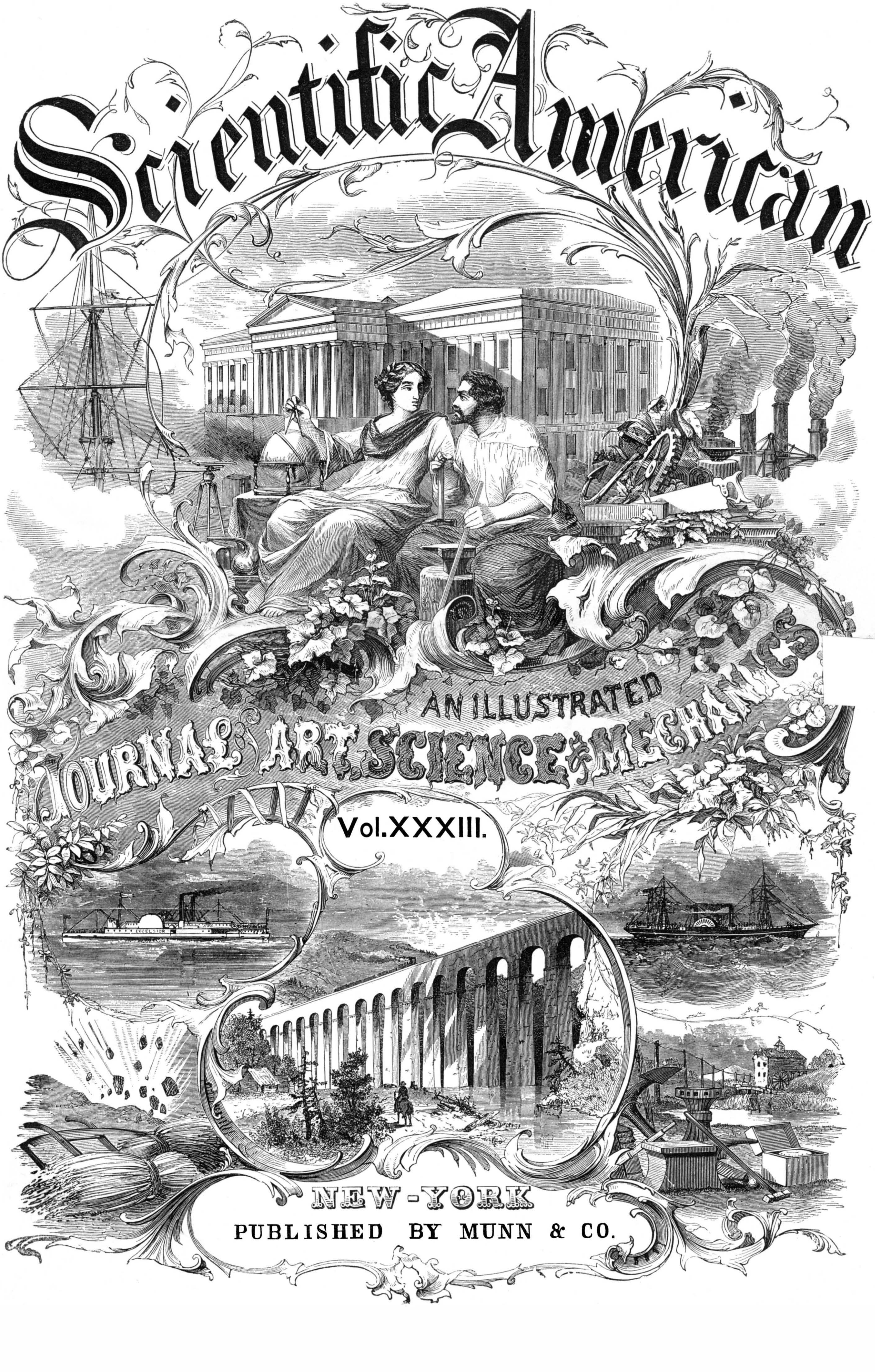

Scientific American
AN ILLUSTRATED
JOURNAL OF ART, SCIENCE & MECHANICS
Vol. XXXIII.
NEW-YORK
PUBLISHED BY MUNN & CO.

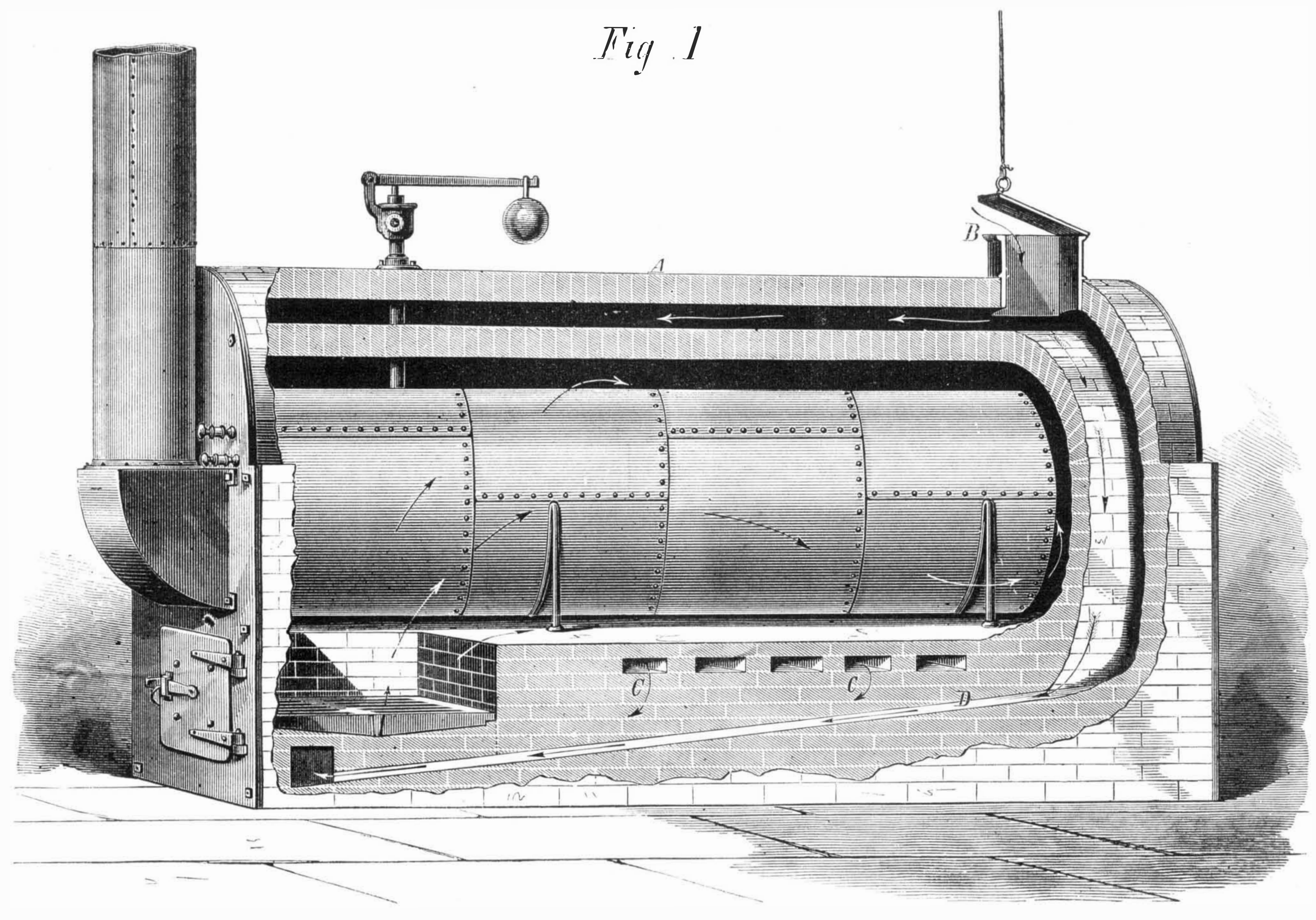
SCIENTIFIC AMERICAN

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

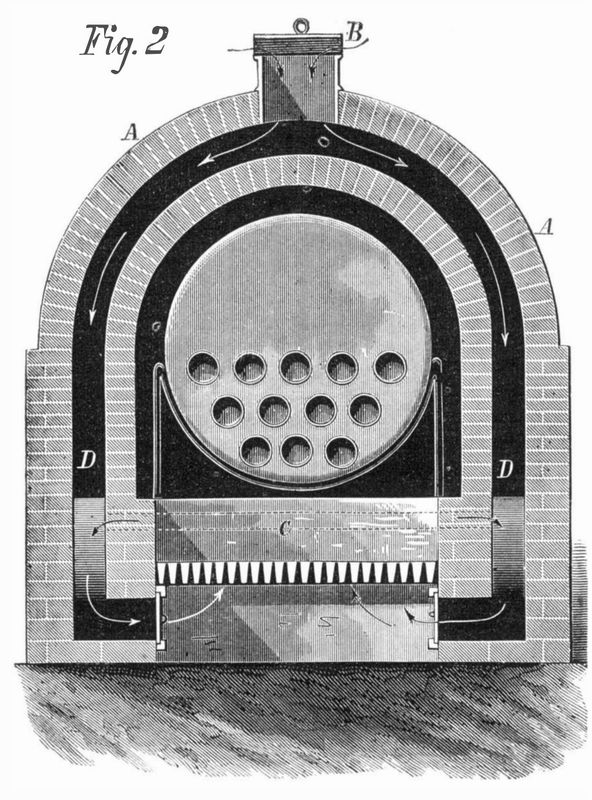
Vol. XXXIII.—No. 1.] [NEW SERIES.] NEW YORK, JULY 3, 1875. [$3.20 per Annum, [POSTAGE PREPAID.

HOT DRAFTS FOR STEAM BOILER FURNACES.

If cold air be injected into a furnace, it absorbs a large quantity of heat by its great increase of volume by the heat of the furnace; but if the draft be admitted hot, then it is already expanded to a degree corresponding to its increased temperature, and consequently it abstracts a less quantity of heat from the ignited fuel. A saving of fuel, it is evident, may thus be effected in proportion as the temperature of the air is the complement of that in the furnace, provided such air be warmed by the waste heat of the furnace itself. The percentage of fuel gained in each case depends on the degree of temperature of the draft as compared with that of the furnace; in other words, for example, if the heat in the fire box be 2,000°, and that of the alimentary air 300°, then a saving of 25 per cent will be realized. These facts underlie the widespread employment of the hot blast in metallurgical operations. It is the object of the inventor, in the device herewith illustrated, to apply the same, by simple arrangements, to the steam boiler (and in so doing to utilize the heat which is radiated, from the generators as ordinarily set, and so lost, or serves only to render the fire room uncomfortable) to heat the incoming draft. This he does by conducting the air, through suitable compartments, to the boiler setting, and ultimately through orifices under the grate. No modifications of the boiler itself or of the fire box are required, and the system is applicable to any type of generator.



KEYES' IMPROVEMENT IN STEAM BOILER SETTING.



A is the bonnet or outer shell, in the rear upper portion of which is the opening, B, into which the air enters to the chamber formed between said shell and the upper part of the boiler, or the brickwork covering the latter, if the top be arched over. Directly beneath the boiler, in rear of the fire box and in the masonry, are formed transverse flues, C, which open at each end into longitudinal flues, D. These last are simply passages in the bed brickwork at each side, the bottoms of which shelve downward until their outer ends are nearly on a level with the ash pit floor, and finally communicating with the ash pit, as above stated, by suitable orifices a little below the grate.

It will be seen that the chamber, B, and the flues, C and D, are practically one compartment, in which the heat radiated from the boiler, from all sides, is confined by the shell, A. As the air which passes up through the grate traverses the boiler and makes its exit from the chimney in the ordinary way, it is obvious that there will be a constant current entering at B, and having its course as already described, and that said current, through its contact with a large area of hot surface, must become heated to a considerable degree. It may be further noted that this modification of the setting necessitates no change in the ordinary practice of starting fires, as, while the single door which closes both fire box and ash pit is open, the draft will be taken from the outside as usual. The moment, however, the door is closed, the hot draft is established, and, save for supplying fuel or cleaning, there is no need of opening the door while steam is up, as the fire can be easily governed by a damper on the air supply orifice, B. The immediate result is a cool fire room, since but little heat can be radiated into the apartment.

We are informed that thirty boilers have already been set after the plan of this invention, and the testimonials of several well known concerns using them indicate a saving of one third the fuel previously employed. One firm asserts that it uses 4,000 lbs. less of coal per week in a boiler thus set than in a precisely similar generator, placed directly beside the former, but set in the ordinary manner. Other writers bear witness to a similarly large economy. Judging from the general construction of the invention, its application to the boiler need not be costly, since it consists principally of simple changes in the masonry; while its value to all steam users, if the testimonials above mentioned may be credited, must necessarily be great. The advantage offered of a cool fire room is likewise of especial importance on sea-going steamers, and particularly so upon ironclads of the Monitor type, where the heat is often extremely oppressive and the ventilation inadequate. The invention, we are informed, may be adapted to locomotives, thus utilizing the large amount of heat which is radiated from the boilers, however well they may be felted and lagged.

Patented November 11, 1873. Reissue now pending through the Scientific American Patent Agency. For further particulars, address the patentee, Mr. Samuel Keyes, Bennington, Vt.

Copper Alloy that will Adhere to Glass.

The following alloy of copper will attach itself firmly to surfaces of metal, glass, or porcelain: Twenty to thirty parts of finely blended copper (made by reduction of oxide of copper with hydrogen or precipitation from solution of its sulphate with zinc) are made into a paste with oil of vitriol. To this seventy parts of mercury are added and well triturated. The acid is then washed out with boiling water and the compound allowed to cool. In ten or twelve hours, it becomes sufficiently hard to receive a brilliant polish and to scratch the surface of tin or gold. When heated it is plastic, but does not contract on cooling.

A New Use of the Sand Blast.

The producing, upon plated ware or silver, of a lusterless very finely grained surface, termed by the trade satin finish, has heretofore been accomplished by the use of swiftly rotating brushes made of fine wire. Messrs. Simpson, Hull, & Co., of Wallingford, Conn., have recently found that the sand blast performs this stippling work much more rapidly and effectually, and have introduced the necessary apparatus for its employment in their large silver-plate manufacturing establishment. From Mr. W. E. Hawkins, a gentleman connected with the above concern, we learn that air is compressed by the driving engine of the works into an ordinary reservoir, and thence distributed through pipes which extend along the front of the workmen's tables; and above the latter is a sand receptacle, V-shaped, from which a stream of sand falls, and is met by a downward blast from the pipe, which current drives the material in a stream through a small hole in the table, beneath which a receptacle to receive the sand is placed. The workman, whose fingers are covered with rubber to protect them, holds the article in the jet and under the table, watching it through a pane of glass let into the top of the latter. The operation is necessarily very rapid, as the article has only to be turned so that the blast strikes the required portions, when the work is completed.

The exposure to the jet, even for an instant, would cut through the Britannia, upon which the plating is afterward deposited. By the interposition of rubber screens of suitable shape, against which the sand has no abrading effect, any fancy patterns or letters are easily imprinted on the surface, the latter of course being satin-finished, while the spaces protected by the screens are afterwards burnished. The screens or patterns are cut out by girls, of whom numbers are employed for that purpose.

Twisting Iron by Electricity.

The remarkable phenomenon, first observed by Professor Gore, which consists in the very perceptible twisting of a bar of iron by the joint effects of currents of electricity passing longitudinally through and also around such a bar by means of the insulated wire of an enveloping helix, has been further investigated. Subsequent experiments have shown that such twisting may be made to reach fully one quarter of a revolution. It has also been ascertained that both currents are necessary to the development of the phenomena. Either current, when applied separately, simply produces the effects of magnetizing the bar. The direction of the twist is definitely related to the direction of the current in the helix. In order to produce the fullest effect, the currents must be simultaneous. When they are successive, a perceptible twist results in a lesser degree.

BENDING HEAVY IRON.—It is now possible, by the aid of hydraulic machinery, to bend iron shafts of 12 inches in diameter to any desired shape. Incredible as this statement may seem to some, crank shafts are now so made, instead of by the slow, laborious, and expensive method of forging. The bent shafts are also said to be much better than forged ones, from the fact that the fiber of the metal runs in one direction continuously, whereas in forged one it is often across the line strain.

IRON IN THE CENTENNIAL BUILDINGS.—The quantity of iron to be used in the construction of the Centennial buildings will aggregate about 6,000 tuns, of which more than five sixths will be wrought

Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

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

TERMS.

One copy, one year, postage included..$3 20

One copy, six months, postage included..1 60

Club Rates:

Ten copies, one year, each $2 70, postage included....................$27 00

Over ten copies, same rate each, postage included.....................2 70

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

NOTE.—Persons subscribing will please to give their full names, and Post Office and State address, plainly written, and also state at which time they wish their subscriptions to commence, otherwise the paper will be sent from the receipt of the order. When requested, the numbers can be supplied from January 1st, when the volume commenced. In case of changing residence, state former address, as well as give the new one. No changes can be made unless the former address is given.

VOLUME XXXIII., No. 1. [NEW SERIES.] *Thirtieth Year.*

NEW YORK, SATURDAY, JULY 3, 1875.

Contents.

(Illustrated articles are marked with an asterisk.)

CREMATION IN THE HOUSEHOLD.

For several weeks past, the daily papers of this city, how ever diverse their views on the currency, the tariff, and the next election, have exhibited a delightful unanimity in condemning the method employed in filling in the Harlem flats. Indeed, they have made such an outcry that at last the Board of Health have shown a little interest in the matter, and have applied disinfectants in some of the worst localities.

Our readers may depend upon it that the nuisance created by using garbage for filling in sunken lands was one of unusual magnitude, as it united all the daily papers in condemnation. As a general thing, when one of the great dailies of this city makes a discovery of local corruption or incompetence, all the other papers hold aloof and have nothing to say about it. It is only when the discovery is one of very great importance that the other papers consent to take part in its discussion and thorough development. For instance, if a contractor, in filling a tract consisting of three or four lots, should skillfully mingle a quantity of garbage with the earth and ashes, it must be difficult to excite much popular indignation at his conduct. It is, of course, a happy circumstance that the daily press is independent enough to endeavor to correct great local abuses, and anything but pleasant to find that the Board of Health need to be told by the papers that great abuses need correction. It is a reasonable inference, from the foregoing, that the Board of Health do not correct similar nuisances when they do not excite public attention; so that probably there are hundreds of lots, all through the city, in which the filling up to grade has been done with a very miscellaneous description of materials. It is pretty evident, also, that contractors, if left to themselves, can scarcely be trusted to make a thorough separation of ashes and garbage, in selecting the materials for grading. So that, as long as ashes and garbage are placed on the sidewalks by families, it is probable that they will be transferred to sunken lots, to form the foundations not only of future residences, but of discomfort, disease, and death. What, then, is to be done? The answer seems obvious. The garbage causes the trouble, and will continue to cause it, as long as it is put out by families for removal; cut off the supply, or allow no garbage to be deposited on the sidewalks. Such an ordinance can readily be enforced by the inspection of the police; and we believe the Board of Health have ample power to make a regulation of this character. But if the garbage is not carried off, what becomes of it, it will be asked. And this brings us to the subject indicated by the title of our article. As fast as the garbage is formed, throw it into the fire, and let it be consumed. A famous housekeeper said to us the other day: "My cook burns up everything that is not eaten or given to the poor, so that nothing is put into my ash can except ashes and broken crockery." We had not given much attention to the subject before; but we discovered, by inquiry and experiment, that the statement was perfectly correct, and that it was always easy and often profitable, while it is certainly desirable, to deposit in the ash can, so far as the garbage is concerned, nothing but the ashes of the garbage.

