater, Wis.—The invention is an improvement in the class of couplings wherein pivoted spring hooks are employed. The forward ends or the bumper heads are slotted vertically, a bar being left at the lower part of their ends to receive a hook and sustain the draft. The rear end of the hook is pivoted in the inner end of the slot in the bumper head by a pin, which passes horizontally through a hole in the bumper head and in the said hook. The pins are locked in place by small pins, which pass down vertically through a staple and through a hole in the forward end of the pin. The staple keeps the pin from turning, and thus prevents the possibility of the small pin dropping out. The forward end of the hook is inclined, and is extended upward so that, as the cars are run together, the inclined end of the hook may strike against the small pin, rise, pass over, and catch upon the bar, even should the cars differ materially in hight. When *the train is* made up, the connection between the cars is further secured by two links, one end of each of which is secured to the opposite sides of the opposite bumpers, so that their other ends may be passed over staples attached to the other bumpers, when they are secured in place. Pins are passed transversely through holes in the forward part of the bumper, above the free end of the hook, to prevent the said hook from becoming accidentally detached. The butt ends of all the pins have eyes formed upon them for heads, so that they may be readily withdrawn by a hooked rod, which is made of such a length that it may be used from the top of a car for uncoupling.

Improved Car Coupling.

Demcy C. Morris, New Sharon, Iowa.—This invention has for its object to furnish an improved car coupling, which shall be so constructed that the cars shall couple themselves as they are run together, and which cannot become accidentally uncoupled, and thus break up the train when running. In coupling cars with this improved coupling, the link is turned up against the end of the car. Then as the bumpers strike each other, as the cars are run together, the concussion will throw down the link, which will drop into the notch of the bumper of the other car, and thus complete the coupling. After the train has been made up, the attendant can pass along the train and turn the buttons into a groove, thus holding the link in place with perfect safety. When not required for use, the link may be allowed to hang down beneath the bumper head, so that it cannot be injured or broken should two cars be run together.

Improved Saw Machine.

Charles H. Smith, Faribault, Minn.—The invention consists in the improvement of wood sawing machines. The platform is mounted on car wheels and has a hand crank, which gears with one of the axles for moving the machine up to the pile of wood from time to time. A couple of circular saws are mounted on an arbor, near one corner of the platform, and raised in suitable supports above the platform. One saw is on the end of the arbor and directly above the edge of the platform. The other is as far inward of the platform as the length to which the wood is to be cut, and beyond this the mandrel projects sufficiently for the application of the driving belt, which works on a pulley, from a large pulley on the driving shaft, to which the engine which is to be mounted on the platform will be connected. The inside collars, for clamping the saws on the arbor, are slightly convex, and the outside collars are correspondingly concave to concave the saws on the side fronting each other, so that the middle pieces of wood will not bind at the ends with the saws, particularly along the middle. The collars are screwed up against the saws on threads pitched, so that in case the saws get bound or cramped in the wood too hard, they will unscrew and release the saws. A wood rack projects forward from the space between the saws and inclines upward, on which the wood is placed as it is taken from the pile to be presented to the saws. At the bottom of this rack is an endless carrier, which takes the long pieces of wood laid on the rack one by one and carries them up to the saws, and carries the middle pieces to a point where it discharges them to the elevator. The end pieces fall down chutes to the same elevator, and all are carried and delivered to pilers. A platform or stand projects from the side of the platform under the saws for the sawyer to stand on for overlooking the saws and adjusting the wood. The roller of the carrier is driven by the belt and countershaft, and the elevator is driven by the belt, which works from the crank shaft on to a pulley on the upper roller. The guard over the saws to protect the attendants from them consists of a light frame of two bars and cross bars extending from one to the other over the saws. A cord hangs down where it is convenient to be reached by the sawyer to swing the frame up away from the saws when they are to be filed. The presser bars, for holding the wood on the carrier and controlling it, consist of a number of right angled bars pivoted at one end to the under side of the guard frame, near the front of the saws, and extending rearward at the other ends along the space between the saws, about to the rear of them. They are so numerous and of such different lengths that they are adapted to pieces of wood of all sizes within the common range. The pieces of wood are carried against the knives of these bars before they are entirely cut off, and swing them back until they pass under them, and the bars then rest on the pieces until they pass beyond the saws.

Improved Button.

Frank Washbourne, Brooklyn, N. Y.—This invention has for its object to furnish an improvement in the construction of buttons, making the buttons much more serviceable without increasing the cost of manufacture. In order to insert the button into the bosom or sleeve of a shirt, the back or inner plate should be first turned as far back as possible upon the shank, and then it can be put through the button hole from the outside without difficulty. After insertion the base or inner plate of the button is turned into a position at right angles with the shank by pressure of it against the person of the wearer or otherwise, and thus the button is prevented from becoming casually detached.

Improved Watchman's Time Check.

Theodore Hahn, Stuttgardt, Germany.—The object of this invention is to simplify the construction of watchmen's time detectors and to lessen the expense of the same so that they may come within reach of all who heretofore avoided the use of time detectors on account of their great expense and complexity. The invention consists in using in connection with a rotary paper dial a piercing tool, which is acted upon by several different sized keys, and which is pivoted below the dial support, so that it can be swung nearer to or further away from the center of the dial, and which is jointed so that it can be swung up by the keys to pierce the dial. This tool or piercer is provided or connected with two springs, one of which serves to keep it down and to hold the piercing points away from the paper, while the other swings it outward to its greatest distance from the center of the dial. Above the dial support is, furthermore, employed a stationary pointer or hand to show the time on the movable dial, said pointer being, by preference, slotted to admit the piercing pins through it from below.

Improved Paper File.

Charles D. Lindsey, Cincinnati, O.—This invention relates to apparatus for securing or holding papers of various kinds, as letters, bills, or other papers. The frame is made of metal consisting of a bed plate and an upright back of any desired size. The center of the back is raised and slotted. The clip plate has on its back edge an upright lug, and is connected with the back so as to be allowed to rise and fall. Both the clips of each plate may be put through the sheets, but at such point that the sheets will be held securely. The clips stand vertically, and are pointed and pass through holes in the clip plate as the latter is pressed down on *the paper* to be filed. A bow spring of steel is confined at its center to the finger piece which is attached to the lug of the clip plate. The ends of the spring are confined to the back by hooks. The clip plate is raised for the filing of a letter or paper by drawing the finger piece upward while bearing upon a thumb piece.

Improved Coal Stove.

Heinrich Meidinger, Carlsruhe, Germany, assignor to himself and Frederick Gutzkow, San Francisco, Cal.—The invention consists in providing the lower part of fuel chamber with a crescent shaped throat plate; also, in connecting with said plate a bottom piece having a mouthpiece, and in connecting the door and said mouth piece by a hinge so that the former can slide. To work this stove, an inner fuel chamber is filled to within some inches below the flue hole with coke or coal. A wood fire is lit on the top, the heating cylinder is closed, and a sliding door opened. The combustion takes place from top to bottom, and is regulated by the sliding hinged door, or by a ventilator—that is, by admittance of air either into the stove or into the chimney. The burned fuel is replaced by fresh, filled into the heating cylinder when required, and the *ashes are removed* once or twice during twenty-four hours, after shoving a small fork shaped grate, provided with a handle, into the ash pit. This grate rests and moves on slides that may be left in the mouth piece of the bottom piece. The grate serves merely to prevent the burning fuel from settling while the ashes are being removed, and is afterward withdrawn. Owing to the absence of grate bars and the circumstance that the burning coal rests on a heap of hot ashes, the heat is kept better collected and the fire regulated with such minuteness as to keep it going when its effect is barely felt and the stove appears quite cold to the touch of the hand. The fire may be maintained for months without relighting, and may be brought to the highest blaze or a mere glimmering within a few minutes.

Improved Refrigerator Water Cooler.

Thomas Smith, Brooklyn, N. Y.—The object of this invention is to construct a *cooler for water* and other liquids, to be arranged in the common refrigerator in use, by which the liquids are cooled and drawn off at pleasure, avoiding thereby the admixture of ice water and its impurities with the liquids used for drinking purposes. The invention consists in a rectangular hollow casing around the ice chamber of the refrigerator, into which the liquid to be cooled is admitted by a funnel shaped opening and drawn off by a faucet, the bottom part of the cooler being inclined so that the cooled liquid may be drawn off completely at the lowest point, and the cleaning of the cooler be fully accomplished.

Improved Buttons.

Mary P. Carpenter, New York city.—This invention has for its object to furnish an improved button, so constructed that the eye may be detached from the head, passed through the cloth or leather, and again secured to the head, rendering sewing unnecessary. The invention consists in a button eye made of a piece of wire bent into proper form, and having its ends flattened and pointed, and a screw thread cut upon them above the taper

Improved Water Wheel Gate.

John M. Burghardt, Great Barrington, Mass.—This invention relates to a mode of discharging water on turbine and other water wheels. The gate is adapted for the turbine wheel, with the head of water resting on the curb and gate. The wheel revolves in close proximity to the face of the curb, to which stationary chutes are attached. The gate is confined by the center of the curb, rests upon it and receives a rotating motion thereon by means of a rack and pinion applied to its projecting flange. The flange is a segment which passes beneath the flange of the curb. The power for operating the gate is applied to this segment flange. The movable chute or tongue projects from the plate of the gate and passes through the water apertures in the curb. The movement of the gate is limited by the water apertures. When the gate is turned in one direction, the chutes come in contact with the stationary chute which cuts off the water. By an opposite movement the water apertures may be made of any desired size. By this arrangement of the chutes, the water is directed to the wheel in unbroken columns, and is brought in direct contact with the buckets. The water apertures are made variable, and the gate may be adjusted to discharge more or less according to the quantity of water or the power required, while the shape of the aperture is not varied.

Improved Loom for Weaving Wire.