TAINTED MEAT.

Thirty-nine tuns of meat were condemned as unfit for food in this city during the year 1874; and it is probable that, under the somewhat lax system of inspection which here prevails, this amount was but small compared with that which found its way from the hands of the retailing butchers, principally to the poorer classes. While it is known that certain races of people habitually eat meat in a high state of putrefaction, with impunity so far as immediate deleterious effects are concerned, it is well settled that the individuals are, as a rule, weak and possessed of slight power to resist disease. The weight of authority points to the fact that bad meat, no matter in what form consumed, is productive of illness, the mild symptoms of which are lassitude, headache, dullness, indigestion, and loss of appetite; while severe attacks are characterized by vomiting and typhoidal indications.

In a recent English health report, it is asserted that, although it may be difficult to prove the fact by actual cases, there can be no doubt that unwholesome meat is one cause among many of the poverty of blood and intractable maladies of the poor, who flock to the dispensaries during the hot weather. Especially in summer is it a cause of diarrhœa; and instances are cited of both typhus and typhoid fevers being traced to its effects. In appearance, tainted meat is generally of a pinkish hue and more than ordinarily slippery to the touch; and the fat is very soft and yellow. In advanced stages, the odor is disagreeably apparent. Shrinkage in cooking, often to the extent of twenty-five per cent, is also another indication.

We have little doubt but that a large percentage of the bad meat sold in New York city is due to the filthy state of many of the slaughterhouses. We recently visited two or three representative shambles, located directly in rear of a number of first class dwellings, and in close proximity to a thickly populated tenement district. The odors which we traced to them were foul and sickening, and pervaded the vicinity over a considerable radius, almost constantly. Unless there be absolute cleanliness in such places (which, in fact, should not be allowed to exist near residences of any kind), the putrid emanations are sufficient in themselves to taint the meat kept in them, or even exposed for sale in the neighborhood. A late report of the Medical Officer of the Privy Council of Great Britain especially dwells upon the fact, and also states that even a low temperature will not serve as a protection to the meat against contamination

Along the rivers on both sides of this city there are several slaughterhouses which form a standing nuisance as well as a source of danger to the residents of the neighborhood; and why the private interests of their owners should be allowed to override the considerations of sanitary welfare of the community—a fact indicated by the apparently flourishing condition of the establishments, and their permanence, despite repeated complaints—is a question which the public looks to the health authorities to answer. At all events, the probable effect of such places, upon the meat prepared in them, is worth serious consideration by the owners of the cattle, as well as by consumers generally. If the latter would take the trouble to find out where their butchers obtained supplies, and would refuse to purchase meat killed in shambles known to be unclean or ill smelling, and if the former would refuse to send stock to such slaughterhouses, remedies both for tainted meat and bad odors would soon be forthcoming.

RIGHTS OF EMPLOYER AND EMPLOYED IN RESPECT TO A NEW INVENTION.

In the case of the Evans Paper Collar Patent, reported in another column of this issue, the Supreme Court of the United States decides as follows in respect to the rights of employers and employees, touching the proprietorship of new inventions:

Where a person has discovered a new and useful principle in a machine, manufacture, or composition of matter, he may employ other persons to assist in carrying out that principle; and if they, in the course of experiments arising from that employment, make discoveries auxiliary to the plan and preconceived design of the employer, such suggested improvements are, in general, to be regarded as the property of the party who discovered the original principle, and they may be embodied in his patent as part of his invention. Doubt upon that subject cannot be entertained.

But persons employed as much as employers are entitled to their own independent inventions: and if the suggestions communicated constitute the whole substance of the improvement, the rule is otherwise, and the patent, if granted to the employer, is invalid, because the real invention or discovery belongs to the person who made the suggestions.

THE KEELY MOTOR DECEPTION.

Newspapers, from all parts of the country, come to us daily, laden with long accounts of the wonderful things that are to be expected from the astounding Keely motor discovery, which is to supersede steam power, hot air, electricity, gravitation, chemical affinity, and other laws of Nature. This is not the first time that the readers of the SCIENTIFIC AMERICAN have seen all these things done—on paper. Nor is it the first time that learned professors, like Rand, experienced civil engineers like Haswell, or good practical mechanics like Sergeant, Wood, and Boekel, have been deluded into the support of strange deceptions like Keely's. But these gentlemen have only temporarily lost their common sense on this one subject. It will return to them again in due time.

In fact, there are indications that Professor Haswell is already recovering, and the others, no doubt, will soon follow. Only those who invest their money will experience permanent loss.

In our paper for May 2, 1874, in an article on the Keely motor, we printed the following extract from the company's pamphlet:

"The following named gentlemen have witnessed the exhibition of the above tests, and may be referred to for the correctness of this statement: Charles H. Haswell, civil and marine engineer, New York city, and formerly Engineer-in-Chief, U. S. N.; William W. W. Wood, Chief of Bureau of Steam Engineering, U. S. N., Washington, D. C.; S. Parrish, gas engineer, Jersey City, N. J.; Joseph Patten, engineer, Elizabeth, N. J.; F. Glocker, machinist, Philadelphia, Pa.; William Boeckel, machinist, Philadelphia, Pa.

In connection with the foregoing statement, a professional report is given in the pamphlet, by Mr. Haswell, one of the referees mentioned above. He certifies, as the results of two actual working trials of the invention, as follows:

'Mr. Keely developed a cold vapor of a density that enabled it, when admitted to a cylinder having a piston $1\frac{1}{16}$ inches in diameter, to raise a weight of 150 lbs. suspended from a compound lever, connected as 1 to 42, which, with the weight of the lever and the friction due to the absence of a knife-edge or rotating joint, was fully equal to an energy of 7,800 lbs. per square inch.'"

Mr. Haswell was, at that time, professionally employed to test and report upon the new motor, and did so, as above reported. But the above is only a small portion of his report, which goes into the other details of the motor, not necessary here to mention, because they are based on statements made to him by the inventor. The portion given above, however, was the result of his personal observations in 1874. Mr. Haswell, having allowed his report of 1874 to stand, together with our comments thereon, without the least objection, for over a year, before the public, at last begins to see the absurdity of the matter, and now sends us, June, 1875, the following communication:

To the Editor of the Scientific American:

I am advised that, in the last number of your paper (June 26, 1875), I am referred to as having, with others, endorsed the alleged capacity of the invention of Mr. J. W. Keely, known as the Keely motor.

If you will point out wherein I have ever expressed an opinion of the integrity of the claims of Mr. Keely, of the foundation of which I am wholly uninformed, I shall be interested to learn of it. Respectfully,

CHAS. H. HASWELL.

New York, June 17, 1875.

He also publishes the following, in the New York *Sun:*

MR. HASWELL ON THE KEELY MOTOR.

To the Editor of the Sun—SIR: In an article in your issue of this morning you imply that I have endorsed the integrity of the Keely motor. As I am wholly uninformed of the foundation upon which Mr. Keely bases his claims, I have never expressed an opinion thereon. I am, respectfully,

June 17, 1875. CHAS. H. HASWELL.

The republication above, from Mr. Haswell's certificate, will, we presume, give him the information he now desires.

THE SEARCH FOR THE POLE.

The British Polar Expedition has sailed from Portsmouth amid salvos of artillery, cheers from congregated thousands, and other grand displays of official and popular enthusiasm. Until the vessels reach Disco, when Mr. Clement Markham will leave the party and return to England with a report of the prospects and general probabilities of success, as far as can be gathered from appearances at that far northern point, we shall have no tidings; and after that time, until the lapse of the three years allowed to the enterprise, the fortunes, good or bad, of the expedition will likely remain unknown. There is great hope, this time, as to the ultimate success of the attempt. Never before have ships started on any voyage of discovery so completely fitted out with everything which Science could suggest or experience counsel as these two quondam whalers; nor has any previous expedition been projected under that rigid military discipline for the lack of which Hall failed, and which, in the present case, will be maintained by officers already thoroughly conversant with the nature of the task before them, and the causes which have led to its non-accomplishment by their predecessors.

The Alert and Discovery are to proceed to Smith's Sound, taking the route by which Hall reached the furthest point of north latitude yet attained. It may easily be argued that, if the last mentioned commander, in a vessel wretchedly prepared for the work, could reach 82° 16′ N. latitude, and then be foiled in further attempts to push onward, not through any fault of his ship, but through dissensions in his crew, there is every reasonable probability that the English ships will have no serious obstacles to encounter in steadily advancing until the open sea, which the peculiar glistening haze (seen above the ice mountains by Dr. Kane's mate from the masthead) indicates, is reached. Then three millions of square miles of water, possibly a frozen continent, unvisited by living things from the lower world, save by the birds which are known to emigrate to the northward of any point yet attained by man, lie open to exploration; and the explorers will doubtless traverse that now unknown region until they reach the end of their journey upon the "spot where the sun's altitude is equal to its declination, and where bearings must be obtained by reference to time and not to the magnet."

Then what? Science is rather vague in her answer, for she relies more upon entirely new discoveries being made than upon verifications of advanced theories. Mr. Clement Markham sums up about all that Science has to expect from the exploration of the earth's apex, thus: "It may be shown," says he, "that no such extent of unknown area in any part of the world has ever yet failed to yield results of practical as well as purely scientific value; and it may be safely urged that, as the area exists,which is mathematically certain, it is impossible that its examination can fail to add largely to the sum of human knowledge."

In plain terms, the discovery of the pole has reduced itself to a matter in which the curiosity of mankind to know what exists at this *ultima thule* of the globe, a curiosity augmented by repeated baffling, is probably more the underlying cause of attempts to solve the problem than even the thirst for abstract knowledge. If there had been, or could be, any direct gain by reaching the open Polar Sea, we have little doubt but that it would have been penetrated long ago; for the arctic whalers' extremely powerful vessels, with proportionately strong engines, make their way through the ice with ease to regions, and spend months in localities, which the earlier explorers attained only by immense toil and hardships. If the masters of these ships had found out that more blubber could be got in the Polar Sea than elsewhere, the passage would have been made, and the world would probably have remained in ignorance of the fact, until some one had noted with astonishment the figures denoting latitude, which the captain would, quite as a matter of course, have jotted down in his log.

Curiosity, coupled with a patriotic desire to outdo the previous endeavors of other nations, is the motive of popular attention to the North Pole just at present. The problem once solved, the attainment of the South Pole will be as eagerly sought after; and there will be scores of attempts to penetrate the barriers of a region so vast that the moon might easily fall into it without affecting, by the impact alone, any portion of the world now known to man.

THE HYDROLOGY OF SOUTH AFRICA.

Mr. Froude the historian turned statesman, came back last winter from his self-appointed mission to South Africa big with the belief that he had seen the beginnings of an Anglo-African empire destined to rival our United States in power and prosperity; and he has just sailed thitherward again, bearing an official commission for the advancement of his scheme of confederation, the one thing needful, he thinks, to ensure the speedy development of the colonies of South Africa into the empire of his dreams.

There is much that is attractive in the thought that the continent so long given over to barbarism is about to be won over to civilization by British pluck and energy: nevertheless the prospect of its successful accomplishment is not nearly so bright as Mr. Froude imagines. Something more than men and money, however plucky and plentiful, is requisite for the up-building of an empire. First of all there must be a favorable physical basis, a fertile country, and a genial climate; and if any climatic changes are going on,they must be such as to make the country increasingly productive and habitable.

Unfortunately these conditions are not well met in South Africa. The drift of its climatic changes (and they are enormous) is in the wrong direction, and the operations of its inhabitants are now,and have long been,of a nature to hasten the natural course of climatic derangement. Already vast areas, recently well wooded, well watered, and of boundless fertility, have been converted into barren wastes, alternately parched by drought, ravaged by fire, and torn with torrents of untimely rain; and unless the settlers make a radical change in their mode of procedure in clearing the country,its conquest is much more likely to result in a great desert than a great nation.

By those who have followed the travels of Livingston and others through South Central Africa, the great interior basin of the continent will be remembered as a vast region of swamp, lakes, broad rivers, and trackless forests. To the south lies the basin more thoroughly drained by the river Zambesi, described by travelers as a region just emerging from a condition like that obtaining further north. The rivers have worn their channels deeper through the enclosing rim of the basin, the swamps are turning into grassy plains, the lakes to swamps or to salt-encrusted "pans.'

Still further to the south is the southernmost basin of the continent, enclosed by mountains running parallel to the coast. The central part consists chiefly of rolling prairies with few springs, fewer permanent rivers, and forests gradually diminishing to a final destruction which cannot be long delayed. As a rule rain is infrequent, droughts of common occurrence, and irrigation absolutely necessary for the raising of European grains. Yet within the memory of men still living this has been a country of lakes and rivers, abundant rain, heavy timber, and plentiful pasturage. Rivers, now dry the most of the year, then ran with full banks and swarmed with hippopotami and other water-loving animals. And the whole country bears abundant evidence that it is but a little while, geologically speaking, since it was the counterpart of the lake regions traversed by Livingston in the central basin of the continent.

When Dr. Moffat first entered the country as a missionary, in 1821, the natives had not forgotten the floods of ancient times, the incessant showers which covered the very rocks with verdure, and the giant trees and forests which flourished on hills and plains now barren and desolate. They boasted of rivers which ran impassable torrents in the days of their forefathers, while the lowing herds walked to their necks in grass; and the ancient river beds, shore lines, and vestiges of enormous trees bore witness that their stories were not exaggerations. Since the missionary work began, streams, which then furnished drink for thousands of cattle and water for the irrigation of miles of cornfields and gardens, are now absolutely dry.

Farther west the desiccation of the country is much more extensive and severe, forming the great Kalahari desert, the wastes of Namagualand, and the barren wilds of Bushmanland. Here the drying up of the country has all but reached its limit in degree, though not in area, for the desert steadily encroaches on the habitable land. To some extent, man is not to blame for the climatic changes thus going on. The natural wearing down of the outlets of the basin has drawn off the waters of the lakes, emptied the swamps, and converted the country into something less like a gigantic sponge than it originally was. But the most disastrous effects have been produced by human agency, by the destruction of the country's arborescent and herbaceous clothing by fire.

When Vasco de Gama first explored the coast four hundred years ago, he called the country Land of Smoke. How long the burning had been going on it is impossible to tell: it has certainly been going on ever since. The dominant native races in South Africa are comparatively recent invaders, and wherever they have gone the forests have disappeared. They are "a nation of levelers," says Mr. James Fox Wilson, who has given the matter much careful study on the spot, and "they are the prime cause of the advancing drought."

The practices of the Bechuanas are especially fatal to the forest growths. They cut down and burn down everything, regardless of scenery or economy, stripping the country where they settle, then moving on to devastate other regions and prepare the way for the encroachments of the desert. Wild fires,started for the purpose of clearing the open country of the annual growth of tall grass, play no small part in the work of devastation, killing in dry seasons most of the shrubs and young trees that spring up in wet ones. In Namagualand, the same office is performed by the scorching sun, the effect of drought in this case being, as Mr. Wilson points out, an auxiliary cause of drought.

But the spreading of the desert is not confined to the areas beyond the European settlements. There are vast regions, in the basin of the Orange river and in Cape Colony itself, bare of timber and bush,largely in consequence of the pertinacity with which both native and European colonists adhere to the suicidal practice of burning the dry fields in winter that the flocks may find abundant pasturage as soon as spring sets in. In these bare regions, trees are hardly ever to be found, except on the banks of rivers or in high mountain passes, as the fire penetrates into all the ravines where the most luxuriant vegetation is found, and destroys it. The more denuded of trees and brush wood, and the more arid the land becomes, the smaller the rainfall. "The greater the extent of heated surface over which the partially exhausted clouds have to pass, the more rarefied the vapor contained in them necessarily becomes, and the higher the position which the clouds themselves assume in the atmosphere under the influence of the radiating caloric: consequently the smaller the chance of the descent of any rain on the thirsty soil beneath. And the more the short-sighted colonists and ignorant natives burn the grass and timber, the wider the area of heated surface is made, the further the droughty region extends, the smaller become the fountain supplies, and the more attenuated the streams, until they finally evaporate and disappear altogether. Thus the evil advances in an increasing ratio, and, unless checked, must advance, and will finally end in the depopulation and entire abandonment of many spots once thickly peopled, fertile, and productive."

This evil prophecy was spoken ten years ago, before the British Association, and the occurrences of the past decade have only tended to confirm it. The progress of South Africa is plainly toward uninhabitableness. The increasing severity of the droughts, the vast sweep of the forest and field fires, and the sudden and terrible cloud bursts of rain and hail experienced in the settled portions of the colonies are described at length in the work on the "Hydrology of South Africa," prepared by Dr. John Croumbie Brown,formerly colonial botanist at the Cape (and favorably remembered by our readers for his successful championship of Darwinism before the Evangelical Alliance two years ago). In 1869, after a long period of exceptionally dry weather, a tract of country 400 miles long and 150 miles in extreme breadth was swept by fire, destroying fields and forests, farm houses, grain stacks, wild beasts, and domestic animals, and in many instances the families of the settlers.

Smaller yet very extensive fires are of yearly occurrence. The effects of such wholesale denudations of the surface are necessarily widespread and disastrous. The uplands become naked, parched, and slashed with gullies; the lowland springs dry up, the streams fail, and the entire economy of Nature is permanently disturbed. Rains that should be distributed over the entire year fall in a few destructive deluges which wash away the soil and turn the rivers into torrents, roaring sometimes fifty feet above their natural level at high water. Details of a number of such storms are reprinted by Dr. Brown from the colonial newspapers. During one of them in Natal, 27 inches of rain are said to have fallen in two days: the destruction of property was necessarily enormous, even in a sparsely settled region.

A specimen hailstorm is described by a member of the Transvall Geological Expedition. It occurred at Pietermaritzburg, Natal, April 18, 1874. Mixed with the hailstones —which averaged from one and a half to two inches in diameter—were irregular masses of ice from two to four inches in diameter and weighing from four to eight ounces. "On many roofs fully half the tiles were broken, not merely cracked, but very frequently masses went right through into the houses. None have escaped. Fortunately for windows, there was no wind, or the damage would have been much heavier. Many of the corrugated iron roofs are dented all over and have a pock-marked aspect, while some corrugated iron roofs are completely riddled: the stones went right through as though they had but paper to encounter."

It is proper to bear in mind in this connection that Natal is the garden of South Africa.

During the following November, the newspapers com plained of severe and long-continued drought in all the midland districts of Cape Colony. It was followed by a deluge toward the end of the month. Rivers which had been dry for months were suddenly filled with raging torrents, carrying away bridges to the value of $1,500,000. In one case a bridge, built high enough, it was supposed, for any flood, was forty-five feet under water, and of course utterly destroyed. Several towns were flooded, and not a few lives were lost.

After reciting at length many incidents in connection with this and similar storms, Dr. Brown remarks that it often happens that, within an hour or two after such torrents of rain have been precipitated, the sky is cloudless and serene, and frequently within a month or two all is as arid as before. Yet in such a country, and with a people bent on courses calculated to intensify and perpetuate such climatic evils, Mr. Froude expects to see a great empire grow up!

It is but just to Dr. Brown to say that, while fearlessly recognizing the certain tendency of the climatic changes to make a desert of South Africa, he does not despair of the future of the colonies, provided the colonists cease to do evil and learn to do well. He strenuously urges upon them the one course which will enable them to hold their ground and possibly recover the advantages they have wasted, namely, to put a stop to field and forest burning, and then set to work to restore the forest growths. It is, he admits, a difficult and costly undertaking; but it is absolutely necessary.

SCIENTIFIC AND PRACTICAL INFORMATION.

ORIGINAL MICROSCOPICAL RESEARCHES.

To such of our readers as propose devoting the coming summer vacation to microscopical work, we can suggest the following investigations as offering excellent fields for original research: First, examine the theory suggested by Dr. Bastion as to occasional transformations taking place between the lowest forms of animal and vegetable life. Confine some minute vegetable tissue—if showing protoplastic circulation, so much the better—in a live box, and watch with care. Notice if, in process of time, nuclei or any other parts should undergo any such transformations. A ¼ inch or ⅕ inch objective is suited for the purpose. There is abundant opportunity for new work in relation to fungi. Cooke's recently published book on that subject should be well studied, and collections made in the field, enough to go over, if possible, the author's ground. The limits of present discovery will soon be recognized, and a line of further progress can readily be mapped out. There is yet plenty to be discovered about the insects. The foot of a fly, for example, its structure, method of use, properties, exudation, etc., would form an excellent subject of study for a long time. The student, if he faithfully perseveres, is pretty certain to hit upon something new. The microscopic changes of the tissues and fluids of the human body, in health and disease, also invite research. This requires vast patience, an excellent instrument, and no small degree of skill; but it offers results which, if gained, will well repay expenditure of time and energy.

MORE JAW WRENCHERS.

"Benzanishydroxamic acid" and "anisdibenzhydroxylamine" are two more chemical absurdities in the way of names recently coined,of course by a German chemist. Cannot somebody invent some rational plan for naming and renaming organic substances that will relieve the science from these polysyllabic nightmares? Suppose the chemists begin by agreeing among themselves to limit the baptismal titles of their discoveries, say to four syllables. Or why not use some symbols which might mean any number of prefixes or suffixes, and thus express the idea without inflicting it on the mind through torture of the jaw?

A MOUTHFUL FOR CIGAR SMOKERS.

The products of the combustion of tobacco, if the combustion were complete, would be carbonic acid, ammonia, and water: in the process of smoking, however, most of the tobacco is distilled rather than burnt,and the products of this distillation are quite numerous and complex. Vohl and Euhlenburg,after burning 150 cigars,recognized with distinctness,in the smoke, cyanhydric acid, sulphuretted hydrogen, certain acids of the fatty acid series, namely, formic, acetic, propionic, butyric, and valerianic: also carbolic acid and creasote, pyridin, picolin, collidin, and other similar alkaloids. They found also ammonia, nitrogen, oxygen, and small quantities of marsh gas and carbonic oxide.

A LIVING RAFT.

The leaves of the gigantic water lily known as the *Victoria Regia*, in the Botanic Garden at Ghent, having attained a remarkably large size, Mr. Van Hulle,the chief gardener,recently undertook to determine their buoyant power. One leaf easily supported a child, and did not sink under a man. Mr. Van Hulle then heaped bricks over its entire area and found that, before the leaf became submerged, a weight of 761 lbs. was floated.

A CENTENNIAL CLERGYMAN.—On the 8th of June last, the Trinity Methodist Episcopal Church, at Jersey City, N. J., held a celebration in honor of the one hundredth birthday of the Rev. Henry Boehm. For seventy years or more he has been a preacher. On the occasion of the celebration, when he rose to address the audience, the clearness of his faculties was observable by all present.

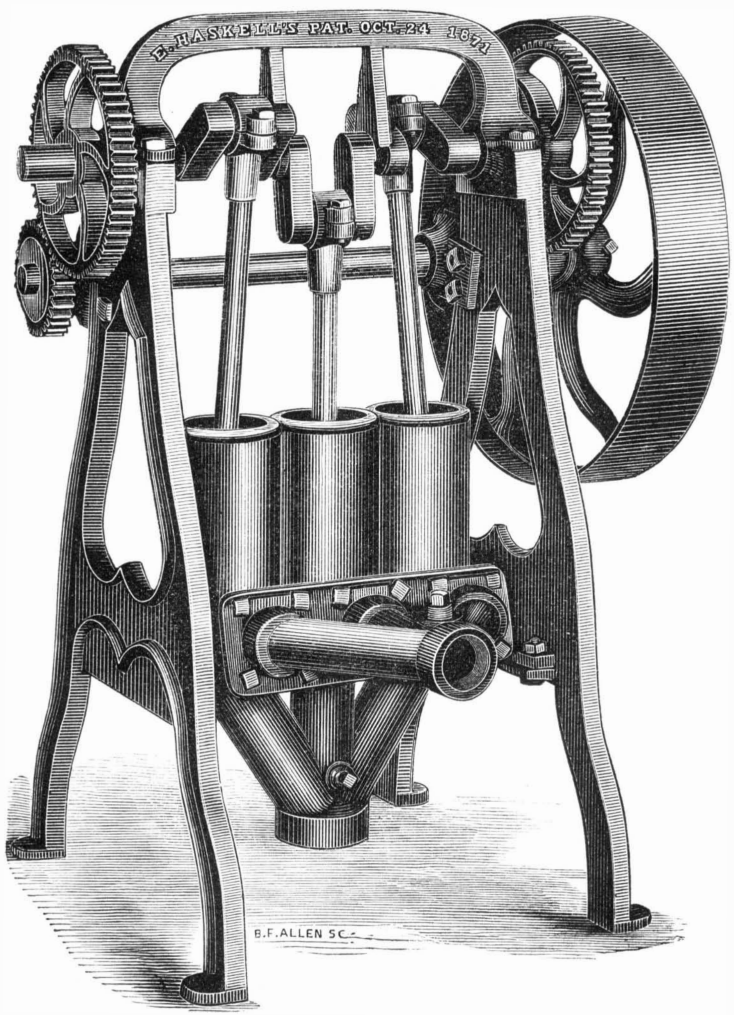
IMPROVED THREE-CYLINDER PUMP.

We illustrate herewith a simple and novel form of three-cylinder pump, the suction of which is continuous, though unaided by an air chamber. Like the rotary pump, its delivery is uniform, but, unlike that machine, it requires no large expenditure of power.

The construction is obvious from the engraving. Three strokes of the piston are caused by one revolution instead of two strokes, as in the double-acting pump, while it is claimed to have the advantage over the latter of being much more free from friction and not to necessitate the stopping and starting of a column of water in the suction pipe at every change of stroke, involving a consequent loss of power. There are, besides, no crooked passages or ports through which the water must be driven; and the construction of the various parts is simple, strong, and lasting. In its smaller sizes, it may readily be worked by hand.

These considerations render the machine useful for railroads, both as a hand pump during the building of lines, and as a permanent power pump for filling tanks where a large volume of water is needed daily. It is also suitable as a fire pump for mills; and since its working parts are but little affected by grit, and it is not liable to choke, it may profitably be employed in quarries. By wind wheels, we are informed, it can be worked at a slow speed with the largest results. It is susceptible to a wide utilization in greenhouses, about farms, and, in fact, wherever a powerful suction and force pump is needed.

Further particulars may be obtained by addressing the Chase Machine Company, manufacturers, No. 36 Charlestown street, Boston, Mass.



HASKELL'S THREE-CYLINDER PUMP.

A Lady Lecturer on Chemistry.

Lately, in Aberdeen, Scotland, Miss Charlotte Napier gave a lecture on chemistry, in connection with the Blackfriars Useful Information Society. There was a very numerous attendance; and the lecture, which was illustrated by a variety of experiments, and was of a highly interesting and instructive character, was listened to with the closest attention, an enthusiastic vote of thanks being awarded to the lecturer at the close. Miss Charlotte Napier is a young Aberdonian. Last winter she studied chemistry in Edinburgh, under the direction of Mr. Falconer King, with a view of assisting her father as an agricultural analyst.

RUDIMENTARY EXISTENCE IN FRESH WATER STREAMS'

The marine aquarium and its inhabitants have been thoroughly studied by naturalists; but as yet, very little attention has been given to the many beautiful forms of life to be found in rivers and ponds. Mr. James Fullagar, of Canterbury, England, has recently found in a stream near that ancient city a specimen of the *lophopus crystallina*, and describes it as follows in the pages of *Science Gossip:*

"The *lophopi* are among the largest fresh water polyzoa known. They are about $\frac{3}{16}$th of an inch in length, and are found attached to the roots of *callitriche verna*, duckweeds, and other fiberous roots in shady dykes of slow-moving water, under thick masses of floating plants; for in their habits they are light-shunning animals, and are always on the under side of aquatic plants. They are very beautiful microscopic objects, and their being perfectly transparent renders them most interesting animals for examination, as the formation of their statoblast (*f*) can be seen in their different stages of growth, from their first appearance as a little swelling (at which stage they are quite colorless) to their perfect forms, when they become detached and fall free in the perigastric space (*l*), having become gradually colored, the center of a dark brown, and the margin a rich yellow. The process of their propagation by gemmation or budding, by which young ones are added to the existing colony of living polyzoa, can be plainly seen; while the statoblasts (*f*) are designed to propagate the species in the following spring, and are liberated from the polyzoon at its death, when the transparent sac is decomposed, and the statoblast escapes and sinks to the bottom of the water."

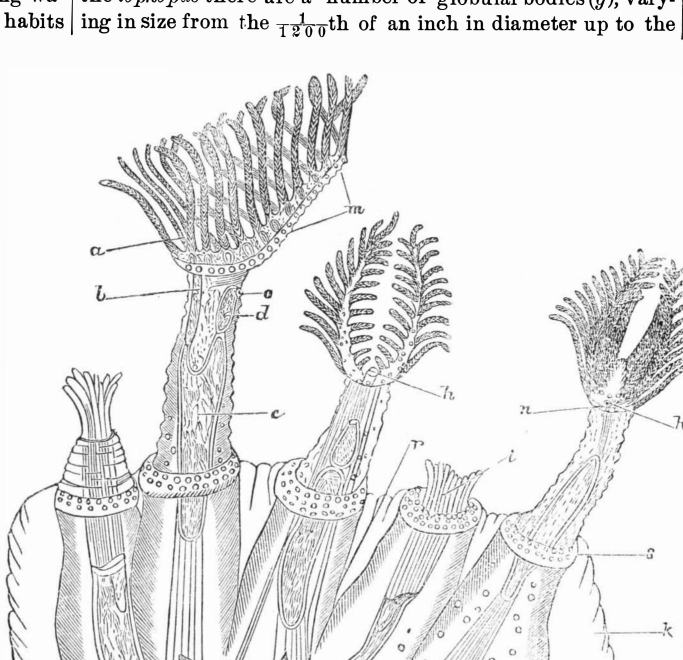
In our engraving, *a* is the region of the mouth; *b*, œsophagus; *c*, stomach; *d*, intestine; *e*, muscles; *f*, statoblast; *g*, parasitic globes; *h*, *h*, mouth; *i*, tentacles retracting within cell; *k*, outer transparent envelope; *l*, perigastric space; *m*, lophophore; *n*, tentacles excised to show mouth; *o*, vent; *p*, hollow globe; *r*, place where division commences; *s*, cell.

"The perfect transparency enables us to witness the internal operations of their system. The action of the stomach in the process of digestion can be observed with great clearness. The contents are seen at times to consist of small desmids, and other disk-shaped and globular bodies, together with decayed vegetable matter, etc. The action of the cilia on the expanded tentacles causes a current of water to set in towards the mouth (*a*, *h*, *h*,), bringing with it the food required; and if in the vortex thus formed there should be any large and objectionable pieces, they are prevented from entering the mouth by a quick, lashing motion of the tentacle, which rejects and throws them out of the reach of the vortex. The accepted morsel passes directly into the œsophagus (*b*), and thence into the stomach (*c*), where it is digested by the up and down motions, of a contracting and expanding nature, of this organ. The lower part of the stomach at intervals is seen to be contracted somewhat in the shape of an hour glass, in which for a moment part of the contents of the stomach are retained, then again released to mix with the rest. After being subjected to the action of the stomach for some time, the alimentary matter is delivered by degrees into the intestine (*d*), from whence it is expelled through the vent (*o*), in form of oval or egg-shaped pellets.

The perigastric space (*l*) is filled with clear fluid, which also extends up the lophophore (*m*), in which fluid are seen floating numerous particles of very varied forms and sizes, the smallest ascending to the tip of the lophophore (*m*). By the movement of those bodies, it is evident that there is a constant rotating motion in this transparent fluid, by which these particles are kept in a perpetual whirl, from one part to the other, and at times with rapidity. No doubt this motion is produced by vibratile cilia on the interior of the body, though not so as to be observable. In some of the colonies of the *lophopus* there are a number of globular bodies (*g*), varying in size from the $\frac{1}{1200}$th of an inch in diameter up to the size of an ordinary *volvox globator*. These bodies are considered to be parasitical, as they do not appear to have any necessary connection with the economy of the polyzoa in whose interior they occur. This would appear to be the case from the fact that in some colonies not one of them is to be seen, while in others they are very numerous. In one instance of a colony under my observation, they were increased in such numbers of all sizes that they entirely filled the perigastric space (*l*), forcing the smaller particles up even into the lophophore (*m*), and ultimately bursting the whole colony and escaping into the water, when all motion in them ceased, and they soon disappeared altogether. When they are few in number, and of various sizes in the animal, they form a novel and pleasing sight as they are carried up and down by the current before mentioned in the perigastric space.

On being alarmed, the *lophopus* quickly retracts within the transparent cell (*s*), and again protrudes when all is quiet, unfolding its beautiful crown of tentacles, in the course of which movement the action of the muscles is plainly seen (*e*). The expanding of the tentacles, immediately on the protrusion of the polypide from its cell, is one of the most pleasing sights that can be presented to the observer, as the cilia with which they are studded are instantly in full play, passing up on one side of the tentacle from the base to the tip, and down the opposite side, like an endless chain, thereby forming the vortices in the water by which the particles of food are brought to the mouth. Sometimes the colony consists of from six to twelve polypides, and will divide into two, commencing the division at *p*, and slowly separating down to the point where it is fixed to the plant, etc., each part moving in opposite directions. They then propagate by gemmation or budding."

"I would advise," says Mr. Fullagar, "those lovers of natural history who possess a microscope and live in a neighborhood where there are shady dykes or a millpond, etc., to search for them; when found, they will amply repay the trouble in the pleasure they afford in observing and investigating their wonderful mechanism and marvelous beauty. No pencil can portray nor pen describe them. I have had them under observation for over three months, have seen some of the colonies die out, and have their statoblasts in glass cells, from which I anticipate the pleasure of seeing the young polyzoa emerge in due time."



A FRESH WATER POLYZOON.

Stagnation in Business the World Over.

It is poor consolation in adversity to know, says the *Commercial Advertiser*, that we are not alone in our misery; such as it is, however, our iron manufacturers may take it to themselves. The depression of the iron trade is general throughout the world. The production of pig iron in Scotland was less in 1874 than in any of the last twenty years. At one time there were only thirty-two furnaces blowing, out of one hundred and thirty-two erected, and the production was 400,000 tuns less than in 1870. Russia, notwithstanding its activity in railroad building, imported only 5,221,000 lbs. of rails, against 7,119,000 in 1873. In Prussia the large steel works of Krupp have discharged some thousand workmen, and the Borsig manufactory of engines at Berlin—the most extensive in Germany—has had to protect itself by taking a similar step. Last month the largest Austrian manufactory of engines (Sigl) dispensed with two thousand hands for the reason that it had neither orders nor sufficient working capital. The government, however, in true Austrian fashion, remedied both misfortunes by advancing capital to the works, and by causing some of the railroads to give extensive orders for rolling stock.

A Queer People.

During the last season, says the *Academy*, Mr. Bond, an Indian surveyor, while at work in the Madras Presidency, to the southwest of the Palanci Hills, managed to catch a couple of the wild folk who live in the hill jungles of the Western Ghauts. These people sometimes bring honey, wax, and sandal wood to exchange with the villagers for cloth, rice, tobacco, and betel nut, but they are very shy. The man was four feet six inches high; he had a round head, coarse, black, woolly hair, and dark brown skin. The forehead was low and slightly retreating, the lower part of the face projected like the muzzle of a monkey, and the mouth, which was small and oval, with thick lips, protruded about an inch beyond the nose; he had short, bandy legs, a comparatively long body, and arms that extended almost to his knees; the back just above the buttocks was concave, making the stern appear to be much protruded. The hands and fingers were dumpy and always contracted, so that they could not be made to stretch out quite straight and flat; the palms and fingers were covered with thick skin (more especially the tips of the fingers); the nails were small and imperfect, and the feet broad and thick-skinned all over. The woman was the same hight as the man, the color of the skin was of a yellow tint, the hair black, long, and straight, and the features well formed. This quaint folk occasionally eat flesh, but feed chiefly upon roots and honey. They have no fixed dwelling places, but sleep on any convenient spot, generally between two rocks, or in caves near which they happen to be benighted. Worship is paid to certain local divinities of the forest.

LEAD pipe will not do to conduct water to fish ponds. It is likely to poison the fish.

REVOLVING FIRE BARS.