Samuel Holdsworth, Maspeth, assignor to himself and James Black, Brooklyn N. Y.—The series of blades, for beating up the weft, consists of small triangular pieces of metal, and are pivoted at the apex side by side on a rod behind the front beam of the loom, with their bases fronting the shuttle race, and lower corners resting on a cam roller so that the upper corners can be thrown up between the warp wires by the spirally arranged ribs of the cam roller. There are two of these ribs to correspond with the two throws of the shuttle during each revolution of the drive shaft, and they are spiral to cause the blades to act successively. The shuttle has a T shaped projection on one side fitted in the notches of vertical plates, forming a horizontal way, and it rests on the top of the roller placed in front of the plates a little below the notches, and having the radial pins arranged in a spiral row and working in an oblique slot, in the bottom of the shuttle to force it upward and back, the roller being turned to the right for moving the shuttle across in one direction, and to the left for moving it in the other direction. This motion is imparted to the roller by a reciprocating piece arm, and wheels, the said sliding piece being worked to and fro in ways on the loom side by a crank on the shaft of the roller, and having a slot through which the arm projects at the free end. In practice the shuttle will have a circular cavity or socket in the upper surface for a flat circular spool or bobbin, and it will have a hole through the front side at or about the center for the weft to run out. The harness frames are connected at the bottom to the arms of a rock shaft. At one end of the rock shaft, and outside of the loom frame, is a weighted arm extending upward and passing through a horizontal sliding piece arranged in ways on the side of the loom frame, and worked by a crank on the end of the shaft of the roller. The slot in this sliding piece, through which the weighted arm passes, is long enough to allow the arm to complete the changing of the harness by falling after it has been raised to and carried a little past the vertical line by the slide, and the weight of the arm is sufficient to continue the motion without the aid of the slide; also to hold the harness in position after the shifting. To effect the shifting the weighted arm has only to be raised to the vertical line or slightly beyond by the slide, in which it is greatly aided by the tension of the warps, so that, its weight being only little more than the force of the tension, the slide has little actual work to do, and this is accomplished without much friction; also, in holding the harness there is no loss by friction. For letting off the warp and taking up the fabric, a small roll is placed a little in advance of the warp roll, around which the warps are carried one turn; another roll is arranged at the front of the loom, over which the fabric passes, and another one alongside of the cloth roll, under which the fabric passes before going on the cloth roll, which is so mounted in slotted bearings as to constantly bear against the said roller, no matter what is the size of the roll of fabric on it, and so receive a uniform motion from it.

Improved Cultivator.

Jack Helm, Hochheim, Texas, assignor to himself and Charles Timm, of same place.—The invention consists in an improved mode of connecting eveners with a pair of gang plows or cultivators. Two gangs of two cultivator plows are attached to an evener in the same ring, and connected together at the rear by a cross piece attached to vertical standards rising from the top of the beams, which separate the plows from each other the requisite distance. The outer beam is connected to the outer end of the evener by a chain, which also assists in keeping the plows separate at the rear by its tendency to pull the outer one away from the other laterally. The two gangs are connected by a straight bar when the corn or other plant being cultivated is not very high; but when more advanced, a yoke is substituted at the front for the straight bar. The screw threaded standards attached to and rising vertically from the eveners are used for attaching either of these devices. The plow beams are provided with vertical standards for being connected by the short cross pieces, also, by the long jointed cross piece when the corn is not too high to admit of it, or by the Λ bars and short cross pieces when the corn is too high for the use of the jointed cross bar. They are also connected by the yoke, which is bolted to the top of the short cross pieces. The standards and pieces keep the plows from swaying laterally too much, as well as separate from each other the distance required. The two gangs of plows are allowed to work forward and back relatively to each other, as necessary, on account of the uneven action of the team, which will, like the *cultivator*, work on both sides of the row.

Improved Churn.

William H. Holdam, Crab Orchard, Ky.—The invention consists in the improvement of churns. The churn body is made cylindrical in form, and to the bottom is pivoted the lower end of the dasher shaft. To the sides of the dasher shaft are attached a number of radial arms, which are made wide and are inclined laterally. A curb or short tube is made of such a size as to surround the dasher and allow said dasher to revolve freely within it. The tube fits into a similar tube or curb, which has radial flanges or blocks formed upon or attached to it, the outer edges of which rest against the inner surface of the churn body so as to keep the curbs securely in place and accurately centered. The milk has a free passage beneath the lower edge of the said curb. In using the churn the curb is adjusted so that the upper edge may be a little above the surface of the milk to be churned. Then, as the dasher is revolved, the blades raise the milk through the curb and project it outward over the edge against the sides of the churn body, its place being immediately supplied by milk flowing in beneath the lower edge, thus producing a *continuous circulation* and a violent agitation of the milk, bringing the butter in a very short time.

Improved Music Notation.

Ebenezer P. Stewart, Cotton Plant, Miss.—The object of this invention is to simplify the method of writing and to facilitate the reading of music. The invention consists in writing music in figures which indicate the length of tone, and in writing canceled notes or figures for pauses, or, rather, rests so that each canceled note will indicate the position and length of rest to be produced.

Improved Lamp.

George Brownlee, Princeton, Ind.—The object of this invention is to construct a burner for coal oil lamps by the use of which explosions may be prevented, a quick extinguishment of the flame be obtained, and clearer and brighter light be produced. The invention consists in a weighted valve on the end of a *lever* connected with a tubular wick slide, which extinguishes the flame, either by the pressure of the oil gases or at will by jerking the lamp or inclining the same. If the lamp is inclined in any direction to an angle of more than 45° from the perpendicular, or is let fall a few inches, or receives a violent jar; or if there is a pressure of gas inside it equal to what a person might produce with his breath, the light is extinguished. This is all done by one and the same device, consisting of three parts: a wire spring, a slide on wick tube and an L shaped weighted lever.

Business and Personal.

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

Case Hardening—I will pay a reasonable price for any quick, good process that will harden Norway or Ulster Iron 1-32 in. deep—small pieces. Must not injure the iron. G. H. N. Cushman & Co., Ottawa, La Salle Co., Ill.

Buy Iron Planers, Upright Drills, of Gear, Boston, Mass.

Manufacturers of Tools and Machinery for working Tin and Sheet Zinc, please send circulars to Matthiessen and Hegeler Zinc Company, La Salle, Ill.

State and County Rights for Duryea's patent Refrigerator, the best in the world; or will exchange for Real Estate. Apply at 690 Seventh avenue.

Save money by ordering Machinery of Gear, Boston, Mass.

Makers of Malleable Cast Iron or Steel Articles, address H. B. W., Box 130, Holly Springs, Miss.

Manufacturers of Wagon Machinery and Wagon Material, send circulars to Union M'f'g Co., Rock Falls, Whiteside Co., Illinois.

Wanted—Iron Shingles, by S. Phillips, Kosciusko, Miss.

Sure cure for Slipping Belts—Sutton's patent Pulley Cover is warranted to do double the work before the belt will slip. Circulars free. John W. Sutton, 95 Liberty Street, Room 2, New York.

Patent for Sale at a great inducement. Apply, for particulars, to Patentee of "Advertising Lantern," S. Kuh, Jefferson, Iowa.

Nat'l M'f'g Co.,11 Dey St.,N.Y.,manufacture & sell novelties & utilities. Ag'ts wanted. Catalogue free.

Jennings' Steam Clothes Washer. Rights for sale. Best out. Samples $6. Nat'l M'f'g Co.,11 Dey St.,N.Y.

Patent Chemical Metallic Paint—All shades, ground in oil, and all mixed ready for use. Put up in cans, barrels and half barrels. Price 50c., $1 and $1.50 per gal. Send for card of colors. N. Y. City Oil Co., Sole Agents, 116 Maiden Lane, New York.

Patent Right for Sale, the whole or by States. The Anti-Lamina for cleaning Steam Boilers. J. J. Allen, Philadelphia, Pa.

Wanted—A thorough machinist, fully capable in every respect to act as Foreman in a Manufacturing Establishment, who is willing to invest some money in one of the best paying inventions of the times; the object being to have an interested person in charge. Address, with particulars and references, Manufacturer, Box 395, Middletown, Conn.

Wanted—Address of Manufacturers of Small Metal Tubing, Iron, Copper, Tin or Brass, from one sixteenth inch to three eighths inch, inside diameter. Object—To give contract for manufacturing Tubing for John J. Chubb's Improvement in "Oiling Mill Burr Spindles." Patented April 22, 1873. Chubb & Bollman, Decatur, Indiana.

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

Cabinet Makers' Machinery. T.R.Bailey&Vail.

Abbe's Bolt Heading Machines, latest and best. For cuts, prices and terms, address S. C. Forsaith & Co., Manchester, N. H.

The Ellis Vapor Engines,with late improvements, manufactured by Haskins Machine Company, Fitchburg, Mass.

For the best and cheapest small portable Engine in market,address Peter Walrath, Chittenango,N.Y.

For Circular Saw Mills, with friction feed works, and Stationary Engines, address Wm. P. Duncan, Bellefonte, Pa.

Shortt's Patent Couplings, Pulleys, Hangers and Shafting a Specialty. Orders promptly filled. Circulars free. Address Shortt Mf'g Co., Carthage, N.Y.

New England Band Saw Machines, cheapest and best, only $187. For descriptive cuts, address S. C. Forsaith & Co., Manchester, N. H.

Grain, Paint, Ink, Spice and Drug Mills. Ross Bro's, 85 First Street, Williamsburgh, N. Y.

Drawings,Models,Machines—All kinds made to order. Towle & Unger Mf'g Co.,30 Cortlandt St., N.Y.

Key Seat Cutting Machine.T.R.Bailey & Vail.

Fire Clay and Limestone Mills, which wear longer than any others made, cast to order by Pittsburgh Casting Co., Pittsburgh, Pa. All work warranted.

Cheap Wood-Working Machinery. Address M. B. Cochran & Co., Pittsburgh, Pa.

Wood workmen—Ask your Bookseller for Richards' Operator's Hand Book of Wood Machinery. 65 cts. Only $1.50.

Agents' names wanted. Wendell & Francis, 436 Walnut Street, Philadelphia, Pa.

Shaw's Planer Bar—For Shop, County, and State Rights, apply to T. Shaw, 915 Ridge Av., Phila., Pa.

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

Royalty — Manufacturers and Inventors, have your Machinery, &c., made in the west for western use. Extra inducements offered by Doty Manufacturing Company, Janesville, Wis.

Stave & Shingle Machinery. T.R.Bailey &Vail.

Monitor Leather Belting you can always rely on. Send for Circular. C.W.Arny,301 Cherry st.,Phila.

3 Winn's Pat. Improved Portable Steam Brick Machines. Averages 40 m per day. Fully guaranteed. For sale cheap. John Cooper Engine Manufacturing Company, Mount Vernon, Ohio.

Incrustation and Boiler Waters, by Jos. G. Rogers, M.D. 20 pp., 8vo. 25c. The only scientific as well as practical treatise on the subject. W. H. Rogers Madison, Inda.

Buy First & Pryibil's Bandsaw machines, which are more used than any other in the country. Also, Shafting and Pulleys a specialty. 467 W. 40th St., New York City.

Hand Fire Engines, Price $300 to $2,000. Also, over 800 different Style Pumps for Tanners, Paper Mills, and Fire Purposes. Address Rumsey & Co., Seneca Falls, N. Y., U. S. A.

The Best Smutter and Separator Combined n America. Address M. Deal & Co., Bucyrus, Ohio.

Damper Regulators and Gage Cocks—For the best, address Murrill & Keizer, Baltimore, Md.

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

Tree Pruners and Saw Mill Tools, improvements. Send for circulars. G.A.Prescott,Sandy Hill, N.Y.