The *Revue Industrielle* has recently published an illustration and description of a system of revolving fire bars recently introduced into France with good results. As will be seen, it consists simply of a series of straight tubes, placed either singly or coupled together, and pierced with openings of a suitable form. Means are provided by which these tubular bars can be caused to revolve. It will be seen that the tubes rest upon transverse bearers also cylindrical and hollow, and longitudinally they are supported by a cast iron plate fixed under the furnace door, and formed with a projection upon which the tubes take their bearing, either by a groove as in our Fig. 1 and the third design in our Fig. 2, or against a ring, as in the second type, shown in the second design in our Fig. 2. The bars are turned by means of a key that is introduced into the end of the bar, which is fitted with a ferrule having a six-sided aperture.

The first application of this system was made to a 12 horse power boiler, in which the steam was maintained by means of coke dust and slack containing 25 per cent of cinders. This boiler belongs to the Parisian Gas Company, which has a deserved reputation for investigating new and promising inventions. The success of their first experiments was so great that now some hundreds of these bars are employed by the gas company, so that the arrangement has passed from the phase of experiment into that of actual and large practice. It is claimed that, by the use of the Schmitz bars, the work of firing is rendered much less difficult, while a thick fire (from 8 inches to 10 inches) can be maintained economically. The draft is regulated for a given consumption of fuel, and the front of the ash pit may be closed, because sufficient air can be admitted through the open ends of the tubes. The inside of these tube is always visible to the fireman, who can at once see when any of the openings are choked. When this takes place he is enabled, by partially turning the tube, to present a new surface to the fire, while he is easily able to clear those passages which have been closed. In turning the tubes, the ashes and other *débris* are precipitated into the ash pit; and as shown in the second and third types of our Fig. 2, the bars are furnished with a spiral projection to assist in breaking up clinkers, etc.

The following are the results of this trial:

	Ordinary Furnace. lbs.	Schmitz' Bars. lbs.
Water evaporated per pound of coal	4·678	5·563
Water evaporated per hour per square foot of heating surface	1·321	1·322
Coal burnt per hour per square foot of grate	6·79	5·70
Coal burnt per hour per square foot of heating surface	0·283	0·238

From trials made with a boiler on the Passy Gas Works, an economy of 26 per cent was claimed for the apparatus, while the fuel employed was of such a nature that it could scarcely have been employed in an ordinary furnace.

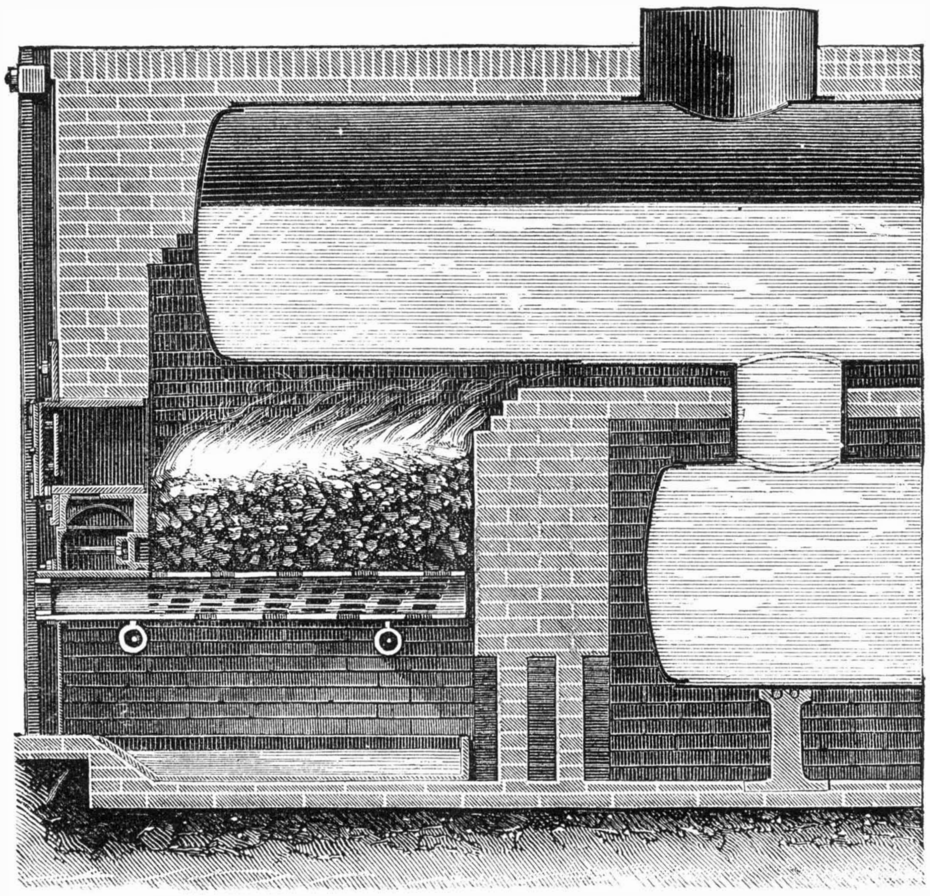
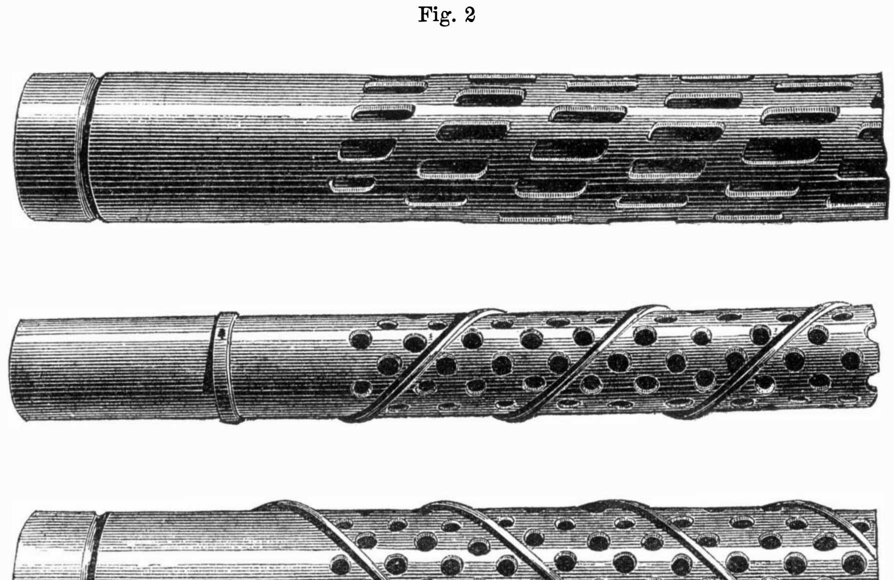


Fig. 1.—SCHMITZ' REVOLVING FIRE BARS.

Fig. 2



A Medical Strike.

A strike among professional men is certainly a novelty; and it has been reserved for Switzerland to produce the same for the astonishment of mankind. In the canton of Glarus, out of 23 licensed physicians, 21 declare that they will perform no more official duties until an efficient sanitary police be established and medical examinations be conducted by a committee of competent men. What a harvest must open before the dazzled gaze of the two disaffected individuals! We can imagine the doctors striking against the quacks; but for them to strike in favor of a sanitary police, in favor of a means for preventing the diseases by curing which they make their bread and butter, certainly passes the bounds of reasonable belief. If the doctors of New York should follow the example of these Swiss brethren for the last mentioned reason, what a vast relief to our stench-sickened citizens would be produced!

How to Reduce Telegraph Charges.

It is undoubtedly true that nine tenths of the messages offered for transmission, if delivered at any time in from six to twelve hours, would answer their purpose just as well as though delivered within a few minutes. On the other hand some of the messages are valueless unless transmitted and delivered immediately. It has been proposed therefore, to establish a class of express messages, which shall be guaranteed precedence and quick delivery, an extra price being charged for such service; a second class of messages which do not require especial despatch, to be sent at the convenience of the lines, but within a special time, at say about the present rates; and a third class, to which even less importance is attached, to be sent at a considerable reduction from present rates.

If telegraph wires were continually occupied in the transmission of despatches, no doubt even lower rates than are now exacted would be profitable; but how few wires, comparatively, are thus continuously occupied! We cannot see any insuperable obstacle to the introduction of this system, and believe that something like it will eventually be adopted by our telegraph managers.

It has been urged, in opposition to such a system, that the laws of this State, and probably of most of the States, require messages to be transmitted in the order in which they are received. This argument is just as good against the half-rate night messages, as to which, so far as we know, it has never been raised. It is not in either case a valid objection, for both would be a special contract between the telegraph company and its customers, and therefore not within the scope of the law in regard to telegraphic service.—*The Telegrapher.*

Metal Arches.

The above was the title of a paper read last week by the President, Professor Fleeming Jenkin, at the closing meeting of the Edinburgh and Leith Engineers' Society. The Professor began by describing the stresses which occurred in the common masonry arch, illustrating the subject by means of a wooden model of novel construction, in which the arch was rendered flexible. He explained that, in papers by Professor Clark Maxwell, Mr. Bell, and Professor Fuller, of Belfast, methods were given by which the maximum intensity of stress on each part of a metal rib could now be determined with as great accuracy as the stress on the ordinary girders; and the reader of the present paper expressed a strong opinion that the great bridges of the future would be metal arches, which for large spans were essentially more economical than beams, while they were also more beautiful. By way of illustration he referred to the bridge of St. Louis, at Cincinnati, which had a central arch of 520 feet in span. There was no reason why arches of 700 or 800 feet span should not be erected; and in some situations even these great spans would be economical in comparison with a number of smaller openings involving expensive foundations.

Crime the Result of Automatism.

A striking analysis of the mental status of the criminal classes, which seems to occupy a middle ground between the theory of morbid impulse of Dr. Hammond and Professor Huxley's ideas as to the automatism of all animals, has recently been made by Dr. Despine and confirmed by Dr. Thomson, resident surgeon of the General Prison for Scotland.

Dr. Despine arrives, after a thorough search of court records, prison statistics, habits of individuals, and of all other possible and available sources of information, at a belief in the entire absence of a moral sense in the criminal class. He says that free will, which in the normal man is only controlled by a sense of duty, in the criminal has no such counterbalance, this sense being wanting. His acts are therefore mentally automatic, the result of the strongest instinct, appetite, or passion prevailing at the time. Although intellectually cognisant of the moral standards of society, the criminal yields to natural passion or appetite, unrestrained and unreproached by any feeling of impropriety. Hence the remarkable *sang froid* seen in hardened offenders under the most trying circumstances, and the superficial character of any apparent reformation or conversion.

How does a Spider Make its Web?

Here is a poser put by a writer in *Science Gossip*, which some of our readers, who have watched the habits of spiders, may be able to answer: How does a spider make its web, the lines of which, crossing at the center, are carried, some of them, to the surrounding objects, while others are fastened to an outer circular line, made evidently before the outer circular lines of the woof are formed? Where does the spider place itself when it ejects the lines which form the spokes of the wheel?

Curious Fact.

Friction impedes the progress of the railway train, and yet it is only through friction that it makes any progress. This apparent paradox is explained when we remember that, by reason of the frictional bite of the drivers upon the track, they draw the train. The bearings of the wheel upon the rails are a mere line where they come in contact, iron and iron, yet this slight and almost imperceptible hold is sufficient to move hundreds of tuns of dead weight with the speed of the wind.

A Monument at Sea.

Several years ago the famous obelisk, known as Cleopatra's Needle, was donated by the Egyptian to the British Government, but the latter, although several plans have been proposed, has heretofore considered no scheme as overcoming the engineering difficulties of removing the monolith from its present site near Alexandria to the shore, and thence transporting it by sea to England. We learn from the London *Times* that an attempt is now shortly to be made, and the project which has been adopted is as follows: The obelisk, which is quadrilateral in shape, is first to be changed into a cylinder. This will be done by attaching heavy beams, strongly connected together, to each face, until the desired form is obtained, the work being continued very carefully, and excavations being made, little by little, until the entire shaft, from apex to foundation, is enveloped. It will not be difficult then to roll the monument over a wooden road, laid over the sand hills which cover the intervening mile between its present location and the sea.

The wooden envelope, while increasing the mass will, at the same time, be such as to diminish the specific gravity of the whole, so that the great bundle will readily float. To this end, the diameter of the circle formed by a section of the cylinder will be 20 feet, or 12 feet larger than the breadth of the sides of the obelisk. Besides, in order to render the line of flotation horizontal, a diameter exceeding 20 feet will be necessary at the heavier base.

After the monument is launched, it will be towed out of the Mediterranean and into the Thames, to the nearest point to its future site. It will then be beached and rolled to its position, where it will be erected before removing its coverings.

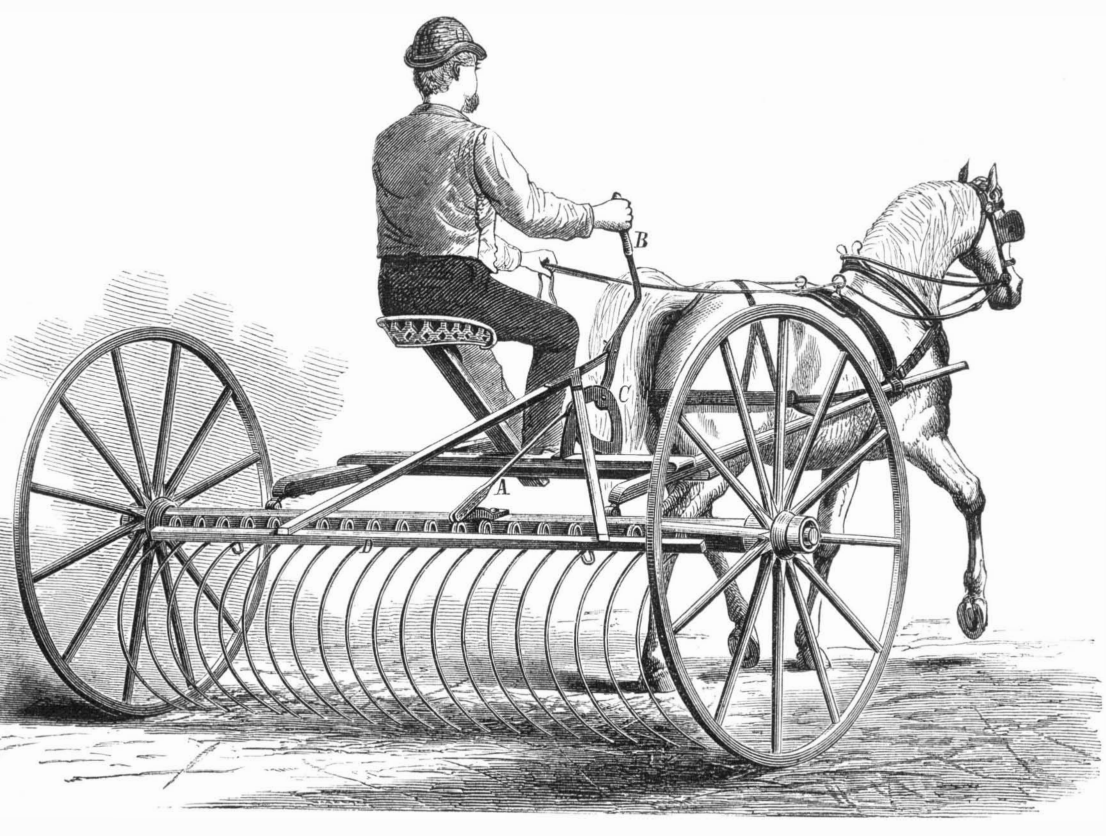
This plan, it is believed, can be carried out very easily and with little expense, while it will be free from the dangers found in transporting the Obelisk of Luxor to Paris, as during its voyage that monument seriously damaged the vessel.

IMPROVED HORSE HAY RAKE.

The invention herewith illustrated consists of a simple and novel apparatus for operating horse hay rakes, by means of which, it is claimed, both the rake and the clearer are more securely and readily adjusted, and at the same time more easily worked by the driver.

The thills are hinged to the axle, so that the latter, when released from the mechanism below described, is turned in its wheels by the pulling of the horse, the effect of such turning being to raise the rake. During the gathering, however, this revolution is prevented by the rod, A, which is bifurcated at its rear end and provided with several holes, so that it can be adjusted to the axle so as to permit the latter to turn rearward more or less, thus throwing the rake nearer to or farther from the ground, as desired. The forward end of rod, A, is pivoted to the hand lever, B, which lever is pivoted in the frame, C. On said frame, but not shown, is a downward-pointing hook, which receives the rod, A, just behind the lever end, which abuts against the hook, thus holding said rod firmly in the position represented in the engraving, and keeping the rake to its work until the rod is released by the driver by a suitable movement of the lever. The rake clearer, D, is connected by a forked rod to the lever, and pivoted above the fulcrum of the latter, so that, whenever the lever is actuated for raising the rake, the forked rod will also be moved, and thus the clearer caused to do its work quickly and efficiently.

Patented through the Scientific American Patent Agency March 9, 1875. For further information address the inventor, Mr. Benjamin Mellinger, Mount Pleasant, Westmoreland county, Pa.



MELLINGER'S HORSE HAY RAKE.

IMPROVED NAPPER AND BRUSHER.

The machine herewith illustrated has been especially designed to meet the requirements of manufacturers of hosiery goods. It takes in any width of cloth, from 24 inches down, brushes the cloth in a flattened web, works on both sides at once, cleans off the specks, burrs, seeds, etc., raises a nap, restores the pliancy and softness (of which the washing has deprived the goods), and leaves the web in a smooth roll, ready for the cutter. To those who wash and dry in the garment—in which case the brushing is done immediately after the cutting—these capabilities of the machine will render it of especial utility.

The brush is arranged to do its work thoroughly, and in order to do this the goods are smoothly and gently stretched, both in length and width, over a roller having a firm and true surface, such surface being so made as to hold the goods in this smooth, stretched shape. To accomplish this, rollers about 5½ inches in diameter, made of cast iron pipe, are used; the shaft runs clear through, and the heads are shrunk in; the surface is then turned off true, and, with a tool made like a comb, having V-shaped points, the roll is filled with parallel grooves; it is then grooved lengthwise with the same tool. This gives a surface similar to emery, but differing from it in being true, with no chance to come off; it is then given a thin coat of paint to prevent rusting.

For the brush card, clothing is generally used, and the brush rollers are made of wood, so that the clothing can be easily tacked on. Its bearings are attached to long swing arms, which are held in place by spiral springs and adjusted by thumb screws and check nuts, so that the brush can be set parallel with the iron roller, and as close or far from the cloth as required. Its shaft and bearings are so made as to enable the user to turn it end for end in a few moments, the object being to keep the brush wire in working shape.

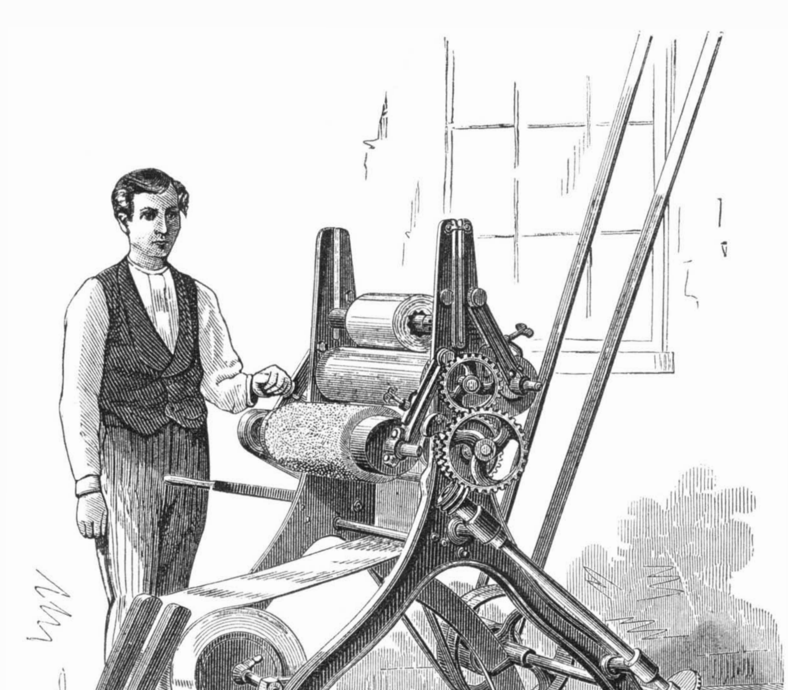
When a quarter or a seam, caused by basting on the end of another roll, reaches the brush, it should be raised for a moment to prevent injury to it. For this purpose, a handle on the left hand side of the machine is so connected as to raise both brush rollers at once. In case the cloth is brushed just as it comes from the knitting machine, the roll is placed in the bearings direct. The receiving pulleys are 5 inches in diameter, 3¼ inches face, calculated to run about 240 revolutions, the top to turn from the machine, thus giving 800 revolutions to the brushes. As the large pulley that gives motion to the brushes is double-crowned, they can be driven with one open belt passing around all three pulleys, or by two separate belts, open or crossed as the user prefers.

For the take-up, change gears are sent, so that the user can hurry or retard the cloth, as circumstances require.

The spreaders are made with long dowel pins, and can be lengthened by slipping on to said pins anything to fill the space and keep them extended, so that a few spreaders will meet the needs of most mills.

The amount of work that can be passed through the machine and the durability of the brushes depend upon how thoroughly one wishes to brush. One party in Troy, we are informed, is using one brusher for eight sets of cards, using old fancy for the brushes. Another party, who has just started one, has new clothing made on purpose for it, and is brushing for eleven sets.

Further particulars may be obtained from the manufacturer, Mr. C. Tompkins, Troy, N. Y.



TOMPKINS' NAPPER AND BRUSHER.

Death Belts.

Frequently in cases of shipwreck, especially in comparatively smooth water, life belts would furnish a means of temporary safety until boats were got ready on shore. They would have done so in the case of the Northfleet, and in the still more recent instance of the Schiller. But the life belts must be genuine, and not pretexts for the purpose of figuring in advertisements as proofs of the care taken by the owners for the lives of their passengers. Those found upon the Schiller's victims appear to have been of the latter sort, consisting, as they did, of a few slabs of cork fastened together and to the person by one or two pieces of tape, and were thus worse than useless to a good swimmer; for it is stated that those who recovered the bodies declare that in very many instances they were found with the head under water and the heels in the air, showing that the belts had really drowned, instead of supporting, the unfortunates who had trusted t them, by dropping down towards their hips. In this way scores of dead bodies were picked up in the water, wearing belts which, if properly constructed, would have saved the life of the wearer.

Printing Telegraph Instruments Duplexed.

Another important step has been successfully taken in duplex telegraphy. The combination printing telegraph instruments, used to a limited extent by the Western Union Company, have been successfully adapted to duplex operation. Two of these instruments, specially arranged for working on the duplex system by Mr. G. M. Phelps, are now in operation, sending and receiving simultaneously on one wire, and the speed at which they are worked is represented as something remarkable. Mr. Gerrett Smith has been engaged for some time past in making the necessary arrangements of circuits, etc., to accomplish this, and it is a complete success. The ease and rapidity with which these new instruments work, and the advantages which they possess, will be likely to lead to a more extensive use of them by the Western Union Company. No doubt they can be adapted to quadruplex operation also; and with four improved combination printers working on one wire, the amount of business which can be transmitted will be likely to astonish not only outsiders, but a large proportion of even experienced telegraphers.

It would be another instance of the changes which time brings about, if the printers, with their old time recommendation, "prompt, accurate, and reliable," should once more become leading and favorite instruments for commercial telegraphic purposes.—*The Telegrapher.*

To Prevent White Paint from Turning Yellow.

Dr. Luedersdorff, of Berlin, in discussing the cause of white paint turning yellow wherever it is excluded from the light, attributes this fault to an inseparable property of linseed oil, and believes that the only cure for it is to substitute some other material for the oil. The value of drying oils for mixing with pigments depends entirely on the property which they have of being converted, by the absorption of oxygen, into a peculiar resin. When entirely dry, this resin is the only bond of union, and to it the oil colors owe their stability. During this oxidation of the oil to a resin and the drying of the paint, especially where there is insufficient air and light, the yellowing takes place.

The author believes that if, instead of waiting for the oil to be gradually converted into a resin, an already formed and colorless resin were employed as binding material, the paint could not change in color. Out of the long list of resins to be chosen from, Luedersdorff selects two, one of which is soluble in alcohol, the other in turpentine; the former is gum sandarac, the latter gum dammar.

When sandarac is employed, it is first carefully picked over, and all pieces of bark or wood thrown out; 7 ozs. of sandarac, 2 ozs. Venice turpentine, and 24 ozs. of alcohol of 90 per cent Tralles, or specific gravity 0·833, are put in a suitable vessel over a slow fire or spirit lamp, and heated with diligent stirring until it is almost but not quite boiling. If the mixture be kept at this temperature, with frequent stirring, for an hour, the resin will all be dissolved, and the varnish is ready for use as soon as it is cool. The Venice turpentine is necessary to prevent too rapid drying, and more dilute alcohol cannot be employed because sandarac does not dissolve easily in weaker alcohol, and furthermore, the alcohol, by evaporation, would soon become so weak that the resin would be precipitated as a powder. When this is to be mixed with white lead, the latter must first be finely ground in water and dried again. It is then rubbed with a little turpentine on a slab, no more turpentine being taken than is absolutely necessary to enable it to be worked with the muller. One pound of the white lead is then mixed with exactly half a pound of varnish and stirred up for use. It must be applied rapidly because it dries so quickly. If, when dry, the color is wanting in luster, it indicates the use of too much varnish. In such cases the article painted should be rubbed, when perfectly dry, with a woolen cloth to give it a gloss.

Dammar varnish is made by heating 8 oz. gum dammar in 16 oz. oil of turpentine to 60° or 70° R. (167° to 190° Fah.), stirring diligently and keeping it at this temperature until all is dissolved, which requires about an hour. The varnish is decanted from any impurities and preserved for use. The second coat of paint, when dry, is dead white, and does not take a gloss so easily as the alcoholic paint. To give it a luster, a coat of the pure varnish, to which half its weight of oil of turpentine has been added, may be applied. It is still better to apply a coat of sandarac varnish made without alcohol, because dammar varnish alone does not possess the hardness of sandarac, and, when the article covered with it is handled much, does not last so long.

These paints are, of course, inferior in elasticity to freshly applied oil paint; but for window frames and closet doors, which do not require much bending, this is a quality easily dispensed with.

THE ANIMALISM OF PLANTS.

A century ago, Dr. Erasmus Darwin, grandfather of our contemporary scientist who wrote the "Origin of Species," published a book entitled "The Botanic Garden": the second part of which bore the name of "The Loves of the Plants," and was much laughed at for its strange theories and the fantastic manner in which consciousness and volition were attributed to specimens of the vegetable kingdom. It was reserved for our day to show, beyond question or cavil, that paralysis of a plant can be produced by external injury, and that the existence of a nervous system in a vegetable cannot be denied; that flowers display their gorgeous hues to attract the insects which convey the impregnating pollen gathered from specimens of the other sex of the same plant; that flowers can not only digest and assimilate animal matter, but can crush insects and drop them on the soil for purposes of fertilization.

We publish herewith engravings of some carnivorous plants, which were described by Dr. Hooker, the celebrated botanist who has charge of the Royal Botanical Gardens, at Kew, Eng., in an address before the British Association, at its recent meeting at Belfast. Dr. Hooker and Mr. Darwin examined them very closely, and found that, when a fly was caught, it was dissolved in a digestive fluid exactly like ordinary gastric juice, and the same happened with a piece of beef; but when a mineral substance was placed on the leaf, there was no contraction. The fine hair on the leaf closed gently on a piece of wet chalk, but soon opened again, and rejected it. The experiments also proved that the contraction of the leaf was precisely similar to the contraction of a muscle, so that, as Dr. Hooker explained, it is not only proved that the digestion of the plant is like that of animals, but that it has a nervous system, and in fact forms one more link in the continuity of Nature. As our readers will see by reference to the engraving, these plants are furnished with various kinds of traps or snares for the unwary insects upon

CARNIVOROUS PLANTS.

which they live. The *sarracenia*, the large plant on the left of the page, the *nepenthes*, in the center, and the *cephalotus*, which is immediately below it, have lids which shut down upon their victims. The *darlingtonia*, shown on the right, curls it leaf around them; the *pinguicula*, in the right hand bottom corner, shuts itself up and curls its leaves; the *dionœa* on the left, below the *sarracenia*, also shuts itself upon its prey, and the *drosera*, in the left hand bottom corner, has an arrangement of fine lines ending with little knobs, which it throws over its prey, and thus secures it.

"To Mr. Ellis," says Dr. Hooker, "belongs the credit of divining the purpose of the capture of insects by the *dionœa*. But Rev. Dr. Curtis made out the details of the mechanism, by ascertaining the seat of the sensitiveness in the leaves; and he also pointed cut that the secretion was not a lure exuded before the capture, but a true digestive fluid, poured out, like our own gastric juice, after the ingestion of food.

"For another generation the history of this wonderful plant stood still; but 1868 an American botanist, Mr. Canby, who is happily still engaged in botanical researches, while staying in the *dionœa* districts, studied the habits of the plant pretty carefully, especially the points which Dr. Curtis had made out. His first idea was that 'the leaf had the power of dissolving animal matter, which was then allowed to flow along the somewhat trough-like petiole to the root, thus furnishing the plant with highly nitrogenous food.' By feeding the leaves with small pieces of beef, he found, however, that these were completely dissolved and absorbed; the leaf opening again with a dry surface, and ready for another meal, though with an appetite somewhat jaded. He found that cheese disagreed horribly with the leaves, turning them black and finally killing them. Finally, he details the useless struggles of a curculio to escape, as thoroughly establishing the fact that the fluid already mentioned is actually secreted, and is not the result of the decomposition of the substance which the leaf has seized. This curculio, being of a resolute nature, attempted to eat his way out. 'When discovered he was still alive, and had made a small hole through the side of the leaf, but was evidently becoming very weak. On opening the leaf, the fluid was found in considerable quantity around him, and was without doubt gradually overcoming him. The leaf being again allowed to close upon him, he soon died.'"

The foregoing description and illustration appeared in a special edition of the SCIENTIFIC AMERICAN, issued in December, 1874, and will be read with interest by all students of natural history and lovers of the marvelous in Science.

Sir John Lubbock has recently turned his attention to botany with special reference to the same thing, and has recently published "British Wild Flowers Considered in Relation to Insects," which will undoubtedly throw a great deal of light upon it. Meanwhile in this country no pains have been spared by those competent to investigate; and within the last year or two one lady in particular, Mrs. Mary Treat, of Vineland, N. J., herself both a practical botanist and a charming writer, encouraged in her pursuits by Professor Gray, of Cambridge, Massachusetts, has made diligent search for plants possessing these characteristics, and has patiently watched them through months of experimenting, keeping a diary and giving the information thus gained to the public. Mrs. Treat's latest experience is with bladderwort, which she carefully observed, and found ample proof that the little sacks are traps for water insects which are unsuspectingly drawn in and then consumed. She found that not only small insects were caught, but "innumerable moths, and butterflies two inches across, are held captive until they die—the bright flowers and brilliant, glistening dew luring them on to sure death." Some of these plants she took to the house, "away from atmospheric agitation," and began her experiments, pinning living flies "within a quarter of an inch of the most vigorous leaves; in less than an hour the flies' legs are entangled in the glands. I now take the long-leaved sun dew, which is more common and a more wonderful flytrap than either of the other species, place a struggling fly on a vigorous, healthy leaf; in less than three hours the leaf is folded completely around its victim. I take a bit of raw beef, placing it as nearly as possible on the center of the leaf; in twelve hours it is so enfolded in the leaf as to be completely hidden from view." Mineral substances, bits of chalk, etc., were not at all affected. Next she tried the round-leaved sun dew, whose leaves clasped a piece of raw beef in less time.

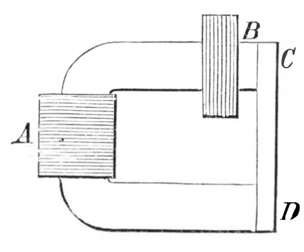
Killing Gophers.

The gopher is one of the most troublesome pests that the Western farmer has to contend with, and as difficult of extermination as any. Several inquiries have been made of us says *The Inter-Ocean*, as to the most effective means of disposing of them; and with a view of finding the most approved, we have consulted several farmers who have had extensive and painful experience with them. The plans for removal have been as various as the persons consulted, and have included poisoning, drowning, shooting, trapping, and other methods. But to our minds by far the best plan is that adopted and highly recommended by Dr. W. A. Pratt, of Elgin, Ill., and seems the most simple, least expensive, and most effective of any. He takes a light steel jaw trap, such as is used for catching rats, and crooks the catch (that passes over one of the jaws to the pan) a little, so as to allow the jaws to come nearer together then they do when set for ordinary purposes. He then sets the trap so that it will go off easily, and plants it bottom upwards over the gopher's hole, bringing the dirt a little around the edges so that the only apparent passage is through the jaws of the trap. The gopher, who generally comes out with some haste, rushes up, hits his head or paws against the pan of the trap, which unfastens it, and he is caught securely in the jaws. Dr. Pratt says that a few days of persistent trapping in this way will completely clean out every vestige of the gophers from a large farm

A NEW MAGNETO-ELECTRIC ENGINE.

In order to investigate the induced currents produced by the application of armatures to horseshoe magnets, Professor W. R. Morse recently constructed the simple apparatus represented in Fig. 1. This consisted of cylindrical horse shoe electromagnets, the wires of which were wound about iron cores at the bend of the iron, so as to form practically straight electromagnets with cores horseshoe in form. A is the coil of the electromagnet, and B the induction coil. Upon exciting the electromagnet, induction currents arose in the coil of fine wire, B, both at making and breaking the circuit. These currents were measured by a reflecting galvanometer placed in the circuit of the coil, B, and were compared with those obtained from the same electromagnet by placing a straight armature, C D, upon its poles, and then exciting the electromagnet.

Fig. 1.

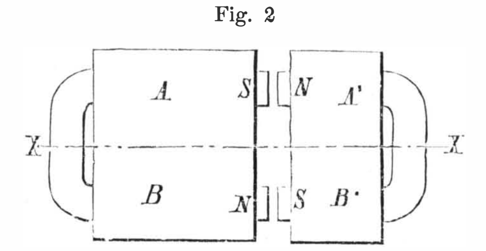


The results of experimenting show that a marked increase, amounting to nearly 25 per cent in the strength of the induction currents, is due to the application of the armature to the poles of the electromagnet. The first induced current after the removal of the armature, which results from again making the current in the electromagnet, shows the same increased effect, but the following current, resulting from breaking the circuit of the electromagnet, falls to its normal amount. This is noteworthy as indicating, according to the author, a certain molecular change in the iron due to the application of the armature.

Generally, it also appears that the induction currents, resulting even from the employment of straight soft iron armatures which had been carefully deprived of residual magnetism, are more than four times as strong as those obtained by merely slipping the induction coil on and off the limits of the electromagnet; and when electromagnet armatures are used, the effects far surpass those obtained by non-magnetic soft iron straight armatures.

Based on these facts, a magneto-electric engine of the following construction is suggested by Professor Trowbridge:

Fig 2



The horseshoe armature is made to revolve around the line, X X, Fig. 2, as an axis. It has been found by experiment that, when a north and south pole are opposed, the induction currents through B and A' are in the same direction, and those through B' and A are also in one direction. By a suitable commutator, the currents circulating through the coils on the stationary magnet can be sent through those on the armature, and *vice versâ*. The residual magnetism in soft iron is sufficient to start the induced currents. Experiments, says the *American Journal of Science and Art*, are now being made upon the engine.

A Word to Young Mechanics.

"When Tubal Cain began to invent utensils and started to make a din in his forge, I suppose the first idea that struck him—for he must have been very observing in his youth—was that some materials are soft and easily manipulated, while others are of a more obdurate and ungovernable nature, and consequently require different treatment at the hand of him who would attempt to work them into new forms, so as to mold the shapeless mass to his uses, or engraft order and design upon chaos. With the lesson to be learned from the example of this pioneer of our order in view, I desire to say a word to young mechanics that would have been valuable to me while in the maze of study in the days in which I was learning a trade.

Every one that ever learned a trade knows that many a time he has been without any clear idea of what he was doing, having merely acted as the machine of a master who was credited with being a No. 1 mechanic and all which that should imply, but who just lacked one thing, and that a very important one—he did not understand how to tell another how to do what he could do exceedingly well himself, and, as a general rule, got into a passion because his 'cub' didn't do it just to his mind. Now I could drop a word of advice here to journeymen; but you know, boys, as well as I do, that it is not our place to tell a 'jour.' anything, for fear his dignity might suffer, and ours too in consequence. But my advice to you is simply this: In starting out to learn a trade, make up your mind to learn and study both at the same time. This combination of occupations, it unfortunately happens, is rarely agreeable at fifteen or seventeen years of age, when one has just left school, and all study is looked at as something belonging to bygone days. I have been told by many a young man that work was his portion now, and that he didn't have time to study, and besides he was so tired at night that it was out of the question. My reply to those who speak in this way is:

'But you misunderstand me, my young friend. The les sons you need to study now are not taught in schools, colleges, or seminaries. You never see the books you need to apply your mind to now in libraries.'

I lay a piece of wood before the carpenter and say, 'my boy, that is one of your books.' I present a piece of iron to the blacksmith in the same manner, and on through all the branches of mechanism. The carpenter answers:

'Why, this is only a piece of pine, or of oak, and nothing more.' The smith will say: 'A bit of iron, and that's all.