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

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

For Sale Cheap—Six Horse Power Portable Engine, mounted on truck, good as new; been used only two months. Address N. Abbott, Mansfield, Ohio.

Five different sizes of Gatling Guns are now manufactured at Colt's Armory, Hartford, Conn. The larger sizes have a range of over two miles. These arms are indispensable in modern warfare.

40 different Bandsaw machines, 60 turning and improved oval lathes, shaping, carving and moulding machinery, for sale by First & Prytbil, 461 W. 40th St., New York City.

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

Gauge Lathe for Cabinet and all kinds of handles. Shaping Machine for Woodworking. T. R. Bailey & Vail.

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

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

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

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

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

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

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

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

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

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

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

Parties desiring Steam Machinery for quarrying stone, address Steam Stone Cutter Co., Rutland, Vt.

Boring Machine for Pulleys—no limit to capacity. T. R. Bailey & Vail, Lockport, N. Y

COPYRIGHTS.

The copyright law of the United States offers a variety of privileges of considerable value for business purposes.

The 86th section of the patent laws of 1870 provides that any citizen of the United States, or any person resident therein, who may be the author, inventor or designer, or proprietor of any book, map, chart, dramatic or musical composition, engraving, cut, print, photograph, or negative thereof, or of a painting, drawing, chromo, statue, statuary, or of models and designs intended to be perfected as works of the fine arts, may obtain copyrights, which shall secure the exclusive privilege of printing, reprinting, publishing, completing, copying, executing, finishing and vending the same.

The copyright is in fact a patent, although not applicable to machinery. A copyright lasts for 28 years, at the end of which time it may be renewed for 14 years longer, by the author, inventor or designer, or, if deceased, by his wife or children. In applying for a copyright, no sworn papers are required, and no signatures; in fact, no forms or ceremonies are involved, nor tedious official delays. Parties who do not wish to attend to the matter themselves may for five dollars have the copyright promptly procured for them by the undersigned.

There is no form of protection that is more easily obtained, or which gives better satisfaction so far as it extends than the copyright, and the simplicity and excellent practical working of the law ought to afford useful instruction to those who constantly aim to add complexity to our mechanical patent laws.

Under the copyright law, it is to be observed that designs for ornamental objects or configurations, prints, engravings, cuts, pictures, cards, and pamphlets of every kind may be secured. Almost every business concern finds it necessary to produce some peculiar work of this kind, large or small. Thus if a man makes a new drawing of his building, his machine shop, interior of office, view of the town showing his works, or any new and pictorial form for border, or design to be used upon goods, circulars, or other purposes, he may, by simply securing a copyright, prevent others from imitating the same. It is obvious that the uses of the copyright are very extensive.

But it should be remembered that the copyright must be applied for *before the work is publicly introduced*, or, in other words, before it is published. A valid copyright cannot be had for a work that has been issued to the public prior to application for the copyright. Nor can a valid copyright be obtained for a mere trade mark, word, or name.

Further information in regard to obtaining copyrights may be had gratis by addressing Messrs. Munn & Co., 37 Park Row, Solicitors of Patents and Publishers of the Scientific American.

Notes & Queries

J. V. D. asks for the process of staining wood to imitate rosewood.

E. H. C. asks for directions for building a small wherry to carry one person. What material is the best for that purpose?

A. L. asks how to lay out a division plate for a shaping machine. What is the most advantageous number of holes to use?

W. H. Y. asks: How can I take rust off any polished article and replace the polish? I have a lot of carpenters' steel squares encrusted with salt water rust.

G. W. asks for a recipe for making a size mixed with clay, such as is used in the making of paper. "I have made size of starch and clay, but find that, if it stands awhile after being boiled, the starch and clay sink to the bottom, leaving nothing but water."

P. asks if there is a process for hardening gold, copper, brass, etc., other than hammering or drawing; and, if so, what is it? In what manner are the peculiar colors given to jewelry? Their hues are frequently removed by heat while under repair. Can it be replaced? If so, how?

J. H. S. asks for the most approved mode of manufacturing the Western stirring or cross plowshare. "I have not been successful in welding wing to landside, and will feel thankful for the information. I would also like to know if there is any satisfactory way of welding cast iron."

P. J. E. says: We have a mine locomotive with chilled tires on drivers. They have worn down about ⅜ of an inch, leaving a ridge on the outside of the tread which makes it bad to run over castings. The cost of new tires is expensive, besides the disadvantage of the loss in time in sending off to have it done. I would like to know whether there is any way in which we could turn or grind off the tires.

E. P. asks if any lasting evil effects are experienced from the taking of quinine, such as weakness or stiffness of the joints or limbs. If a person takes too much at once or too often, it will produce ringing in the ears, etc., and if continued, other and more serious effects will be produced. But if taken in moderate doses, will any of the effects first mentioned be experienced?

H. W. M. says: As the correct setting of the slide valve of common steam engines is one of the most important duties of the engineer, and as I have found no simple and correct scientific method in any of the books and papers, I would ask engineers to give their methods through your paper. I am sure they would be very interesting to a large number of your readers.

J. S. asks if wire bells, so much used for clocks, have ever been tried, and with what success, for churches. If coiled like clock bells, in form of a vertical plane, such a bell would take up too much space; but the space would be very much reduced if wound in a spherical form, and it is of interest to the public to know how the sound would compare with that of other church bells, as the cost would probably be less.

J. E. G. wishes to put in steam to help in a mill during busy times, but objects to the danger from fire from the smoke stack. Does any one know of a system by which the smoke and sparks from the stack can be made harmless? It is proposed to lead the stack into the tail race of the mill; would the outflowing water give draft enough, supposing the end of the stack to be entirely under water? Or would a fan blower, which could be run at any time by water power to get up steam, be necessary? "I should like to hear from some one who has had experience in such matters."

H. B. says, in reference to the question of sailing faster than the stream: During an experience of many years in the navigation of the Alleghany and Ohio rivers, it has been asserted that a raft of boards will run faster than a log or piece of drift wood, and that an oil or coal boat will run faster than a raft of boards. It has been further observed that rafts and boats do run faster than the water in which they float. Moreover, a boat will outrun the rise of the stream so as to have to wait for it. Oil barges in Pennsylvania were run out of Oil Creek by what are called pond freshes. There was, at or near Titusville, a very large mill pond, the dam of which had a "breast" that was raised four or five feet by a temporary "bracket." The oil barges, when light, were towed up the creek with horses; when loaded, the oil shippers would club together and "buy a fresh," that is, they would hire the mill owner to "cut the bracket" of his dam and let the water run out of his mill pond. When the creek was fairly full of water, the oil shippers would start their barges on plenty of water; but they would often have to stop twice, before reaching the river, to let the water overtake them, the average distance run not being more than twelve miles to the river. I would like to know the reason of it.

Answers to Correspondents

J. C. R. can coat his iron articles with a black Japan by following the directions on p. 203, vol. 28.—E. F. L. should write to the author; we published his address.—S. H. & Co., will find full directions for tempering steel for all purposes in the recent numbers of our journal.—X. Y. Z. will find full directions for tinning iron on pp. 212 and 213 of our vol. 26.—C. H. F. will find his question as to loss of power by use of a crank answered by our reply to G. W. L. on p. 235, current vol.

C. H. F. asks if an iron or brass wire electroplated with copper will convey electricity as well as a copper wire of the same size. Answer: No. The copper wire would be a much better conductor. Electricity travels not merely on the surface, as formerly supposed, but in and throughout the wire.

T. D. & Co. ask: How long would it take one man, working 10 hours per day, to do the same work that could be done with an engine using 1 tun of coal? Answer: An engine of small power may use ten pounds or more of coal per horse power per hour. A large engine may run on two pounds. A man power is equal to about one tenth the "horse power" of engineers, as an average.

L. W. E. asks what carbolate of lime is. Answer: A compound of carbolic acid and lime, which is an excellent disinfectant, although to some the odor is unpleasant. It can be made by putting 3 ozs. carbolic acid in 12 quarts lime water. Whitewash your hennery with this preparation.

J. T. D. asks: At what distance should the crank of an engine be from the "straight" when the steam first enters the port? Answer: In a slowly running engine, the steam valve should open just as the crank reaches its center. In a quick moving engine, as that of a locomotive, it is given considerable lead, and should be open to the extent of perhaps five sixteenths of an inch when the piston commences its stroke. Some well known engineers dissent from the general opinion as expressed above, and believe that lead is, under no circumstances, beneficial.

G. T. asks: By what rule is the horse power (nominal and actual) of a marine engine of the compound and surface condensing system determined? Answer: Precisely as in any other case. By determining the mean pressure in each cylinder, multiplying by piston area and speed, and dividing by 33,000.

J. L. asks: 1. Which will propel a boat the faster, the paddle wheel or the screw wheel? I believe the screw wheel propels a boat the faster, and if so, why is it not used on river boats? 2. How many feet do river boats draw on the average? How many do ocean steamers? Answers: 1. The screw in vessels of deep draft; the paddle wheel in vessels of light draft. 2. Three to 6 feet; 15 to 20 feet.

E. A. V. asks why some water backs in ranges rust the water after standing a few minutes, and others do not. Is it owing to the iron or to the water? Answer: Such cases are usually due to some exceptional cause, which has rusted the water back badly, and the difficulty generally disappears after a time. Some kinds of water will, however, be more likely to produce rust than others. Water from rapidly running streams which absorb considerable free oxygen is more likely to cause rust than water from wells, or from rivers having a sluggish current.

A Student in Chemistry asks: 1. Will the oxyhydrogen blow pipe burn a hole in a thick piece of iron? 2. Will gunpowder burst any thickness of iron if confined in the center, or could there be strength enough to prevent it from exploding? Answers: 1. Yes. Experiments with ordnance have developed a pressure by firing gunpowder as high as 22½ to 40 tuns per square inch. The latter pressure would burst an iron vessel of any thickness, but might be confined by steel of higher tenacity than 40 tuns per square inch, as good tool steel, or Bessemer metal of very high quality and containing more than ½ per cent carbon. No thickness whatever can be made to withstand pressures per square inch exceeding the tenacity, per square inch, of the metal adopted.

S. & D. say: 1. We have rented 30 horse power, to be received by means of 60 feet shafting connecting with 40 feet of 2½ inch cold rolled shafting. Is 2½ inch cold rolled strong enough? The shaft is to revolve 110 in a minute; how shall we determine the amount of power we are getting? 2. How many horse power do we require for two 4½ inches run of flouring burrs, and a 30 inches middlings, run with ordinary bolting, elevating, cleaning, etc? Answers: 1. Two and a half inches cold rolled shafting will probably carry the specified amount of power, but we should prefer 3 inches. 2. Thirty horse power should do the work if everything is in good order and lubrication well done.