But here comes the question, 'what do you know of the nature of the wood, or of the iron, and why should you know its nature? True, you may be able to work them after a fashion, and your powers of imitation may enable you to be as good a mechanic as the man who taught you; but you will never thus, in the nature of things, excel, and excellence is what every young man should have in view in any pursuit, for without it you will be termed just what you so often hear of—only a mechanic.'

Every mechanic should have as thorough a knowledge of the material he works as has the best chemist in the land; and this cannot be arrived at without close study and attention to its every natural feature—strength, power of resistance, and tension; in short, everything connected with its working or transformation from one condition to another. This knowledge is what is meant when you hear a man spoken of as an experienced mechanic."—*Paper Trade Journal.*

Correspondence.

The Fireless Locomotive.

To the Editor of the Scientific American:

The fireless method of using steam is one of those simple affairs which need but little experiment to develop its best results.

Locomotives of this kind with large tanks will probably prove more economical than those with small tanks. If a tank, 3 feet diameter and 10 feet long, is capable, with one charge, of propelling a car with from 25 to 40 passengers a distance of 8 or 10 miles, a tank of twice this capacity would probably do considerably more than twice the amount of work, owing to the greater body of concentrated power and heat in proportion to the weight and surface of tank. The weight of these tanks may be reduced to a minimum by making them with hemispherical ends.

A tank of this form, 4 feet in diameter and 15 feet long, capable of sustaining a pressure of 360 lbs. per square inch safely, would weigh only about one third as much as an ordinary locomotive boiler. A tank of this size once charged with cold air only, to a pressure of 350 lbs. would propel an ordinary horse car load of passengers about five miles, if I figure correctly; if charged with water and steam at the same pressure, it would probably propel the same load some twenty miles. Notwithstanding this difference in expansive power of the two mediums, condensed air might prove the more economical and satisfactory of the two, especially in localities where ample water power could be obtained for condensing the air into reservoirs for charging the locomotive tanks.

A foreign periodical recently contained an illustrated description of a car propelled by a series of coiled steel springs arranged upon a single shaft beneath the car; but nothing very satisfactory seemed to be developed by this device. At present there seems to be nothing so likely to supersede horses on street railroads as the fireless locomotive or a system of condensed air engines. When the possibilities of both of these systems are fully developed, city transit will be conducted much more cheaply and satisfactorily than it now is.

Worcester, Mass. F. G. WOODWARD.

Fire Escapes Wanted.

To the Editor of the Scientific American:

The French church in which the Holyoke horror occurred was a large wooden building constructed of inflammable pine, with insufficient modes of exit in case of accident. Under such conditions, the best fire department in the world is helpless, and the only possible remedy is to rigidly require such buildings to be properly constructed. The only door by which escape could be made opened inwardly; and as was the case in the accident at a New York church several weeks ago, the frenzied crowd of men, women, and children pressed against it, barring their only way of escape, and became a prey to the raging flames.

There must be a remedy for all this. There must be responsibility somewhere for an arrangement that will crowd seven hundred strong men, timid women, and helpless children into a small church with no sufficient means of egress in case of an alarm. The church at South Holyoke is not the first that has been thus destroyed, and with it the lives of many human beings; yet that church, and many another like it, seems to have been constructed with a special view to occasioning a loss of life in the event of a stampede. This large and densely packed congregation were quietly seated in their church at a certain moment; and in twenty minutes thereafter, seventy-five of their number lay dead and dying, trampled under foot, crushed by fatal leaps, or blackened by the flames that rushed upon them. There was not a person in that church who could not, with an uninterrupted passage, have placed himself in security from danger in the space of one minute. If the means of egress had been sufficient to empty the church in five minutes, all would have been saved.

The estimates for the strength of gallery and floor are based upon the largest crowds they can hold, and may be calculated with accuracy. Why should not similar estimates and calculations be made in determining the facility for emptying a place for public gathering? Why should not the architect picture to his mind's eye a great audience struggling for egress, as well as standing or sitting, wedged in together, on the floor and gallery? There is need for the law to control these matters. Provision can be made, and it should be compelled to be. We forbid the building of frame structures in our cities; we maintain, at enormous cost to the public treasury, and by an onerous tax on private property, efficient and skillful fire departments; we cover the roofs of our cities with a network of telegraph wires that summon, at an instant's warning, the distant engine to the scene of a conflagration; we take every public precaution against the destruction of property by fire; yet we take none against the destruction of human life through the same instrumentality. To save some slight expense, an extra flight of stairs, or an extra door and a few convenient windows, the law permits hundreds of persons to be gathered into a pen from which there is no escape in case of confusion and alarm, to be seated, as it were, over a magazine that may be exploded in an instant.

There is just as much danger of fire in every church and public place as there was in the church at South Holyoke. Drapery and lights in close proximity may be noted anywhere. It chanced there, as it may in any such place, that the light touched the drapery; that a small stream of flame shot terror into some one's heart; that there was a cry, and, as the contagion of fright increased, a rush for the door. All this may occur in any place where a crowd is gathered; but it is not from every place that, when the rush begins, the crowd can escape. The crowd could not readily pour itself out of the South Holyoke church, nor can a startled crowd so pour itself out of anyone of two thirds of the churches and halls in this country.

Indianapolis, Ind. L. K. Y.

The Motive Power of Light.

To the Editor of the Scientific American:

I read in your paper an account of Professor Crookes' instrument for proving the motive power of sunlight. In Dick's "Practical Astronomer," chapter 1, you will find a description of a device made for the same purpose thirty years ago. R. L. TAYLOR.

914 Chestnut street, Philadelphia, Pa.

The following is the description to which our correspondent refers:

[From "The Practical Astronomer," by Thomas L. Dick, LL.D. Published in 1848.]

"*Light*, though extremely minute, *is supposed to have a certain degree of force momentum*. In order to prove this, the late ingenious Mr. Mitchell contrived the following experiment: He constructed a small vane in the form of a common weathercock, of a *very thin* plate of copper, about an inch square, and attached to one of the finest harpsicord wires about ten inches long, and nicely balanced at the other end of the wire by a grain of very small shot. The instrument had also fixed to it in the middle, at right angles to the length of the wire, and in a horizontal direction, a small bit of a very slender sewing needle, about half an inch long, which was made magnetical. In this state the whole instrument might weigh about ten grains. The vane was supported in the manner of the needle in the mariner's compass, so that it could turn with the greatest ease; and to prevent its being affected by the vibrations of the air, it was enclosed in a glass case or box. The rays of the sun were then thrown upon the broad part of the vane, or copper plate, from a concave mirror of about two feet diameter, which, passing through the front glass of the box, were collected into the focus of the mirror upon the copper plate. In consequence of this, the plate began to move with a slow motion of about an inch in a second of time, till it had moved through a space of about two inches and a half, when it struck against the back of the box. The mirror being moved, the instrument returned to its former situation; and the rays of the sun being again thrown upon it, it again began to move, and struck against the back of the box as before. This was repeated three or four times with the same success.

On the above experiment the following calculation has been founded: If we impute the motion produced in this experiment to the impulse of the rays of light, and suppose that the instrument weighed ten grains, and acquired a velocity of one inch in a second, we shall find that the quantity of matter contained in the rays falling upon the instrument in that time amounted to no more than one twelve-hundredth-millionth part of a grain, the velocity of light exceeding the velocity of one inch in a second in the proportion of about 12,000,000,000 to 1. The light in this experiment was collected from a surface of about three square feet, which reflected only about half what falls upon it; the quantity of matter contained in the rays of the sun, incident upon a foot and a half of surface in one second of time, ought to be no more than the twelve-hundred-millionth part of a grain. But the density of the rays of light at the surface of the sun is greater than that at the earth in the proportion of 45,000 to 1; there ought, therefore, to issue from one square foot of the sun's surface, in one second of time, in order to supply the waste by light, $\frac{1}{45000}$th part of a grain of matter, that is, a little more than two grains a day, or about 4,752,000 grains, or 670 pounds avoirdupois, nearly, in 6,000 years; a quantity which would have shortened the sun's diameter no more than about ten feet, if it were formed of the density of water only.

If the above experiment be considered as having been accurately performed, and if the calculation founded upon it be correct, it appears that there can be no grounds for apprehension that the sun can ever be sensibly diminished by the immense and incessant radiations proceeding from his body on the supposition that light is a material emanation. For the diameter of the sun is no less than 880,000 miles; and before this diameter could be shortened, by the emission of light, one English mile, it would require three millions one hundred and sixty-eight thousand years, at the rate now stated; and before it could be shortened ten miles, it would require a period of about thirty-one millions of years. And although the sun were thus actually diminished, it would produce no sensible effect or derangement throughout the planetary system. We have no reason to believe that the system, *in its present state and arrangements*, was intended to endure for ever; and before the luminary could be so far reduced, during the revolutions of eternity, as to produce any irregularities in the system, new arrangements and modifications might be introduced by the hand of the All Wise and Omnipotent Creator. Besides, it is not improbable that a system of means is established by which the sun and all the luminaries in the Universe receive back again a portion of the light which they are continually emitting, either from the planets from whose surface it is reflected, or from the millions of stars whose rays are continually traversing the immense space of creation, or from some other source to us unknown."

Our Patent System.

"A Defence of our Patent System," and "Our Country's Debt to Patents," are the titles of two essays, written respectively by Mr. John S. Perry, of Albany, N. Y., and Mr. H. Howson, of Philadelphia, and published under the auspices of the United States Patent Association, in a handy volume, by J. R. Osgood & Co., of Boston, Mass. Mr. Perry's paper is a reply to the speech of Hon. H. B. Sayler, in the House of Representatives, last winter, in support of a bill permitting the free use of any article made under a single patent, on the payment of a royalty of 10 per cent and the filing of a bond by the user. The object of the measure was the prevention of such monopolies as those controlled by the sewing machine ring and the hat body people; but the provisions advocated, as we remarked in commenting upon them at the time, were objectionable and contrary to public policy for a variety of reasons, which need not here be recapitulated as the bill was not passed.

Mr. Perry does not confine himself to showing up the disadvantages of Mr. Sayler's proposition, but goes further and denies, *in toto*, the latter gentleman's statements as to the profits made by the various industries involving the manufacture of patented articles; and he fortifies his denials by the testimony of a number of manufacturers and inventors, and by the assertion that the census returns, from which Mr. Sayler gathered his statistics, are entirely unreliable. There are several points in Mr. Perry's statements as to the profits of the sewing machine people, and those of various other manufacturers, which are open to criticism; but, in the main, his views on the general subject of our patent system are sound and able. He says, very truly, that "a patent law compels the inventor, if he would avail himself of its benefits, to make the inventions known by spreading out a minute description of the same upon the public records of the Office, and, if he would reap pecuniary advantage, to publish them to the world, thereby giving an opportunity for their general adoption. . . In no sense can a patent be considered an injustice to the public, because it takes nothing from them which they had ever before possessed; on the contrary, it gives them something new, some increased facility, some more advantageous method, a cheaper substitute for a rare and costly article. . . In proportion as the patent system has stimulated and developed inventions among our people, have our mechanical arts risen in importance, until our power in this direction has become recognized throughout the world."

Mr. Howson's essay will, without doubt, interest every one who is himself interested in patents. He deals with the subject in a practical and lucid manner, and his remarks are well worth careful perusal. We give an extract below, and shall present other selections in future issues.

"We constantly hear the word 'patents' from the mouths of the manufacturer and mechanic, the wholesale merchant and retail dealer, and the farmer, and always in connection with something that is novel, or of superior quality, or some thing that can be obtained at a cheaper rate than usual.

Now and then we hear the word uttered in contemptuous tones by disappointed speculators, jealous manufacturers, men who would invent without being inventors, or by those who would attempt to cure the minor evils always accompanying even the most salutary and beneficent systems of public policy, not by attacking these evils in detail, but by the disorganization of the whole system.

Common as the word is, there are few who are aware how intimately related patents are to our present well-being and comfort, how much we owe to patents in the past, how much we have to hope from them in the future, and how intimately they are interwoven with our whole social system."

WHAT PATENTS HAVE DONE FOR US.

"I propose to show how grateful we ought to be for our patent system, not by any elaborate investigation of different branches of industry, not by any lengthy historical and statistical researches, but by confining my remarks to familiar objects within my reach in the room which I now occupy—a library furnished with the ordinary accessories which a professional man requires.

There is a tapestry carpet on the floor, a carpet with a tasty pattern woven in brilliant colors. Twenty-five years ago, a skilled workman could weave by hand two yards per day of a carpet like this, but not equal in quality; and now a single power loom will weave twenty yards per day. 'The carpets, moreover,' to quote the words of a well known authority, 'are more exact in their figures, so that they are perfectly matched, and their surface is smooth and regular. They surpass, indeed, in their quality, the best carpets of their kind manufactured in any other part of the world.'

To-day these superior carpets can be purchased at half the cost per yard charged for the inferior hand-made carpets of thirty years ago; that is, if we take into account the difference in value of money then and now.

To what shall we attribute this rapid progress in the manufacture of carpets? To Erastus B. Bigelow, you will say. I shall not be detracting from the merits of this great American inventor in saying, as I believe he himself would say, that the rapid progress of this manufacture is due quite as much to our patent system as to Bigelow's ingenuity.

This accomplished patentee spent years of studious application in the production of his loom. Where was the incentive to this laborious mental task? The reward which our patent system held out to him. Where was the incentive for capitalists to invest money in the manufacture of these carpets on a large scale? The security which patents afforded for the investment. Mr. Bigelow, although the most prominent inventor in this branch of industry, was not the sole contributor to its progress. Crompton and hosts of other patentees, have aided in bringing this manufacture to its present perfection, or rather to its present state of excellence; for we cannot foresee the end which perfection implies. We must look for further improvements, based on future patented inventions, providing progress is not obstructed by legislation tending to destroy the motive to invent. It is safe to say that better carpets may be seen to-day in the cottages of hardworking artisans than were found forty years ago in the houses of the wealthiest citizens; and this is due to the ingenuity called out by the incentives which patents have presented, and continue to present. It is not the wealthy alone who are gainers by our patent system; it is the masses who derive the greatest comforts from that source.

Before I leave the carpet, let me say that its greater durability is insured by a cheap patented lining, for different styles of which a dozen or two of patents have been granted, and that the carpet is secured by patent fastenings, on the production of which much ingenuity has been expended; for patents for these little devices can be counted by the score."

To be continued.

The Inventor's Paradise.

"A thousand patents," says a London writer, "are granted every month in the United States for new inventions. This number exceeds the aggregate issue of all the European States, yet the supply does not equal the demand, and the average value of patents is greater in America than in Europe by reason of the vast number of new industrial enterprises and the higher price of manual labor. A hundred thousand dollars is no unusual consideration for a patent-right, and some are valued by millions. The annual income from licenses granted on the Blake sole sewing machine is over three hundred thousand dollars, and other patented inventions are equally profitable. Inventors are encouraged by the moderate government fee of thirty-five dollars, which secures an invention for seventeen years without further payment; the rights of patentees are generally respected by the public; and no national legislator, with a single exception, has ventured to propose the abolition of a system which at once secures substantial justice to inventors and proves of incalculable advantage to the nation."

GUTTA PERCHA and india rubber are brought hither chiefly from Brazil and Columbia.

DECISIONS OF THE COURTS.

Supreme Court of the United States.

PATENT PAPER COLLAR.—THE UNION PAPER COLLAR COMPANY, APPELLANTS, *vs.* ISAAC VAN DEUSEN, JOHN VAN DEUSEN, AND HENRY BOEHMER, PARTNERS, AS VAN DEUSEN, BOEHMER & CO.

[Appeal from the Circuit Court of the United States for the Southern District of New York.—Decided at the October term, 1874.]

The purpose of a reissue is to render effectual the actual invention for which the original patent should have been granted—not to introduce new features.

Therefore in an application for reissue, parol testimony is not admissible to enlarge the scope of the invention beyond what was described, suggested, or substantially indicated in the original specification, drawings, or Patent Office model.

Whether a reissued patent is for the same invention as the original depends upon whether the specification and drawings of the reissued patent are substantially the same as those of the original; and if not, whether the omissions or additions are or are not greater than the law allows to cure the defect of the original.

Where the original patent for improvement in paper shirt collars, granted to Andrew A. Evans, May 26, 1863, stated the invention to consist, first, in making the collars of parchment paper, or paper prepared with animal sizing; and second, in coating one or both sides of the collar with a thin varnish of bleached shellac to give smoothness, strength, and stiffness, and to repel moisture, the claim being for "a shirt collar made of parchment paper, and coated with varnish of bleached shellac, substantially as described, and for the objects specified:" *Held*, that a reissue thereof which describes a paper other than parchment paper, or one prepared with animal sizing, and which does not require either side of the collars to be coated with a varnish of bleached shellac for any purpose, the claim being for "a collar made of long fiber paper, substantially such as is above described," is for a different invention from that embodied in the original patent.

Articles of manufacture may be new in the commercial sense when they are not new in the sense of the patent law.

New articles of commerce are not patentable as new manufactures unless it appears in the given case that the production of the new article involved the exercise of invention or discovery beyond what was necessary to construct the apparatus for its manufacture.

It appearing that the collars made by Evans, apart from the paper composing them, were identical in form, structure, and arrangement with collars previously made of linen, paper of different quality, and of other fabrics, and that Evans did not invent the paper used by him, nor the process by which it was obtained: *Held*, that he was entitled to a patent for the collars as a new manufacture.

The relation of employer and employé, in regard to the origin of inventions, stated.

The object in turning down a collar on a curved line instead of a straight line is precisely the same, whether the collar be all paper, paper and linen, or all linen. Hence, where it appeared that linen collars had been turned over on a curved line to prevent wrinkling, and to afford space for the cravat: *Held*, that it was not patentable to apply the same mode of turning down to collars of paper or paper and linen.

Reissued patent of Andrew A. Evans for "Improvement in Paper Shirt Collars," July 10, 1866 (original May 26, 1863), and of Solomon S. Gray, March 29, 1864 (original June 23, 1863), pronounced invalid.

Mr. Justice Clifford delivered the opinion of the court.

[*C. A. Seward*, for appellant.

J. J. Coombs & E. Wetmore, for appellees.

Recent American and Foreign Patents.

Improved Fence Post.

Myron W. Colwell, Dunlap, Iowa.—This invention consists in a tapered fence post made of wrought sheet iron, bent longitudinally into angular form, and having angular slots formed in its side edges, and holes formed in its angle. When the post is used for a wire fence, the wires are placed in the angular slots and tightened in the usual way; for a board fence, the boards are secured to it by wire bands, which are passed through the holes and twisted.

Improved Pantaloons Block.

James McCurdy, Lock Haven, Pa.—This invention relates to an improved pantaloons block for forming and ironing pants, and it consists of a forming block made of a front intermediate wedge and a back part, and provided with a locking bolt at the broader end, and a bottom-stretching clamping device at the narrower end.