W. F. says: For some time past I have noticed that iron castings molded in our shop have a different color after being cleaned; some of them have a blue color on the surface, and others are of a clear gray color. What is the cause? Those having the gray color are molded in sand mixed with pure Sydney coal for facing. I do not know what the blue ones have mixed with the sand, unless it is a small portion of Cumberland coal. A short time ago I saw a short editorial of yours on molding sand, and I hoped to have seen more on that subject. I would like to know how to mix the facings, blackening and other finish for molds. No workman seems to know; or if he does know, he does not care to tell a boy, who wishes to learn all the details of the trade. Answer: We are glad to hear from an intelligent and ambitious apprentice, and will try to help him. We presume that the Sydney coal blackening gave color to the metal by its ash, if it produced any change at all. The blue on other castings may be due to bituminous matter from the Cumberland coal. For black wash, mix char coal, plumbago and size with water enough to give the consistency desired. For small fine work, do not use blackening at all. Select fine, clean, sharp sand. For larger work blacking is necessary; black lead is least affected by heat, anthracite and charcoal next, and bituminous coal most. Blackening of anthracite or charcoal weakens the sand, and, if too fine, clogs its pores. Bituminous blackening opens the sand and weakens it, but if it is properly used, by an experienced molder, smooth castings are always obtained.

N. M. says: We have in our establishment the following machinery: Two rip and 2 cross cut saws, 1 planer and matcher, 1 tenoner, 1 scroll saw, 1 sticker, 1 shaper and 1 boring machine. For power, we have an engine, 10 inch bore, 8 inch crank, making 70 turns per minute. We have to carry 60 lbs. of steam, and even at that it is very hard work for the engine to drive the machinery; in fact, I cannot run the matcher and siding saw (which I run on a large saw table) together. Our boiler is 12 feet long x 40 inches diameter of shell, with 41 three inch tubes, firing underneath and returning through the tubes. 1. Do you think the boiler would make steam enough to run the engine up to, say, 120 turns per minute? Should a boiler of those dimensions make steam enough to run an engine of that size at that speed? 2. How is the heating surface of a boiler calculated, what is termed the grate surface, and what is the fire surface? I have twenty-four volumes of your paper bound, and money would be no temptation to part with it. Answers: 1. We should speed up the engine and also carry higher steam if convenient and safe to do so. Some benefit should be expected from both changes. 2. Measure the area of all surfaces of the boiler in contact with the furnace gases on the one side and water on the other. Thus a tube 4 inches diameter would be one foot in circumference, very closely, and would have a foot of heating surface for each foot of its length. The grate surface is simply the area of fire grate, and is measured by multiplying its length by its breadth. We are pleased to hear from our old friends and readers of such long standing.

J. H. says: I wish to construct a small steam engine and boiler, for the purpose of running a family sewing machine, for my wife, and wish to ask: 1. Will a plain cylindrical boiler, 6 inches diameter and 20 inches length, with cast iron heads ⅜ inch thick, having flange outwards for riveting to the boiler, constructed of sheet copper ⅛ inch thick riveted, give power enough to an engine of 1¼ by 3 inches cylinder? The motive power is to be a gas flame from an ordinary burner. 2. What pressure would such a boiler sustain before rupture? 3. What pressure would be required to run the sewing machine? 4. Where must the water line be? 5. What must be the size and stroke of the pump supplying the boiler, said pump being constantly in use? 6. What must be the size of opening for safety valve in boiler? 7. Will such a boiler and engine be safe? 8. Where must the opening in boiler be for the pump? Answers: 1. Yes, but the heating surface is too small for economy. We doubt if a single burner would give sufficient heat. 2. Without joint, it should sustain 1,500 pounds on the square inch. Actually, the riveted joint and possible weak spots in the metal would probably reduce its strength to about 750 lbs. We should set the safety valve on such a boiler at anywhere from 100 to 150 lbs. 3. We can only guess—20 lbs. The resistance would be quite as much, or more, in the engine itself as in the sewing machine. 4. A little above the middle line. 5. Three sixteenths, if of same stroke and number of revolutions per minute as the engine. 6. One quarter inch diameter. 7. Yes, as safe as any ordinary steam engine and boiler. 8. Near the back end.

G. E. B. asks how carbons for Bunsen batteries are made. Answer: In the manufacture of illuminating gas, the retorts become coated with amorphous carbon; from this retort carbon, or coke, the battery carbons are made. There are several processes; one is to cut it into shape, another is to press the pulverized coke into a mold, having first laid a strip of platina in the mold, so that the carbon will cast on it, the aim being to hold the material together with the least amount of cementing substance, as is the case in the manufacture of solid emery wheels.

D. C. M. asks for an explanation of the term "a horse power." Answer: See editorial pages of this issue.

W. A. C. asks: 1. How many gages of water should be carried in stationary tubular boilers, where the water used is clear and the force pump works well? Does it require any more fuel to drive the same machinery by carrying the water in boilers at first, second or third gages; and if so, what proportion does each gage take more respectively? 2. Forty lbs. pressure will give our machinery the required motion; how many lbs. would be advisable to carry to be economical? 3. Where it is necessary to transmit steam through pipe some distance, what is the best way to cover and pack the pipe, and what with? 4. What would be the loss in fuel in transmitting steam from boiler to engine situated 250 feet apart more than if close by? Answers: 1. The lower the water is carried, the drier the steam; the higher it is habitually kept, the safer against accidents from low water. In ordinary boilers we should carry six inches of water over the crown sheet. The gages should be so placed that the middle one should be at about that line. The lower should be above the level of the crown sheet. The higher the pressure and the drier the steam, the greater the economy, where boiler and steam pipe are well felted and lagged. 2. The amount of economy varies in every instance. Try it, if safety permits carrying higher steam. There is a pressure, giving maximum economy, which can only be determined by experiment. 3. Hair felt, for low temperatures, as of steam at 60 or 80 lbs., and for higher pressures, ashes, plaster, and the patent cements sold for the purpose, are effective as covering. 4. Properly covered, the loss from the steam pipe would be of little amount in the case mentioned.

A. L. K. asks: Is there any kind of an instrument by which a person can see an object in the dark, distinctly or nearly so? Answer: None except the lantern.

A. E. L. says: Will you give us a description of the steam engine indicator and the manner of using it? Answer: Consult Hamilton's "Useful Information for Railway Men," pp. 314-319, or see our reply to H. S. M.

G. H. M. asks: If rails and drive wheels of engine locomotives were toothed so that they could not slip, and two engines were built, similar in every respect with the exception that one locomotive had a 6 feet driver and the other a 3 feet, which locomotive will haul the biggest load? Answer: All other things being equal, the smallest drivers will pull the heaviest load.

J. W. S. asks: Will some one please inform me how I can get a thin coating of rubber on a solid object like a block of wood? Answer: Dissolve rubber in bisulphide of carbon and apply as a varnish.

H. E. N. asks: How is bird lime made, especially that which is very tenacious? Answer: Bird lime is made by boiling the middle bark of the European holly (*ilex aquifolium*), or the young shoots of elder, plants like misletoe, and other parasites, separating the gummy matter from the liquid and leaving it for a fortnight in a moist, cool place, to become viscid. It is next pounded into a tough paste, and washed, and put aside for some days to ferment. Some oil or thin grease is to be incorporated with it, when it is ready for use.

B. O. asks whether there is any known process of coating glass with gold from solution, similar to the process of silvering the same by precipitating metallic silver. Answer: Three solutions are required for depositing gold on glass: 1. 1½ drams caustic soda, 3½ ozs. water. 2. ½ dram grape sugar (glucose), 3 ozs. distilled water, 2½ ozs. alcohol of 80 per cent, 2½ ozs. aldehyde of sp. gr. 0·87. 3. Neutral solution of chloride of gold, ½ dram gold to 37 ozs. water. Take 4 volumes of No. 3, and 1 volume No. 1, mix and add $\frac{1}{16}$ of a volume of No. 2. Pour quickly into the hollow glass globe to be plated. Five minutes or more is required. Do not warm above 140° Fahr. Clean the glass with soda and alcohol, not with acids.

H. B. asks: How can I ascertain for myself whether a substance is lime or magnesia, or whether it is a mixture of both? If the latter, how can I get them apart? Answer: Lime, when in solution, gives with oxalate of ammonia a white precipitate. If lime and magnesia are to be separated, add to the solution some sal ammoniac, and afterwards oxalate of ammonia as long as a precipitate is formed. After filtering, add phosphate of soda, which will precipitate the magnesia if any be present.

C. R. asks: How are the eggs of the so-called Pharaoh's serpents made? Answer: Pharaoh's serpents' eggs are made by precipitating a solution of subnitrate of mercury with sulphocyanide of ammonium. Filter the precipitate; wash and dry and mix with every pound of the precipitate one ounce gum tragacanth, soaked in hot water. Make a somewhat dry pill mass, and roll in pellets of the desired size, and dry again. The fumes are dangerous and must not be inhaled.

J. B. S. says: I am building an aquarium, and want to know whether, in the use of the cement mentioned on page 202, of your current volume, it is intended that the glass shall be let into the wood, or can the cement come only to the glass, forming the joint of itself? 2. What is the best polish for black walnut, and how is it applied? Answers: 1. Use an angular beading of wood, outside the glass, and cement the edges of the glass into the angle. 2. See page 72 of our volume XXVI.

J. S. J. asks: Is there any friction gained by placing the rub of a wagon brake below the horizontal center on the front side of the wheel, or above the center on the rear part, instead of on any other part of the wheel? Answer: Not unless the pressure is, by that arrangement, increased.

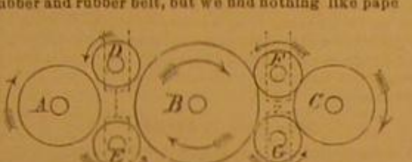
C. H. wants to know what sized boiler is wanted to run two cylinders of 2 inches stroke x ¾ inch bore, to make 200 revolutions per minute. How thick must the iron be for a small locomotive boiler, what diameter should the drive wheels have, and how many should there be on a side? Answer: Measure the sizes of the first locomotive that you can conveniently obtain access to; make all parts in proportion except the boiler, which should have a considerable excess of heating surface.

R. A. R. asks: How large pulleys should I use to run a 1 or 1¼ inches band saw over, of 16 gage? Answer: The larger the better; 30 inches is a good size.

J. F. W. asks: Will wood answer as a float in a steam boiler, in its natural state, or will any preparation better it for that purpose? I want it to operate a valve, and for certain reasons the common copper one will not answer. Answer: Wood in its natural state would answer for a time as a float. But we should not wish to trust it as a permanent float. We do not call to mind any preparation that would keep it waterproof under the heat and pressure of a steam boiler.

A. W. C. asks: Do galvanized sheet iron kettles impart, to food cooked therein, any poisonous or unwholesome properties? Answer: Zinc, with which the so-called galvanized iron is covered, is poisonous. Galvanized iron should not be used for culinary purposes.

J. & J. T. say: We have in view the building of a flouring mill, and we propose to drive the buhr spindles by friction. A rough sketch of the proposed plan is enclosed, and we wish to have your opinion about it. The dotted lines at each pair of pulleys show the edges of the pulley frame, which works in suitable slides, the pulleys being brought into gear by a short rope or chain fastened to an upright rod something like a hand brake on a railroad car. The bottom of the rod is to work in a slot so that both pulleys will have the same pressure, and a spring or weight will be arranged to take them out of gear. The pair on the right hand are in gear and the pair on the left are out. One great advantage will be that the driving pulley or engine need not be stopped to throw them in or out of gear. We propose making the small friction pulleys of disks or rings of thick paste or card board; we have used one now for more than a year to drive our saw mill carriage and it is quite true, smooth, and hard yet, and as good as when made. It surpasses anything we ever tried in our twelve years experience, and that alone has saved us far more than $3, the price of your paper, from which we got the idea of paper friction pulleys. Previous to that time we used iron, wood, rawhide, leather, rubber and rubber belt, but we find nothing like pape

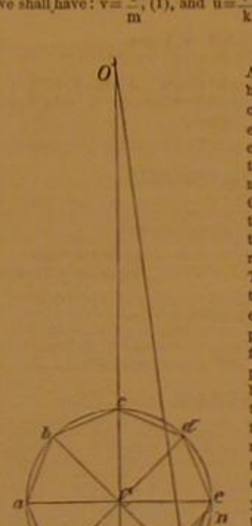


A, C, cast iron pulleys on burr spindles, each 3 feet diameter x 6 inches face. B, cast iron driving pulley, 4½ feet diameter x 6 inches face. D, E, F, G, paper friction pulleys, each 18 inches diameter x 6 inches face. Answer: The proposed arrangement promises well.

A. F., Jr., says: I have two Daniell's batteries, and I use diluted blue vitriol and pure water in the porous cups, and insert the zinc. I have never succeeded in getting but a slight current, and find that, after a few hours standing, the lower part of the porous cups are all coated with copper. What is the cause? Answer: If you use a saturated solution of sulphate of copper outside, to act on the copper, and nine parts of water to one part of sulphuric acid, inside the porous cup, to act on the amalgamated zinc, it will be at least a month before you are troubled with the copper deposit.

T. A. N. asks for information concerning the discovery of the ancient tablets pertaining to Scriptural history, and the name of the student who translated them into English. Answer: The translator is George Smith, of the British Museum. A full account may be found in the *Eclectic Magazine* for February, 1873, p. 201.

J. E. H. says: In accordance with your request that some reader would furnish solutions to the questions of E. C. M. and E. W. H., published in your issue of April 19, 1873, I submit the following solution to the question of E. C. M: Let w=5 lbs. and w′=6 lbs; and let sin. of 45°(= $\sqrt{\frac{1}{2}}$)=sin. i; then we shall have for the accelerative force, $f=[(w-w' \sin. i)\div(w+w')]\times g=[(5-6\times \cdot707107)\div(5+6)]\times 32\frac{1}{6}=2\cdot21476$. Hence, the distance the first body will descend in 10 seconds will be $t^2\times(2\cdot21476\div2)=100\times2\cdot21476\div2=110\cdot738$ feet, answer. The solution to the question of E. W. H. is: Let r=the distance of the point of application of the force, P, from the center of inertia of the body, k its principal radius of gyration, m its mass, v its progressive velocity, and u its angular rotary velocity. Then we shall have: $v=\frac{P}{m}$, (1), and $u=\frac{rv}{k^2}$. (2.)



R. L. B. says that A. McG., who asks how to get the bevel on the back of the rafters of an octagonal church spire, will find this diagram and explanation sufficient. Let C O represent the altitude of the spire from the base or foot of the rafters to their apex. Then f O will represent the length of the rafter. Through any two points between f e and f g draw the line p n perpendicular to the base line C f. From the point of intersection x, with the proper radius describe a circle tangent to the line f O. Through the point y, where the circle intersects the base line f C, draw the lines y p and y n; the angle p y n is the bevel sought. It will be observed that the angle p y n depends upon the length of C O and C f, or, in other words, the bevel depends upon the rake of the rafter.

H. M. W. says, in answer to W. W. C., who asked for a cement to fasten leather upon iron: 1. Use glue and gum ammoniacum; melt together, then add nitric acid. 2. Coat the clean iron with a hot solution of glue, and soak the leather in a warm infusion of nutgalls. Put both together and subject to pressure. 3. Put pulverized rosin to the flesh side of the leather and apply to the heated iron.

R. F. replies to J. G. K., who asked if acorns were edible; I would say that in the southern mining district of California, there are plenty of oaks that yield a very pleasantly tasted acorn. I presume they may be found on this side of the Rocky Mountains, but I never found them in the New England States. They are very pleasant eating, either raw or boiled, and seem to be very nutritious. Whether they could be used as food in a regular way is doubtful, because of the fact that they are of a stringent nature; and I believe that, when eaten raw, they are an excellent preventive of and cure for diarrhœa.

W. W. replies to T. E. B., who asked how to remove clinkers from stoves: Take an iron rod about half an inch in diameter, sharpened at one end to a point, and with a hammer, drive it through the clinker, at such distance from the side of the stove as not to injure the firebrick; having made one hole in this manner, repeat the operation at the distance of an inch from the first, and if the stove be a cylinder, make a circle of holes, when with a smart blow the center of the clinker can be broken away, and the other part will easily detach from the firebrick, the vibration caused by the hammering causing it to loosen.

H. M. W. says, in reference to artificial butter: The following two recipes will perhaps be of interest to your readers: 1. The London Lancet, 1858, p. 460, says: Sixty lbs. colza oil are put into a well tinned brass boiler (of about twice the capacity); add 2 lbs. potato starch and stir with a wooden spatula until the mixture begins to boil. Let the boiling continue for several hours until the oil has lost all disagreeable taste or smell. Decant and let cool. Add half its weight of clean suet. 2. The *Pharmaceutische Centralhalle*, vol. 5, p. 157, contains the following: 1 lb. mutton suet is melted with 9 ozs. of milk and strained; there is then added thereto 1½ lbs poppyseed oil. Heat with 2 ozs. of bread crust, ½ oz. mugwort and 2 sliced onions. Strain.

S. W. H. says, in answer to E. W. H., who asked what motion would be imparted to a body by a given force applied at one end, at right angles to its axis: My opinion would be that it would move in a direct line for ever, its axis remaining at right angles to the line of motion. Having no weight, it could have no inertia; and there being no resistance of air or anything else, if it were once in motion, it would always be in motion. The absence of inertia and all resistance would prevent the upper end from getting the start of the lower end. I know little of higher mathematics, and am perhaps entirely wrong, but give my ideas for what they are worth. Since impossible conditions are allowable in problems, I would like to ask E. W. H. what the result would be, should an irresistible moving body come in direct contact with an immovable body.

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

O. M.—The mineral you send contains silver.

A. O.—The composition consists of prussiate of potash, chlorate of potash and bichromate of potash.

COMMUNICATIONS RECEIVED.

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

On the Patent Office Surplus. By F. D. J.

On the Retardation of the Earth's Motion by the Tides. By J. H.

On Girdled Trees. By A. D.

On the SCIENTIFIC AMERICAN. By C.H.D.

On Solar and Sidereal Time. By J. E. H.

On Saw Teeth. By C. H. B.

On the Million Dollar Telescope. By A. D.

On Iron Shipbuilding in Philadelphia. By B. H. B.

On Light. By C. E. T.

On a Remarkable Astronomical Phenomenon. By J.

On Concentration of the Sun's Heat. By J. C. F.

On Boiler Explosions. By J. C.

On the Ransom Condenser. By W. C. D.

On Patents. By J. B. C.

On Deep Sea Soundings. By C. E. A

On Marine Carriages. By C. A. B.

Also enquiries from the following:

A. de W.—H. E. N.—J. McC.—J. E. H.—P. K.—L. L. B.—J. W. C.—J. M.

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

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

April 29, 1873,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Air brake, steam power, H. L. McAvoy	138,339
Atomizer bulb, H. D. Lockwood	138,416
Awning frame, window, J. A. Allen	138,224
Axle boxes, gage for setting, T. Scott	138,347
Bed bottom, M. A. Hunt	138,252
Bed bottom, spring, E. G. Sherman	138,348
Bed bottom, spring, W. Starke	138,446
Bed, cot, L. B. Morse, (r)	5,380
Billiard cushion, H. A. Alden	138,356
Bird cage, G. Günther	138,396
Blower, rotary, J. A. Svedberg	138,448
Boat detaching apparatus, C. A. Enell	138,386
Boat, life, E. A. Barrett	138,225
Boiler, wash, J. Reinig	138,285
Boiler covering, J. M. Allison	138,358
Bolt, door, S. D. Arnold	138,360
Book case, revolving, L. B. Pert	138,279
Boot and shoe shave, D. Harrington	138,328
Bottle filling apparatus, J. Matthews	138,421
Bottle for effervescing liquids, H. Codd	138,230
Bottles, mold for glass, C. D. Fox	138,323
Box, work, W. Brace	138,372
Bracket, L. Benecke	138,367
Brick machine, Hotchkiss & Wollston	138,251
Brick machine, R. A. Smith, (r)	5,390
Brush, blacking, Von Kessler & Mendenwald	138,333
Brush handles, driving, P. Peartree	138,344
Buckle, harness, J. L. Selleck	138,291
Calculating machine, G. B. Grant	138,246
Candle mold tip, I. Cole	138,380
Car axle box, S. F. Gates	138,242
Car axle box, W. J. Manker	138,265
Car coupling, E. H. Janney	138,405
Car, dumping, O. M. Avery	138,361
Car replacer, J. T. Baxter	138,311
Car spittoon, H. J. Zimmerman	138,464
Car spring, J. B. Quirk	138,433
Car starter, T. Cooper	138,233
Car starter, Rodier & Bates	138,440
Car truck, C. D. Tisdale, (r)	5,383
Car seat, folding, K. Egan	138,321
Carburetting air, Judd & Doty	138,409
Card rack, H. R. Van Eps	138,454
Carpet stretcher, P. Kelly	138,331
Carpet stretcher, C. Terry	138,450
Carriage, glass mold, Bennett *et al.*	138,308
Carriage spring, C. F. Hall	138,247
Carriage spring, J. D. Richardson	138,438
Carriage king bolt, J. L. H. Mosier	138,342
Cartridges, loading, T. L. Sturtevant	138,294
Cattle blinder, M. Backmayr	138,224
Chain links, making, E. I. Levavasseur	138,413
Chair, tilting, G. C. Winchester	138,461
Churn, rotary, F. E. Clarkson	138,229
Coal screen, S. W. Woodward	138,356
Coffee, coating, J. T. Cooke, (r)	5,383
Cooler, beer, F. Schmitt	138,289
Cooling rooms, etc., T. D. Kingan	138,411
Corn crib, Hughes & Mapes	138,332
Corpse preserver, P. Taltavull	138,449
Cotton chopper, Bailey & Bagby	138,363
Cradle, W. T. Doremus	138,320
Cultivator, C. Thede	138,451
Dental clamp, C. E. Blake	138,370
Dental engine, C. M. Curtis	138,318
Doors, threshold for, O. G. Thomas	138,300
Dredger, A. C. Both	138,227
Dredger, T. Symonds	138,296
Dress facing, W. H. Gallup	138,226
Dry goods stand, J. J. Bisel	138,226
Electrical apparatus, F. H. Varley	138,455
Electro magnetic coil, J. S. Camacho	138,3.6
Elevator, Mageean & Marks	138,337
Elevator, water, T. Bell	138,312
Engine governor, marine, O. Marland	138,420
Engine lubricator, W. R. Patterson	138,343
Engine, rotary steam, J. Lucas	138,334
Engine, rotary steam, W. C. Stiles	138,352
Fan, automatic, Reichhardt & Schnapp	138,345
Feather renovator, W. S. Groff	138,327
Fertilizer, S. Whitehill	138,458
Fertilizer distributer, D. F. Halliburton	138,394
File, J. B. Johnson	138,256
File, prescription, A. D. Foster	138,390
Fire arm, magazine, Rodier & Bates	138,439
Fire escape, W. Kegg	138,410
Fire kindling composition, J. C. Crumpton	138,382
Fork, horse hay, L. Harverstick	138,249
Fork, horse hay, T. Rhoads	138,286
Furnace, smelting, J. Neville	138,428
Furnace, puddling, J. Neville	138,429
Furniture polish, C. A. Libby	138,262
Gas apparatus, Brown & West	138,377
Gas fittings, etc., boring, M. Waltz	138,456
Gate, automatic, L. Filson	138,238
Gate, automatic, J. P. Ponce	138,283
Gear, friction, F. Simmons	138,444
Generator, steam, J. H. Mills	138,269
Hammer, power, J. Palmer (r)	5,381
Harvester knives, tempering, J. F. Shippey	138,349
Hat, J. O'Donnell	138,430
Hat wiring machine, etc., H. A. Whiting	138,459
Hatchway, J. D. Sinclair (r)	5,387
Heel rands, turning, Johnson & Moulton	138,257
Hinge, P. P. Lynch	138,336
Horse collar lining, D. Curtis	138,383
Inhaler, Hunter & Woods	138,253
Iron front for stone piers, J. Abbott	138,222
Ironing board, R. N. Herring	138,331
Joiner, universal, Raynard & Hatch	138,284
Key fastener, W. Neracher	138,272
Knife, corn, G. Stevenson	138,447
Knife, saw, and spring scale, J. Baggs	138,362
Ladder, extension step, L. B. Covert	138,234
Ladder, fire escape, C. H. White	138,304
Lamp filler, H. H. V. Lilley	138,415
Lamp, magnesium, I. S. & H. R. Russell	138,346
Lamp, paraffin, H. Ryder	138,441
Lantern, Connor & Hynes	138,232
Lathe boring attachment, F. B. Williams	138,460
Lathe dog, C. L. Wickham	138,305
Lathe for turning hubs, Wagner & Fry	138,303
Light house, floating, J. B. Stoner	138,292
Light house, floating, J. B. Stoner	138,293
Locomotive head light, L. Michaels	138,426
Locomotive recorder, J. D. Richardson	138,437
Log turner, J. C. Moore	138,270
Loom let off, Gahren & Langlotz	138,391
Lounge and bath tub, C. Wendel	138,457
Lubricator, J. Gates	138,243
Lubricator, W. Morris	138,341
Lubricator, J. A. Osenbrück	138,274
Lubricator, H. W. Regan	138,436
Lumber measure, F. S. Baldwin	138,310
Malt kilns, stirrer for, E. Schmidt	138,288
Match safe, C. H. Leggett	138,261
Mattress stuffing, F. A. Lane (r)	5,379
Mechanical movement, C. Meiners	138,424
Medical compound, J. Benda	138,313
Medical compound, G. Lucy	138,335
Medical compound, Phillips & Reid	138,282
Metal, separating, S. J. Peet	138,278
Metal stippling, R. Dimes (r)	5,378
Mill, fanning, J. W. Johnson	138,407
Mill feed regulator, J. C. Dunlap	138,384
Milling machine, B. Lawrence	138,260
Mitten, F. L. Oakley	138,273
Musical instrument, I. Fiske	138,389
Needle making, F. W. Mallett	138,419
Nut lock, L. J. Miller	138,268
Paper, H. E. Wagner	138,302
Pencil case, W. S. Hicks (r)	5,384
Petroleum, refining, A. Farrar	138,237
Photograph plate holder, H. T. Anthony	138,359
Photograph plate holder, W. Lewis	138,414
Piers, iron front for, J. Abbott	138,222
Pin hinge, Lyons & Abrahams	138,418
Planchets, cutting out, J. Lowe	138,264
Planing machine, L. Gould	138,244
Planing machine, J. P. Woodbury	138,462
Planter, corn, L. Lacey	138,259
Planter, hand corn, H. Gortner	138,392
Plaster for walls, Smith & Harris (r)	5,389
Plasterer's head support, T. T. Wright	138,463
Platform, dumping, W. W. Hinman	138,400
Plow handle, J. T. Raftery	138,434
Plow, wheel, F. Hasbrook	138,329
Press, E. B. Platt	138,432
Press, hydraulic wheel, G. A. Gray, Jr.	138,393
Press, lever cider, H. Peters	138,280
Pruning shears, M. C. Malone	138,338
Pruning shears, W. McCray	138,340
Pulleys, turning, G. A. Gray, Jr.	138,394
Pulverizing soil, A. C. Tower	138,301
Pyroxylin articles, J. W. Hyatt	138,254
Quilting frame, B. Blackstone	138,369
Railroad cattle guard, R. M. Yorks	138,306
Reflector, C. F. Jacobsen	138,255
Refrigerator, J. J. Bailey	138,364
Refrigerator building, W. M. Mixer	138,427
Regulator, mill feed, J. C. Dunlap	138,384

Rock and ore crusher, C. Forster 138,240
Row lock, T. Fearon 138,368
Sash holder, E. Knapp 138,258
Saw gage, circular, C. H. Uhner 138,458
Saw gumming machine, K. Weinberger 138,354
Saw set, J. G. Tattershall 138,291
Saw teeth, J. E. Emerson 138,236
Sawing machine, band, H. Silliman 138,443
Scale, bag holder, Budge & Russell 138,315
Screw and nut, S. J. Peet 138,277
Screws, forming, W. A. McCool 138,422
Screw rod, S. J. Peet 138,278
Screws, adjusting roll, R. H. Thomas 138,452
Scrubber, I. J. Emory 138,322
Seeder, broadcast, J. D. Huffman 138,303
Separator, middlings, H. P. Jones 138,408
Sewage, treatment of, F. Hillé 138,250
Sewing machine, D. H. Coles 138,281
Sewing machine, E. H. Smith (r) 5,388
Sewing machine cabinet, G. Range 138,435
Sewing machine folder, S. W. Wood 138,306
Sewing machine hemmer, E. Booth 138,371
Sewing machine cover, E. F. French 138,324
Sewing machine quilter, W. H. Heffley 138,399
Sewing machine thread cutter, A. M. Leslie 138,412
Shaft for vehicles, B. Schroder 138,442
Shingling bracket, L. W. Merriam 138,425
Snuff, packing, A. H. Pflock 138,281
Splints, cutting, C. P. & C. D. Clarke 138,378
Stereotype plate holder, F. Scholefield 138,290
Stock feeder, portable, J. M. Spencer 138,351
Stone, doublet, S. Bruhl 138,314
Stool, store, A. A. Murphy 138,271
Stove pipe shelf, W. B. Elliott 138,385
Stud, shirt, O. S. Thayer 138,399
Syringe, fountain, H. D. Lockwood 138,417
Table, H. W. Pearsall 138,431
Table, auxiliary, E. Johnson 138,406
Table leaf support, Abbott & Gibson 138,509
Thimble, W. P. Slensley 138,445
Thrashing clover, etc., I. T. Barton 138,366
Tool handle, W. H. McCoy 138,123
Torpedo, self-tamping, S. A. Briggs 138,373
Toy, C. Ball 138,365
Toy, Hubbard & Severance 138,401
Trap, animal, D. J. Owen 138,275
Treadle, G. B. Kirkaam (r) 5,385
Turbine wheel, D. B. Flint 138,239
Tweer, G. Harsch 138,548
Type, distributing, M. Gally 138,241
Tyre bending machine, E. E. Coleman 138,231
Vacuum pan, A. P. Brown 138,375
Valve, balanced, A. N. Hadley 138,397
Valve, balanced slide, A. O. Frick 138,225
Valve, slide, J. L. Brown 138,376
Vehicles, sign for, Clark & Lilliendahl 138,228
Veneers, perfecting, A. H. Allen 138,357
Vessel, liquid pressure, S. Marks 138,266
Wagon axle lubricator, W. Loewenstein 138,363
Wagon, dumping, O. Gunnuldson 138,395
Wagon, dumping, D. E. Haines 138,246
Wagon standard, J. L. Hudson 138,402
Washer, ore, T. Wren 138,307
Washing machine, Brooks & Hartzell 138,374
Washing machine, G. J. Colby 138,379
Washing machine, H. Dextor 138,319
Washing machine, E. Dickermann 138,235
Washing machines, G. W. Fagaines 138,387
Washing machine, D. W. Helfrich 138,330
Washing machine, J. Taber 138,296
Watches, winding click for, S. C. Smith 138,350
Water closet, P. C. Rowe 138,287
Water closet bowls, J. V. Mathivet 138,267
Wells, grab tool for oil, J. H. Luther (r) 5,386
Wheel, traction, O. Hyde 138,404
Wire and rope, stretching, R. L. Taylor 138,298
Wire brush, coiled, J. B. Christoffel 138,317
Wood, transferring grain of, J. R. Cross (r) 5,377

APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending, for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

21,915.—CASTING COPPER CYLINDERS.—F. Adams. July 16.
24,922.—ELEVATOR.—G. A. Betteley. July 16.
24,953.—MEAT CUTTER.—J. G. Perry. July 16.
25,061.—ELEVATOR.—O. Tufts. July 23.
25,148.—WEIGHING SCALES.—F. M. Strong, T. Ross. July 30.