Improved Horseshoeing Harness.

Isaac P. Pickering, Table Grove, Ill.—This consists in a harness so constructed that the foot on which the shoe is to be placed is held up and in proper position by drawing upon a draft strap, thus avoiding the necessity of holding up the horse's foot in the usual manner.

Improved Railway Switch.

Minter H. Davidson, Pruntytown, W. Va.—This rail is made with a broad base piece, designed to keep it in place when it is moved back and forth. The operating lever plays longitudinally through a clip in which are two oblique holes, which the rounded end of the lever enters, and is locked by a pin. A rod connects the lever with the rail. To change the rail, the locking pin is withdrawn, and the lever is pulled back from the hole it now occupies, and is turned on its fulcrum pin. This, while shifting the rail, brings the end of the lever to the other hole in the clip, into which it is pushed and locked by means of the pin, as before. By this arrangement the adjustable rail cannot be changed or moved until the lever is unlocked and changed to the other hole in the clip, and so on for each change made.

Improved Spring Bed Bottom.

Alva P. Brown, Texas, O.—This invention consists of arched slats resting at the ends on cross bars, which yield to the end pressure of the slats by means of rubber springs. Over the arched slats are horizontal slats fastened at the middle, and resting at the ends on cross bars supported by coiled springs on the movable rests of the arched slats.

Improved Sand and Gravel Separator.

Nicholas J. Keller, Pittsburgh, Pa.—This invention improves the construction of the sand and gravel separator for which letters patent were issued to same inventor May 21, 1872. An elevator discharges the sand and gravel upon a concave wire screen. The screen is set at an inclination of fifty degrees, and is agitated from the driving mechanism of the elevator. Another elevator serves as an endless chain pump to raise water and discharge it through upon the screen. The finer parts of the material pass through the screen into a trough, while the coarser parts slide down the screen board, and the finer parts of said refuse drop through the holes in the lower part of the said screen board. The lumps of coal and other coarse refuse drop from the lower end of the screen board into a flat or other suitable receptacle. The sand and finer gravel, that pass through the screen, slide down the inclined spout into a box, whence they are taken by another elevator, and discharged upon an inclined slide, down which they slide into a convenient receptacle. The elevators last mentioned may be stopped without stopping the sand elevator and screen.

Improved Plant Protector.

Mrs. Martha E. Slocum, Hornellsville, N. Y.—This is a device by which flowers and other plants may be protected against freezing in cold weather. It consists of a hollow tapering standard placed on legs with side openings and shelves at different hights, on which the plants are placed to be heated by a lamp under the standard. A top cross piece supports a covering thrown over the whole to prevent escape of heat and moisture.

Improved Door Mat.

Orrin Rice, Adrian, Ill.—The invention relates to a mat formed of corn husks or analogous material, and a back plate having screw-threaded holes into which the tufts or bunches of husks are screwed.

Improved Blank for Corrugated Paper Boxes.

Albert L. Jones, Brooklyn, N. Y.—The invention consists in the formation of blanks of corrugated paper, by cutting the paper to the size of the designed box, and then creasing the blank across the corrugations, on one or both sides, wherever the blank is to be turned or bent to form the angles of the box. The blanks thus prepared may be packed or transported from place to place, and form an article of commerce, and allow the boxes or canisters to be made where they are used.

Improved Portable Lighter.

John A. Watson, Lexington, Miss.—The invention contemplates the introduction to the public of a very simple and useful device by which a person may quickly strike a light in the dark. It consists in a matchbox having three cells which receive respectively a folding candlestick, a lot of matches, and a spare candle.

Improved Washing Machine.

George S. Jones and Benjamin F. Kidd, Russellville, Ky.—This invention relates to certain improvements in washing machines; and it consists in the peculiar construction of the rollers, which are formed of end plates connected by small detachable metallic rods that are passed through sections of rubber tubing, which series of rubber-covered rods forms the periphery of the rollers. When the periphery of the roller becomes worn, the rods are turned and a new face of rubber presented to constitute a new periphery for the roller.

Improved Fertilizer Distributor.

Clemon Bailey, Kinston, N. C.—The invention consists in a hand sower consisting of a hopper having a bottom slot, and a crank shaft having blades and a long tube, whereby the fertilizer or a ground or powdered substance may be discharged close to the bottom of furrow or surface of ground, and with perfect regularity in the most windy weather.

Improved Washing Machine.

Thomas Addison and James T. Yates, Ellicott City, Md.—This invention relates to certain improvements in washing machines which are designed to simplify the construction of the same, and lessen the wear and tear of the clothes. It consists of a receptacle for the water, having inside, and resting upon its bottom, a false bottom, upon which are disposed the clothes. Upon the inner sides of the machine are partitions which form lateral chambers that open into the main compartment both above and below the clothes. Fitting in this main compartment and moving vertically in the same, above the clothes, is a large plunger which is pivoted to and operated by a vertically moving lever. In the center of the plunger is a downwardly opening valve of large size. As the lever is operated the water is forced violently through the clothes, down the false bottom, up the lateral chambers, and falls over the top of the partitions into the main compartment, and through the valve upon the clothes for a repetition of the same action upon the next stroke of the lever.

Improved Low Water Indicator.

James Harding Brown, Porter's Mills, Wis.—This is an improved water gage for steam boilers, which is provided with a governor for regulating the supply of water and thus keeping the water always at the same level. It also has an alarm whistle, to give an alarm when the water rises to high water mark or sinks to low water mark. It is free from gearing upon the inside, and thus is not liable to stick or work hard.

Improved Carriage Clip.

Alfred W. Doty, Windham Center, N. Y.—Simple and inexpensive springs may with this arrangement be used, the springs being in some form or other interposed between the bars and the body or fittings attached thereto. The invention includes an improvement of the metallic fittings, by making them in malleable iron to economize in the cost of them, and consists essentially of the contrivance of them to be applied or assembled with the other parts without special fitting, except in the shaping of the woodwork and the preparing of it as to size, also in the fitting of a few rivets or bolts.

Improved Machine for Washing Printers' Rollers.

Thomas Muir, Glasgow, Scotland.—This is an improved machine for cleaning, in a rapid and reliable manner, printers' rollers from all adhering ink and other impurities; and it consists of a cylinder that rotates in a trough, with lye or other washing material, transferring the same by its rotary and simultaneous laterally vibrating motion to the rollers hung to quadrantal arms that are fixed to a shaft, and thus may be swung on or off the cleaning cylinder, as required. Fixed to the shaft from below is a lateral plate, whose outer edge assumes a downwardly inclined position on raising the arms from the cylinder, and whose inner edge comes in contact with the same. The arms are held to the cylinder by a notched lever secured to their shaft and resting on a cross bar of the framework of the machine, and these are kept in an upright position by a hook that drops into a notch in the lever. Perforated water pipes are arranged vertically above the rollers to throw a spray of water on them, the drip water being prevented by the inclined plane from running into the lye trough.

Improved Folding Table.

Franklin C. Wheeler, St. Joseph, Mo.—By suitable construction, enabling the four legs to be brought into the same plane, the table top may be turned down against and parallel with the said legs, folding the table into a very compact form for storage or transportation.

Improved Step Ladder.

Henry P. Stichter, Pottsville, Pa.—This ladder has the upper ends of its brace legs held by hooks in groove seats of the body, to prevent the brace from slipping or folding up.

Improved Log Sled.

Hiram S. Bartlett, Midland, Mich.—Suitable construction allows the runner to adjust itself to uneven ground, while the beam is held in place by a reach passing from the forward beam to the hind one. A saddle also strengthens the runner, and renders it less liable to split or break.

Improved Harness Knife.

Alexis Friderick, O'Fallon, Ill.—This invention relates to edge splitting and beveling knives for beveling both edges of a strap; and it consists of a straight blade fastened obliquely to the guide roller for splitting one edge at a time, so that straps of different widths may be split. It is also provided with two cutting edges, contrived so that, when one end of the blade is dull, the other may be used by shifting the blade upside down.

Improved Step Ladder.

Jacob Blauvelt, Blauveltville, N. Y.—This invention consists of connecting or jointing plates or hinges for jointing the ladder and the braces together at the top, so contrived that they will lock when the braces are adjusted to hold the ladder in the position for use. The invention also allows the braces to fold up to the ladder for storing away, and will lock them in that position. The device further consists of plates contrived to allow the braces to swing up into line, or nearly so, and to lock them in that position, so as to utilize said braces for an extension ladder.

Improved Apparatus for Capsuling Bottles.

Antoine Bosquet, Paris, France.—This invention relates to improved apparatus for fixing metallic capsules on bottles and other necked vessels, the apparatus belonging to that class in which the necessary pressure is applied to the capsule through the medium of water or other fluid acting on an elastic diaphragm or chamber of india rubber brought in contact with the capsule.

Improved Lamp Extinguisher.

J. O. Soderstrom, Pepin, Wis.—The invention consists in two oppositely concaved, but differently sized jaws, one folding within the other, a spring arranged in a curve behind and attached to the jaws so as to slide them forward, and in arms that move on the inside of jaws in order to spread them apart.

Improved Water Filter.

Charles B. Cooper, Nashville, Tenn.—As the water to be filtered is admitted into and rises in an upper vessel, it flows through a siphon, a perforated cone on the short arm of which prevents the coarser impurities from entering the said siphon. The water is further filtered as it flows from the siphon through a sponge and perforated cone on the long arm into an inner cylindrical vessel. Thence the water passes through a large perforated cone at the bottom into the space between the vessels, rises through the sand and gravel in said space, and overflows into a concave ring through the holes, in which it flows into the middle part of the space between other inner vessels, percolates through the gravel and charcoal in said space, and flows out through the holes in the bottom of the lower vessel into a receiver placed beneath it.

Improved Harrow.

Addison H. Whiteside, Onarga, Ill.—This is a right-angle-shaped tooth, one end of which is let into the harrow frame obliquely to the cross section, and confined by a staple. The latter holds the tooth perpendicular when the harrow is drawn by one end, and allows it to swing outward and backward obliquely to the line of the beam, and also to the horizon when drawn by the other end, thus combining two different harrows in one. The staple is secured, so as to be readily detached, by a nut on one of the prongs, which goes through the beam, to allow of taking out the tooth readily.

Improved Nut Lock.

Horace L. Heaton, Lilly Chapel, assignor of one half his right to Benjamin F. Roberts, of West Jefferson, O.—This consists of a nut with a grooved shank, in connection with a double spring entering into grooves at opposite sides of the shank. Said spring is readily detached for removing or applying the nut by an intermediate pivoted cam piece with handle part and drop pin acting thereon for spreading and retaining the same.

Improved Whiffletree.

James Harding Brown, Porter's Mills, Wis.—Clevises are placed upon the end parts of the doubletree and pivoted to said ends by bolts passing through slots in said clevises, so that they may move forward to take up the wear. The rear ends of the clevises project in the rear of half-round end projections, and have rollers pivoted or blocks attached to them, which bear against said half-round projections. The whiffletrees are pivoted to the forward part or bow, or are rigidly attached to the upper arm of said clevises.

Improved Lumber Dryer.

Philipp Pfeffer, New York city.—This invention relates to an improved apparatus for drying lumber of varying thickness within short time by the influence of pressure and heat; and it consists in introducing the boards between press plates heated by steam, and provided with a perforated face lining, with connecting grooves at the inner side, for admitting the escape of the moisture in the lumber.

Improved Corn Sheller.

Frelinghuyson H. Hunter, Heltonville, Ind.—The invention is an improvement in the class of corn shellers having a ribbed surface, over which the ears are drawn by hand to free them of the kernels. A chaff box, which is formed of a sheet metal plate, is applied beneath the ribs of the sheller to catch the kernel husks or chaff that becomes separated from the cob.

Improved Coffee Pot.

Richard Law Bate, Adrian, Mich.—The coffee pot is seated by a bottom extension in the open top of the kettle. A central tube extends vertically from a bottom aperture to about the hight of the coffee pot, and is provided with a detachable strainer, having a perforated bottom for the ground coffee. A detachable cap is attached to the central tube of the strainer, and serves to throw the steam on the ground coffee. A vessel with cold water is placed on the top of the strainer for condensing the steam passing from the kettle through the tube to the strainer. The condensed steam drops on the coffee, and passes through the perforated bottom of the strainer into the body of the pot below the same.

Improved Washing Machine.

Solomon Wells, Brownsville, Ky.—This improvement relates to the combination of a series of vertically adjustable rollers, the journals of which work in slots formed in the sides of the suds box, and a series of lower fixed rollers supporting the series of adjustable rollers, and provided with crank mechanism, whereby both series or sets are rotated together.

Improved Beer Cooler.

Wenzel Toepfer, Milwaukee, Wis.—This invention consists of a fan having a hollow and perforated shaft with pipe connections at the ends for receiving cold air from other blowers arranged over the vat containing the beer on trucks, which are caused, by suitable machinery, to reciprocate the fan and rotate it at the same time, so as to agitate the beer and cool it by the air delivered from the shaft. A bent tube is mounted on the trucks, with pipe connections for conducting cold water through the beer as a further means of cooling it, the pipe being contrived to move along in the beer or over it. There is also a new mode of fastening the bottom sheets of the vat together by key clamps and a couple of strips of metal fastened together, between which the edges of the bottom plates are wedged by the clamps.

Improved Plow.

Francis R. Bell, Marshall, Texas.—The object of this invention is to furnish plow mold boards to which the black land of Texas, and other similar soils, will not adhere, so that a furrow can be turned, however sticky and waxy the soil may be. The invention consists in a wooden mold board for plows, saturated with oil, and provided with a number of oil-receiving holes or reservoirs in its edges to keep it saturated.

Improved Truck for Brick Yards.

Edward Noonan, La Salle, Ill.—This is an improved truck for bearing off bricks in a brick yard, so constructed that the shafts may be readily detached from one truck and attached to another without unhitching the horse from the said shafts.

Improved Portable Medicated Hot Vapor Bath.

Robert R. Roberts, Hot Springs, Ark.—This is a box which encloses the body of the patient, containing an adjustable seat and foot rest, and also devices for warming an incoming current of air before the same reaches the person of the bather.

Improved Miner's Lamp.

James Sawyer, Freeburg, Ill.—The lamp is filled with sponge, except a well in the middle, from which the sponge is held by a spiral wire, to allow the wick to extend down into the lamp. The lower end of the wick tube is funnel-shaped, and the wick is flared out thereat to the sides of the well, to touch the sponge, so as to draw the oil held in it. The flame regulator consists of a tubular sleeve on the upper end of the wick tube, to slide up and down along the flame, and has a rubber-spring ring to hold it fast. There is a hook for connecting the lamp to the hat of the miner, and a spring for securing it. With this improved lamp, miners can safely burn gasoline and other light products of petroleum, which are much cheaper, and give better light, than the lard oil commonly used.

Improved Hames.

John G. Eberhard, Akron, Ohio.—This invention consists of a new manufacture of hames for harness, the same being a hollow hame of cast metal of ductile character, or iron malleableized, the object being to obtain the requisite size for strength in such material without too much weight.

Improved Crib.

Henry Buttenberg and William R. Hodges, Memphis, Tenn.—The improvement relates to the arrangement of a sliding block and a clamping-screw hook with the slatted front rail of a crib, whereby said hook may be adjusted toward or from one which is stationary, thus adapting the crib for attachment to bedstead rails of irregular form.

Improved Clothes Dryer.

George Bent, Seneca, Kan.—This consists in a drying frame which will freely revolve with the wind, or may be placed or adjusted to take advantage of the sun in drying clothes. The dryer can readily be detached from the post with the clothes furled and carried under shelter in case of storm.

Improved Gas Burner.

Coleman D. Payne, Moselle, Mo.—The gas passes through fire chambers and intermediate perforations and passages, so arranged and constructed as to counteract the pressure from the gas reservoir and to admit a gentle and steady current to the burner.

Improved Implement for Loading Fire Arms.

Orson D. Phillips, Lisle, N. Y.—This is a gun-loading device for sportsmen, by which muzzle-loading guns may be charged with great rapidity; and it consists of a muzzle cap, with revolving cylinder, and a sliding rod, by which the charge is carried into the muzzle for being rammed down.

Improved Gas Purifier.

Joseph D. Patton, Trevorton, Pa.—This device consists of one or more scrubbers located outside of a gasometer tank, in connection with condensing chambers beneath the surface of the water within the tank, for removing condensable matter and cleansing the gas.

Improved Saw Guard.

Dwight Graves and Charles O. Howes, North Amherst, Mass.—The guard has its under side made circular to correspond with the diameter of the saw. The foot, which is hinged to the stationary stand on the guard, is serrated and rests upon the piece being sawn for preventing the rising of said piece, and to hold it firmly in position. When this foot is not required, it can be thrown back on the guard out of the way. Any other suitable devices may be employed to render the saw guard adjustable as to hight, according to the diameter of the saw or hight of the room.

Business and Personal.

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

Dry steam dries green lumber in 2 days, and is the only Cheap House Furnace. H. G. Bulkley, Cleveland, O.

Hoadley Portable Engines. R. H. Allen & Co., New York, Sole Agents of this best of all patterns.

For Sale—Large lot second hand Machinists' Tools, cheap. Send for list. I. H. Shearman, 45 Cortlandt Street, New York.

Microscopes, from 50 cts. to $500, for Scientific nvestigation and home amusement. Magnifying Glasses, Spy Glasses, Telescopes, and Lenses. Price List free. McAllister, M'f'g Optician, 49 Nassau St., New York.

$25 to $50 per day to good agents to sell Well-Boring Machinery. A Horse Bores from 10 to 48 in. diam. Send for pamphlet. Pump & Skein Co., Belleville, Ill.

Wanted—Situation as Draughtsman. Good reference. Address C. H. Lee, Easton, Pa.

The Original Skinner Portable Engine (Improved), 2 to 8 H.P. L. G. Skinner, Erie, Pa.

Chemicals for Making Self-Acting Copying Paper, 50c. Address E. Ford, Mendota, Ill.

For Sale—1 new 3 ft. Iron Planer, chuck & countershaft, pr. $225. Davis Level & Tool Co., Springfield, Ms.

To Rent—Machine, Boiler Shop, and Foundry. Machine Shop, built of stone, 80x30. Two Stories and Basement; other buildings proportionately large. 25 horse power new American turbine water wheel. Located in a village of 2,000 inhabitants, with two Railroads, and in the heart of Western New York. The buildings and power are well adapted for any manufacturing business. Reason for renting, removal. Address A. G. Ridley, Phelps, N. Y.

Wanted—Catalogues of best Paper Making Machinery. Address Lock Box No. 1, Knoxville, E. Tenn.