EXTENSIONS GRANTED.

23,820.—MANUFACTURE OF WATCH CASES.—J. Boss.
23,835.—LAMP SHADE.—C. & A. C. Wilhelm.
23,826.—SKATE FASTENING.—J. Coe & W. B. Sniffin.
23,882.—ROOFING CEMENT.—N. A. Dyar.

DISCLAIMER.

3,333.—SKATE FASTENING.—J. Coe & W. B. Sniffin.

DESIGNS PATENTED.

6,613.—GLASS WARE.—T. B. Atterbury, Pittsburgh, Pa.
6,614.—KNOBS, ETC.—G. E. Bringman, Philadelphia, Pa.
6,615.—STAIR RODS.—W. T. Mersereau, Orange, N. J.
6,616.—LAMP STAND.—M. H. Mosman, Chicopee, Mass.
6,617.—HAMES TOP.—H. Beagle, Jr., Philadelphia, Pa.
6,618.—COOK STOVE.—M. M. Coppuck, Philadelphia, Pa.
6,619.—TOY SAVINGS BANK.—R. Frisble, Cromwell, Conn.
6,620 to 6,622.—HOT AIR REGISTERS.—E. A. Tuttle, Morristown, N. J.
6,623.—DOOR KNOBS.—G. W. White, New York city.
6,624.—DOOR BOLT PLATE.—G. W. White, New York city.

TRADE MARKS REGISTERED.

1,232.—NEEDLES.—Bridgeport Cold Swaged Needle Co. C*.
1,233.—FRILLINGS.—Browett & Co., Coventry, England.
1,234.—BRANDY BOTTLE.—Cazade *et al.*, New York city.
1,235.—SEALING WAX.—R. B. Dovell's Son, N. Y. city.
1,236.—BURNISHING INK.—Fletcher *et al.*, Lynn, Mass.
1,237.—MEDICAL OIL.—M. S. Goodrich & Co., Flint, Mich.
1,238.—PREPARED FLOUR.—Hopkins & Co., N. Y. city.
1,239.—OINTMENT.—F. H. Kimberley, Springfield, Mass.
1,240.—RAKE HANDLES, ETC.—Smith *et al.*, Galien, Mich.
1,241.—HARVESTER.—D. M. Osborne & Co., Auburn, N. Y.
1,242.—BLUING.—H. Sawyer, Chelsea, Mass.
1,243.—GAS BURNERS.—Mrs. A. H. Wood, Boston, Mass.

SCHEDULE OF PATENT FEES:

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

VALUE OF PATENTS

And How to Obtain Them.

Practical Hints to Inventors

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

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

HOW TO OBTAIN *Patents*

This is the closing inquiry in nearly every letter, describing some invention which comes to this office. A *positive* answer can only be had by presenting a complete application for a patent to the Commissioner of Patents. An application consists of a Model, Drawings, Petition, Oath, and full Specification. Various official rules and formalities must also be observed. The efforts of the inventor to do all this business himself are generally without success. After great perplexity and delay, he is usually glad to seek the aid of persons experienced in patent business, and have all the work done over again. The best plan is to solicit proper advice at the beginning. If the parties consulted are honorable men, the inventor may safely confide his ideas to them: they will advise whether the improvement is probably patentable, and will give him all the directions needful to protect his rights.

How Can I Best Secure My Invention?

This is an inquiry which one inventor naturally asks another, who has had some experience in obtaining patents. His answer generally is as follows, and correct:

Construct a neat model, not over a foot in any dimension—smaller if possible—and send by express, prepaid, addressed to MUNN & Co., 37 Park Row, together with a description of its operation and merits. On receipt thereof, they will examine the invention carefully, and advise you as to its patentability, free of charge. Or, if you have not time, or the means at hand, to construct a model, make as good a pen and ink sketch of the improvement as possible and send by mail. An answer as to the prospect of a patent will be received, usually, by return of mail. It is sometimes best to have a search made at the Patent Office; such a measure often saves the cost of an application for a patent.

Preliminary Examination.

In order to have such search, make out a written description of the invention, in your own words, and a pencil, or pen and ink, sketch. Send these, with the fee of $5, by mail, addressed to MUNN & Co., 37 Park Row, and in due time you will receive an acknowledgment thereof, followed by a written report in regard to the patentability of your improvement. This special search is made with great care, among the models and patents at Washington, to ascertain whether the improvement presented is patentable.

Reissues.

A reissue is granted to the original patentee, his heirs, or the assignees of the entire interest, when, by reason of an insufficient or defective specification, the original patent is invalid, provided the error has arisen from inadvertence, accident, or mistake, without any fraudulent or deceptive intention.

A patentee may, at his option, have in his reissue a separate patent for each distinct part of the invention comprehended in his original application by paying the required fee in each case, and complying with the other requirements of the law, as in original applications. Address MUNN & Co., 37 Park Row, New York, for full particulars.

Caveats.

Persons desiring to file a caveat can have the papers prepared in the shortest time, by sending a sketch and description of the invention. The Government fee for a caveat is $10. A pamphlet of advice regarding applications for patents and caveats is furnished gratis, on application by mail. Address MUNN & Co., 37 Park Row, New York

Design Patents.

Foreign designers and manufacturers, who send goods to this country, may secure patents here upon their new patterns, and thus prevent others from fabricating or selling the same goods in this market.

A patent for a design may be granted to any person, whether citizen or alien, for any new and original design for a manufacture, bust, statue, alto relievo, or bas relief, any new and original design for the printing of woolen, silk, cotton, or other fabrics, any new and original impression, ornament, pattern, print, or picture, to be printed, painted, cast, or otherwise placed on or worked into any article of manufacture.

Design patents are equally as important to citizens as to foreigners. For full particulars send for pamphlet to MUNN & Co., 37 Park Row, New York.

Trademarks.

Any person or firm domiciled in the United States, or any firm or corporation residing in any foreign country where similar privileges are extended to citizens of the United States, may register their designs and obtain protection. This is very important to manufacturers in this country, and equally so to foreigners. For full particulars address MUNN & Co., 37 Park Row, New York.

Canadian Patents.

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

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

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

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

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

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, although sometimes it may be dispensed with; or, if the invention be a chemical production, he must furnish samples of the ingredients of which his composition consists. These should be securely packed, the inventor's name marked on them, and sent by express, prepaid. Small models, from a distance, can often be sent cheaper by mail. The safest way to remit money is by a draft, or postal order, on New York, payable to the order of MUNN & Co. Persons who live in remote parts of the country can usually purchase drafts from their merchants on their New York correspondents.

Foreign Patents.

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

Copies of Patents.

Persons desiring any patent issued from 1836 to November 26, 1867, can be supplied with official copies at a reasonable cost, the price depending upon the extent of drawings and length of specification.

Any patent issued since November 27, 1867, at which time the Patent Office commenced printing the drawings and specifications, may be had by remitting to this office $1.

A copy of the claims of any patent issued since 1836 will be furnished for $1.

When ordering copies, please to remit for the same as above, and state name of patentee, title of invention, and date of patent. Address MUNN & Co., Patent Solicitors 37 Park Row, New York.

MUNN & Co. will be happy to see inventors in person, at their office, or to advise them by letter. In all cases, they may expect an *honest opinion*. For such consultations, opinions, and advice, *no charge is made*. Write plain; do not use pencil or pale ink; be brief.

All business committed to our care, and all consultations, are kept *secret and strictly confidential*.

In all matters pertaining to patents, such as conducting interferences, procuring extensions, drawing assignments, examinations into the validity of patents, etc., special care and attention is given. For information and for pamphlets of instruction and advice

Address

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

Advertisements.

RATES OF ADVERTISING.

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

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

BAIRD'S BOOKS

FOR

MILLERS, MILLWRIGHTS, MILL OWNERS, & ENGINEERS.

The Practical American Millwright and Miller. Comprising the Elementary Principles of Mechanics, Mechanism, and Motive Power, Hydraulic Motors, Mill Dams, Saw Mills, Grist Mills, the Oatmeal Mill, the Barley Mill, Wool Carding, and Cloth Fulling and Dressing, Wind Mills, Steam Power, etc. By David Craik, Millwright. Illustrated by numerous wood engravings and folding plates. In one vol., 432 pages. Price $5. By mail, free of postage.

The American Miller and Millwright's Assistant. By Wm. Carter Hughes. Illustrated. 12mo. $1.50

The Miller's, Millwright's, and Engineer's Guide. By Henry Pallett. Illustrated. In one vol., 12mo....$3.00

The Practical Millwright's and Engineer's Guide; or, Tables for Finding the Diameter and Power of Cogwheels; Diameter, Weight, and Power of Shafts; Diameter and Strength of Bolts, etc., etc. By Thomas Dixon. 12mo., cloth....$1.50

The Principles of Mechanism and Machinery of Transmission: Comprising the Principles of Mechanism, Wheels, and Pulleys, Strength and Proportions of Shafts, Coupling of Shafts, and Engaging and Disengaging Gear. By William Fairbairn, Bart., C.E., LL.D., F.R.S., F.G.S. Beautifully illustrated by over 150 wood cuts. In one vol., 12mo....$2.50

A Treatise on the Teeth of Wheels; Demonstrating the best forms which can be given to them for the purposes of Machinery, such as Mill work and Clock work. Translated from the French of M. Camus by John J. Hawkins. Illustrated by 40 plates. 8vo....$3

The Practical Draftsman's Book of Industrial Design, and Machinists' and Engineers' Drawing Companion. By Armengaud, Amoroux, and Johnston. 50 folio steel plates and 50 wood cuts. 4to....$10

Practical Hydraulics; a Series of Rules and Tables for the Use of Engineers, etc. By Thomas Box....$2.50

Hydraulic Motors. Translated from the French Cours de Méchanique Appliquée, par M. Bresse. By F. A. Mahan. Revised by D. H. Mahan, LL.D. One vol., 8vo....$2

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

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

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

PUNCHING PRESSES FOR SALE Cheap, several sizes, both Screw and Treadle, suitable for Tinners or Fruit Can Makers. All in good working order. For particulars, address H. EVERETT, No. 108 North Front Street, Philadelphia, Pa.

WOOD WORKING MACHINERY

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

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

An deutsche Erfinder.

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

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

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

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

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

Adresse:

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

NEW YORK EXPOSITION & MANUFACTURING CO.

Authorized Capital, $100,000—32, 34 & 36 Broadway—invite the co-operation of INVENTORS in their method of Exposition and Negotiation of Valuable Improvements. Circulars free on application. MANUFACTURERS and CAPITALISTS can find at the above address the most approved and reliable inventions of modern times, an interest in which can be secured on very liberal terms, either by partnership, royalty, absolute purchase, or, in some cases, for expense of patenting. Among others now offered are Klein's Artificial Whalebone, Holmes' Scales, Crosby's Burial Casket, Severgold's Clutch and Improvement in Iron Rolls, Budd's Sawing Machine, Plush's Journal Bearing, Stryker's Brick Machine, Weatherby's Steam Heating Apparatus, Crossman's Fishing Apparatus, Hopkins' Washer, Early's Rotary Engine, Rupp's Spring Helve, Washburn's Egg Holder, Simpson's Locomotive Heater, McGregor's Piano Action and Copula, Steven's Wheel Hub, Mercer's Travelling Crib and Needle Threading Reflector, Peabody's Crank Substitute, Heard's Ventilating Hat, and Bushnell's Tidal Wheel. Circulars, specifications, etc., of above sent by mail, or personal explanation cheerfully afforded to applicants.

T. COTESWORTH PINKNEY, SECRETARY. E. E. ROBERTS, PRESIDENT.

Machinery,

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

Cold Rolled Shafting.

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

Sturtevant Blowers.

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

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

Niagara Steam Pump.

CHAS. B. HARDICK,
23 Adams st., Brooklyn, 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.

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.

ONLY 10 CTS. for two numbers of the new illustrated paper. MY OWN FIRESIDE. A $5 Chromo and the paper only $1 a year. JONES & HADLEY, Publishers, 176 Broadway, N. Y.

ROPER HOT AIR

ENGINE COMPANY, 70 New Church St., New York.

Imitation Gold Watches and Clocks.

This metal has all the brilliancy and durability of Gold. Prices, $15, $20, and $25 each; Chains from $2 to $12. Sent C. O. D. by Express. Order six and you will get one free. Send stamp for an Illustrated Circular. Send postal order and we will send goods free of expense. Address COLLINS METAL WATCH FACTORY, 335 Broadway, N. Y. City.

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., 126 Chambers street, N. Y.
PIERCE & WHALING, Milwaukee, Wis.

WOODBURY'S PATENT

Planing and Matching

and Molding Machines, Gray & Wood's Planers, Self-oiling Saw Arbors, and other wood working machinery.

S. A. WOODS, { 91 Liberty street, N. Y.; 67 Sudbury street, Boston.
Send for Circulars.

Milling Machines.

STANDARD, UNIVERSAL, INDEX AND PLAIN. Send for illustrated catalogue to the BRAINARD MILLING MACHINE COMPANY, 115 Water St., Boston, Mass.

1,000,000 NAMES of residents in the towns of New York, Pa., Ohio, Mich., Ill. and Wis., just procured for private use, to address circulars. A copy will be furnished for a fair consideration. For parties desiring to advertise any specialty, such as Sewing Machines, Wringers, household utensils, agricultural implements, Western Lands, Nursery Stock, new inventions, etc., there is no means so effectual as to send a neatly printed circular direct to individuals. Address GEO. S. LEFFINGWELL, Box 117, Burlington, Iowa.

FOR SALE—A new first class horizontal Steam Engine, 25 horse power. SOUTH BROOKLYN STEAM ENGINE WORKS, Van Brunt, near Summit Street, South Brooklyn, N. Y.

ALCOTT LATHES, for Broom, Rake, and Hoe Handles. S. C. HILLS, 51 Courtlandt St., N. Y.

PAGE'S Water Flame Coal Lime Kiln, with coal or wood. No. 1 Soft White Lime or Cement, with use of water. C. D. PAGE, Patentee, Rochester, N. Y.

BOILERS AND PIPES COVERED

With "ASBESTOS FELTING;" saves twenty-five per cent. in fuel. Send for circulars.

ASBESTOS FELTING COMPANY,

Nos. 316, 318, 320, and 322 Front Street, New York. ☞ Asbestos in all quantities and qualities for sale.

WOOD-WORKING MACHINERY.

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

MILLERS AND GROCERS—Gray's Flour and Yeast Company, 60 West 42d St., New York, Manufacturers of Gray's Pure Hop Yeast Powder, for Family and Millers' use, owners and grantors of Patent Right of manufacture of Pure Hop Yeast, Self Raising Flour, and Gray's Superior Family Flour. Agents Wanted. Samples and circulars, 25c. Gray's Wheat and Yeast Feeder.

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.

BUERK'S WATCHMAN'S TIME DETECTOR.—Important for all large Corporations and Manufacturing concerns—capable of controlling with the utmost accuracy the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular. J. E. BUERK, P. O. Box 1,057 Boston, Mass.

N. B.—This detector is covered by two U. S. Patents. Parties using or selling these instruments without authority from me will be dealt with according to law.

RICHARDSON, MERIAM & CO. Manufacturers of the latest improved Patent Daniels' and Woodworth Planing Machines, Matching, Sash and molding, Tenoning, Mortising, Boring, Shaping, Vertical, and Circular Re-sawing Machines, Saw Mills, Saw Arbors, Scroll Saws, Railway, Cut-off, and Rip-saw Machines, Spoke and Wood Turning Lathes, and various other kinds of Wood-working Machinery. Catalogues and price lists sent on application. Manufactory, Worcester, Mass. Warehouse, 107 Liberty st, New York. 17

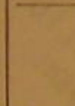
12 Samples sent by mail for 50 cts., that retail quick for $10. R. L. WOLCOTT, 181 Chatham Square, New York.

CHAMPION SPRING MATTRESS—The latest and best improvement. Do you want a healthy and comfortable bed? Here it is. The softest, easiest, cheapest, most popular, and durable Spring Bed in market. Sold by all leading dealers. No stock complete without it. Wholly composed of tenacious tempered steel springs, so united that the pressure is equally distributed. Easily moved or carried about the house. Can be lifted, turned, or rolled up like a blanket. Both sides alike. No frame, no wooden slats, no straps. May be used on floor without bedstead. No under bed required. Needs only half thickness of hair mattress. The regular size double bed, 4 ft. 6 in. by 6 ft., contains 192 tempered steel upholstery springs and weighs only 25 lbs. More springs for your money in this bed than in any other. Warranted noiseless. Any sizes made to order. Send for pictorial circular. Retail price of double bed, $13. Shipped, by single bed or quantity, to all parts of the world. Liberal discount to the trade. Agents wanted. F. C. BEACH & CO., Makers, 102 Chambers St., cor. Church New York.

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

HYDROFLUORIC ACID.

We are the largest makers in this country, and purest article. L. & J. W. FEUCHTWANGER, 55 Cedar St., N. Y.



IMPROVED FOOT LATHES, Slide Rests, Hand Planers, Scroll Saws Superior to all others. Selling every where Catalogues free.
N. H. BALDWIN,
Laconia, N. H.

WANTED! Agents to sell our Rubber Stamps and other Novelties. Address U. S. MANUFACTURING COMPANY, 97 W. Lombard St., Baltimore, Md.

WORKING CLASS MALE OR FEMALE, $60 a week guaranteed. Respectable employment at home, day or evening; no capital required; full instructions and valuable package of goods sent free by mail. Address with 6 cent return stamp, M. YOUNG & CO., 16 Cortlandt St., New York.

BUILDERS, Dealers, and Users of Wood-bending Machinery, patented or not, since March, 1866, unauthorized by the Morris & Heywood Timber Bending Co., can effect amicable settlement by prompt application. Licenses granted; Machines for sale. S. M. BARRETT, Pres., cor. Walnut & Front Sts., Cincinnati, Ohio.

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. Liberty st., New York.

OTIS' SAFETY HOISTING Machinery.

OTIS, BROS. & CO.,
NO. 348 BROADWAY, NEW YORK.

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

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

MACHINERY, NEW and 2d-HAND.—

Send for Circular. CHAS. PLACE & CO. 60 Vesey st., New York.

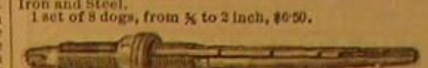
Andrew's Patents.

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

NEW & IMPROVED PATTERNS.—MACHINISTS' TOOLS—all sizes—at low prices. E. & R. J. GOULD, 103 N. J. R. R. Ave., Newark, N. J.

GREAT REDUCTION IN PRICES

OF LE COUNT'S PATENT HOLLOW LATHE DOGS, and his Machinist Clamps of both Iron and Steel. 1 set of 8 dogs, from ⅜ to 2 inch, $6·50.



His expanding Mandril is a first class tool which has long been needed by every Machinist. Send for latest circular.
W. LE COUNT, South Norwalk, Conn.

THE CANADIAN PATENT OFFICE RECORD AND MECHANICS' MAGAZINE, Published Monthly, contains: 1. Short claim and Diagram of every invention patented in Canada during the month, furnished by the Canadian Patent Office and published officially. 2. Original and selected articles on every branch of Engineering, Mechanics and Manufactures, profusely illustrated. The whole forming a handsome do pamphlet of 60 to 80 pages monthly, and a volume of 850 pages annually. Invaluable to inventors, mechanics, manufacturers, architects, builders, chemists and others. Two Dollars, U. S. currency, payable in advance, cover one year's subscription, including Canadian postage. Only $2 per annum. Inventors and manufacturers will find this magazine the very best medium for advertising. Rates low, being only 12 cts. per line, and $1.50, U. S. currency, per inch space each insertion. Illustrations of important inventions inserted at special rates by contract. The "Scientific American" of April 19th, speaking of this publication, says: "A new publication, under the above title, has been recently commenced at Montreal, Canada, by the well known publisher, Mr. George E. Desbarats. It embodies an official list of all patents granted in Canada, with the claims and reduced diagrams of the drawings. Added to this is a department of miscellaneous information, consisting of illustrations of recent interesting discoveries, general scientific news, &c. The whole forms a valuable publication, which reflects the highest credit upon its enterprising publisher, and deserves success." Send your address, with $2 for one year's subscription, to GEORGE E. DESBARATS, Publisher, Montreal, Ca.

REYNOLDS'

Turbine Water Wheels.

30 years' experience enables me to excel in Gearing Mills of all kinds, and furnishing them **reliable**, economical power. Scientific pamphlet free. GEO. TALLCOT, 96 Liberty Street, New York.

PATTERN & BRANDING LETTERS—SHARP, Flat or Rounding Surfaces—Large stock. PAVEMENT Letters, suitable for ARTIFICIAL STONE-WORK. VANDERBURGH, WELLS & CO., 18 Dutch, cor. Fulton St., New York

---

PROSPECTUS

OF THE

SCIENTIFIC AMERICAN.

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

The Best Mechanical Paper in the World!

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

To the Mechanic and Manufacturer!

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

Chemists, Architects, Millwrights and Farmers

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

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

TERMS.

One copy, one year	$3.00
One copy, six months	1.50
One copy, four months	1.00
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress"	10.00
One copy of Scientific American for one year, and one copy of "Science Record," for 1873	4.50

Remit by postal order, draft or express.

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

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

MUNN & CO.,
37 PARK ROW, NEW YORK.