Geo. P. Rowell & Co's Advertising Agency, No. 41 Park Row, New York, receives advertisements for all the newspapers in the United States, at the lowest cash rates, furnishing circulars and estimates free.—[Brooklyn (E. D.) Times.] It is a model business house. They give more for the money than any other house in the world.—[City Item, Philadelphia, Pa.]

Wrought Iron Pipe—For water, gas, or steam. Prices low. Send for list. Bailey, Farrell & Co., Pittsburgh, Pa.

J. S. Mundy's Pat. Friction Hoisting, Pumping, and Mining Engines, 5 to 60 H.P., 7 R.R.Av., Newark, N. J.

Woolen and Cotton Machinery of every description for Sale. Estimates furnished for erection of Factories of any size. A. C. Tully, 55 Dey Street, New York.

A Permanent Situation Wanted by an experienced Pattern Maker. I. C. Carter, Fort Wayne, Ind.

Rights for Sale—Wooden article. 2947, N.Y. P.O.

Camp Lounge, $5. C. L. Co., Troy, N.Y., and Norwalk, Ct. N. Y. City Salesroom, 177 Broadway.

For the best Animal Trap in the world, address John Dunne, Limestoneville, Montour Co., Pa.

For Sale, or on Royalty—Two Patents, Stationery Articles. Address Key Box, Spartenburg, S. C.

A Machinist and Draughtsman, acquainted with Erecting Oil Gas Works, 15 years' experience as foreman, wants employment. Letter Carrier 85, Philadelphia, Pa.

Room and 12 Horse Power to Let. Good Shipping point. Ainslie & Masten, Toledo, Ohio.

Money made by Consumers of Steam and Agents, with Fenn's Feed Water Heater and Purifier. Send for Circular. Pump & Skein Co., Belleville, Ill.

Walrus Leather Wheels for polishing all Metals. Greene, Tweed & Co., 18 Park Place, New York.

Small Gray iron castings made to order. Hotchkiss & Ball, Foundrymen, West Meriden, Conn.

"Book-Keeping Simplified."—The Double-entry system briefly and clearly explained. Cloth, $1. Boards, 75 cts. Sent postpaid. Catalogue free. D. B. Waggener & Co., Publishers, 424 Walnut St., Philadelphia, Pa.

Wood Planers—Five 2d H'd for Sale Cheap; 1 2d H'd 30 H.P. Boiler. Wm.M.Hawes, Fall River, Mass.

Saw Ye the Saw?—$1,000 Gold for Hand Sawmill to do same work with no more power Expended. A. B. Cohu, 197 Water St., New York.

Moss Agates, Petrified Bones, Wood, Shells, and other curiosities, will be sent C. O. D. by S. H. Wright, Church Buttes Station, Winta Co., Wyoming Ter.

Scale in Boilers Removed—No pay till the work is done. Send for 34 page pamphlet. George W. Lord, Philadelphia, Pa.

Hotchkiss & Ball, West Meriden, Conn., Foundrymen and Workers of Sheet Metal. Will manufacture n royalty any Patented articles of merit.

Wanted—To sell a half interest in a large, well established business, secured by original patents. C. H. Kirkpatrick, Lafayette, Ind.

Blake's Belt Studs are the best fastening for Leather or Rubber Belts. Greene, Tweed & Co., 18 Park Place, New York.

The Best Wooden Pulley made; fastens without keys or set screws. Adjustable Dead Pulleys stop loose pulleys and belts when machinery to which they belong is not in motion. Cold Rolled Shafting, Improved Couplings and Hangers. A. B. Cook & Co., Erie Pa.

File-cutting Machines. C. Vogel, Fort Lee, N. J.

Grind Winter Wheat—New Process. John Ross, Williamsburgh, N. Y.

Dickinson's Patent Shaped Diamond Carbon Points and adjustable holder for working Stone, dressing Emery Wheels, Grindstones, &c., 64 Nassau st., N. Y.

Boult's Paneling, Moulding and Dovetailing Machine is a complete success. Send for pamphlet and sample of work. B. C. Mach'y Co., Battle Creek, Mich.

Pipe and Bolt Threading Machines. Prices from $80 up. Address Empire Manufacturing Company, 48 Gold Street, New York.

Johnson's Universal Lathe Chuck. Medal awarded by the Franklin Institute for "durability, firmness, and adaptation to variety of work." Lambertville Iron Works, Lambertville, N. J.

For best Bolt Cutter, at greatly reduced prices, address H. B. Brown & Co., 25 Whitney Avenue, New Haven Conn.

American Metaline Co., 61 Warren St., N.Y. City.

Grindstones, 2,000 tuns stock. Mitchell, Phila., Pa.

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

The "Scientific American" Office, New York, is fitted with the Miniature Electric Telegraph. By touching little buttons on the desks of the managers signals are sent to persons in the various departments of the establishment. Cheap and effective. Splendid for shops, offices, dwellings. Works for any distance. Price $6, with good Battery. F. C. Beach & Co., 246 Canal St., New York, Makers. Send for free illustrated Catalogue.

Three Second Hand Norris Locomotives, 16 tuns each; 4 ft. 8½ inches gauge, for sale by N. O. & C. R. R. Co., New Orleans, La.

Agents.—100 men wanted; $10 daily, or salary, selling our new goods. Novelty Co., 300 Broadway, N. Y.

Genuine Concord Axles—Brown, Fisherville, N.H.

Temples and Oilcans. Draper, Hopedale, Mass.

Price only $3.50.—The Tom Thumb Electric Telegraph. A compact working Telegraph Apparatus, for sending messages, making magnets the electric light, giving alarms, and various other purposes. Can be put in operation by any lad. Includes battery, key, and wires. Neatly packed and sent to all parts of the world on receipt of price. F. C. Beach & Co., 246 Canal St., New York.

Hotchkiss Air Spring Forge Hammer, best in the market. Prices low. D. Frisbie & Co., New Haven, Ct.

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

Spinning Rings of a Superior Quality—Whitinsville Spinning Ring Co., Whitinsville, Mass.

All Fruit-can Tools, Ferracute W k's, Bridgton, N. J.

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

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

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

Faught's Patent Round Braided Belting—The Best thing out—Manufactured only by C. W. Arny, 301 & 303 Cherry St., Philadelphia, Pa. Send for Circular.

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

For 13, 15, 16 and 18 inch Swing Engine Lathes, address Star Tool Co., Providence, R. I.

Machinery Wanted—Edging, Milling, and other Gun Machines wanted, new or second hand. Address E., Box 1758, New York.

Single, Double and Triple Tenoning Machines of superior construction. Martin Buck, Lebanon, N. H.

Peck's Patent Drop Press. Still the best in use. Address Milo Peck, New Haven, Conn.

Notes & Queries

W. F. P. will find an account of the termination of the phylloxera controversy on pp. 242, 385, vol. 32.—L. C. will find a recipe for a black ink with iron in it on p. 203, vol. 29.—W. R. W. will find an answer to his engine query on p. 321, vol. 30.—C. E. W. will find a description of silver-plating on p. 405, vol. 32. For plating without a battery, see p. 299, vol. 31.

(1) K. K. C. asks: In what way is mercury used in exterminating bedbugs? A. Take corrosive sublimate 1 drachm, sal ammoniac (chloride of ammonium) 2 drachms, water 8 ozs. Sprinkle the bedding with the mixture.

(2) F. T. J. asks: How can I handle hot iron without being burned? A. The hands, when wet, can be plunged for a moment in molten iron without injury.

(3) R. W. B. says: 1. I have a quantity of vinegar made from honey. It has a pure transparent color, but has a slightly sweetish taste. What can I put in it to correct that, and give a genuine sour vinegar taste? A. See answer to H. K. G., p. 106, vol. 32. 2. How can I keep moths out of the hives? A. It is very well known that a colony of bees, under a right system of management, has no enemies that it cannot overcome. The secret of all successful management is to keep your colonies always strong, and they will always protect themselves; and the use of hives giving you the control of every comb enables you always to secure this end. When an intelligent bee-keeper possesses this power, the moth has no terror for him, since a strong stock is never injured by it.

(4) J. W. E. asks: What varnish is used to varnish saw handles? A. Shellac varnish.—J. E. E., of Pa.

(5) J. G. P. asks: How can I harden circular saws from $\frac{1}{32}$ to ⅛ of an inch in thickness, and from 3 to 4 inches in diameter, without warping? The saws are used to cut steel and iron. A. There is no way known to harden any kind of a saw without its springing. They may be flattened between two heated blocks when the temper is drawn, which will make the most of them nearly flat and some of them entirely so. For a good job, they must be straightened by a saw maker.—J. E. E., of Pa.

(6) W. A. M. says: 1. I am putting in a band saw (for sawing logs 6 inches wide) of No. 16 gage to run over a 4 foot pulley. Will it be a practicable machine? A. Such a mill is perfectly practicable if properly built and worked. 2. How many lbs. strain will it bear without breaking? A. Your pulleys will be too small for a band saw mill; they ought to be 6 feet in diameter in place of 4. The strain that the saw will bear depends upon the width of the blade. About 50 lbs. to the inch in width is a fair rule to work by. 3. How fast will it do to run the pulleys? A. You can run them at a speed that will drive the saw 9,000 feet per minute.—J. E. E., of Pa.

(7) J. S. P. asks: Will an 8x10 inches engine drive a four foot burr to any advantage? A. With a sufficient pressure of steam, it would answer very well.

(8) E. K. asks: How can I remove coal oil from cotton and woolen cloth? Boiling water and soap will not do it. A. Try steeping them for a short time in bisulphide of carbon in a closed vessel, and then allowing them to remain exposed to the air until completely deodorized.

(9) F. S. C. asks: 1. What is the difference between methylated ether and simple ether, and what is the meaning of methylated? A. Methol (also called wood spirit, pyroxylic spirit, and methylic alcohol) is a product of the destructive distillation of wood. The acetic acid of the crude product being saturated with lime, impure methol is obtained by distillation, which, after rectification, constitutes the methylated spirit of commerce. Methylic ether is obtained by the same process as ordinary or vinic ether, namely, by distillation of the spirit in contact with sulphuric acid; the only difference being that, in the manufacture of vinic ether, alcohol is used, while methol is the spirit used in the manufacture of methylic ether. 2. What are spirits of wine and spirits of turpentine? A. Spirit of wine is an alcohol, usually obtained from wheat, rye, barley, corn, molasses, etc., by fermentation and distillation, and derives its name from first having been obtained by distilling wine for its yield of brandy, and then slowly abstracting the more volatile part of the brandy by a small fire and tall vessels. Oil or spirit of turpentine is obtained by distilling common turpentine, a semi-solid resin which flows from the *pinus abies*, a species of pine, when wounded. This resin yields nearly one fourth of its weight of the essential oil, which passes over as a volatile, limpid, very inflammable liquid, of a penetrating, well known balsamic odor. The residue in the retort constitutes the common rosin or colophony.

(10) H. S. J. asks: What is the best process of cooling lard in summer, so that it will stand up? A. Keep it immersed in cold water.

(11) P. S. says: 1. In your issue of April 10, I find a device for bronzing cast iron, which I do not quite understand. It requires a bath of melted chloride of copper and cryolite, to which chloride of barium is added. Does this mean that these three articles are to be mixed in a melted state, or are they to be dissolved in water? A. The recipe is to be taken as written. 2. I am about to reduce some old gold solutions, consisting of cyanide of gold dissolved in cyanide of potassium. I evaporated it to dryness; can I now melt it in a crucible with borax, to get metallic gold, or does it want to be treated in another way? A. The pure metal may be obtained, in the form of a black, finely divided powder, from its solutions, by the addition of a filtered aqueous solution of common sulphate of iron. If this be melted, a mass of the metal with its characteristic color may be obtained in its pure state.

(12) H. B. asks: I have a sign (which I believe to be zinc) which requires cleaning two or three times a week and needs a great deal of rubbing to obtain a good polish and remove stains and finger marks. How can I clean it? A. Rub the metal over with a strong aqueous solution of oxychloride of zinc; wash, and dry quickly.

(13) G. C. S. says: We are putting in two boilers, each having two 16½ inch flues. Length of boilers is 24 feet. What should be the diameter of smoke stack, in order to insure good draft? A. Make the cross section of the chimney from $\frac{1}{6}$ to ⅕ the grate surface.

(14) C. E. B. says: 1. In your issue of April 10, mention is made of too much oil in engine cylinders being the cause of priming. Can this be so, except by the use of an open heater where the oil would be forced into the boiler with the feed water, causing it to foam? A. No. 2. I built an engine 1½ x 3 inches, with which I run a lathe, using a cylinder boiler, 10x18 inches. In surface blowing, I notice that the water is very dirty and oily, that blown off at bottom being much clearer. I always supposed that the oil would get into the boiler while making the connection. I exhaust into the air, and have not noticed any indication of priming; but the water appears to foam considerably. Will frequent blowing off remove all the oil from the boiler? A. Blow all the water out a few times, and cleanse with cold water.

(15) D. A. W. asks: In making an arrangement for heating the water for a bath tub, I unfortunately used second hand ¾ inch pipe, which was badly rusted. The water is badly discolored from the rust in the pipes. Is there anything that I can place in the tank, to pass through the pipes, that will cleanse them of rust and stop the discoloration of the water? A. Take the pipe down, and coat the interior with coal tar.

(16) J. C. L. says: 1. I have a small mill, driven by a 30 horse engine: and on account of dry weather, my well has partially failed. At its lowest stage the Missouri river is 35 feet below the level of the ground at the mill, and nearly 1,000 feet distant. Can I get water from the river by laying a pipe so that the highest point would not be over 25 feet above the river, and terminating in a well 50 feet deep? I know that in theory I could, but have never seen or known a siphon so long. A. Much longer siphons are in successful operation. It would probably be necessary to draw the water from subsiding basins or through filters. The siphon should be fitted with a valve at the top, to let out the air which will collect from time to time. 2. How ought I to start the water? Could it be done by means of a jet of steam from the boiler down the well end of the pipe, on the principle that a jet pump (or steam siphon) works? A. You can use the jet of steam or a small pump to start the flow.

(17) G. F. says: The wells in this vicinity average about 80 feet in depth, in clay and soapstone. One is 84 feet with no sign of water yet. We have struck a number of dry crevices that are full of wind and are continually blowing off, etc., so that you can hear them for rods around. Is this any sign of water? A. The escape of gas sometimes precedes the finding of oil, etc. You had better follow up the matter.

(18) C. W. R. asks: 1. How does the cycloid differ from the ellipse? A. The ellipse is an algebraic curve, and the cycloid a transcendental. 2. How can the circumference of a cycloid be found when the major and minor axes are known? A. The length of a cycloid formed by one revolution of the generating circle is four times the diameter of this circle. 3. Is every section of a cone an ellipse except that which is at right angles to its axis? A. No.

(19) W. M. asks: At what distance above the rail is the center of gravity of an ordinary box freight car, when empty, situated? A. We have not the data at hand for a complete calculation, but believe that the center of gravity is a little below the top of the trucks.

(20) C. J. M. asks: In running a small boat with a horizontal engine, 1⅝ inches diameter of cylinder and 4 inches stroke, what should be the size of screw? A. Use a propeller from 15 to 18 inches in diameter. 2. What sized boat would it run? A. The engine would answer for a boat from 12 to 15 feet in length. 3. Are two 13 x 16 inch engines more powerful than a 17x19 at 90 lbs. pressure? A. With the same mean pressure and piston speed, the double engine would develope about 15 per cent more indicated power than the single one.

(21) A. K. asks: Why is the fly wheel of an engine placed next to the bed plate, and the driving pulley next to the pillow block? A. This arrangement is by no means general; but where it is adopted, it is probably done for convenience in getting at the belt and pulley.

(22) J. K. W. asks: 1. What should be the size of a chimney large enough for three boilers with 38 three-inch flues in each? A. Make the chimney with a cross section of about ⅕ the area of the grate surface. 2. What is the comparative value of hard and soft coal for generating steam? A. There is very little difference between good qualities of either kind.

What length of 3 ply 1 inch hose (horizontal) will a common suction pump suck through, it having also a suction of about 10 feet perpendicular? A. Through several hundred feet, if everything is well arranged.

(23) W. S. B. says: I have a boiler badly incrustated, and I am bothered also with hot water pipes coated with similar incrustation. Kerosene, applied to the lime on the pipe, will soften it so that it is easily removed. Would there be any danger if I put in the boiler 2 or 3 gallons of the oil, and apply it to the incrustation for the purpose of soaking loose the scale? A. You can use the oil with little fear of danger.

(24) E. R. J. asks: Can a knife blade be tempered without being taken from the handle? A. It might be done, but it would be bad for the handle.

(25) J. W. W. C. says. I am making a lathe of the following proportions: Pulley, 3¼ inches in diameter at end, 3½ inches at center of face. Driver, 2 feet in diameter, weighs exactly 50 lbs. Crank, 2¼ inches long, 4¼ inches stroke. What should be the relative position and distance apart of the pivot, pivot of pitman, and point of foot pressure of the treadle? A. The arrangement is in a great manner a matter of taste, so far as we know; except that, of course, the movement of that part of the treadle to which the pitman is attached must be sufficient, without making the space moved through by the foot excessive.

(26) W. G. says: I am building a boat 6 feet wide and 40 feet long, to draw 10 inches of water. How fast will an engine 3x6 inches, with a boiler containing 30 square feet of fire surface, drive this boat on slack water, with a paddle wheel? A. Probably at 3 or 4 miles an hour.

(27) A. R. R. asks: 1. How many cubic feet are contained in a tun of anthracite coal? A. The specific gravity of anthracite coal is about 1 41, and as water is 1, and weighs 62·5 per cubic foot, you can easily work out the problem. 2. What are its heating qualities compared with those of hard wood? A. It is assumed in practice that the heating effect of good coal is very nearly that of wood charcoal, and twice that of dry wood. In smelting operations, the heating effect of coal is taken by bulk to that of wood by bulk as 3:1, and by weight as 15:8. According to Karsten's researches: 100 parts by bulk of coal in the reverberatory furnace=700 parts by bulk of wood; 100 parts by weight of coal in the reverberatory furnace=250 parts by weight of wood. In boiling operations: 100 volumes of coal =400 volumes of wood; 100 parts by weight of coal =130 parts by weight of wood.

1. I am easily affected with lead poison. Would rain water kept in an ice cooler lined with zinc be injurious? A. No. 2. I see you recommend (for use in cisterns) lead pipe lined with tin. What protects the outside of the pipe from poisoning the water? A. In this case it would be necessary that the outer surface be also protected.

(28) S. E. H. says: A flat bottomed scow is being built of No. 24 galvanized iron (weighing 1 lb. to the square foot), 11 feet long, 2½ feet wide, and 10 inches high. What number of lbs. will it sustain? A. You must calculate the weight of the boat, and the amount of water it displaces at various drafts. The difference between the weight of the boat and the weight of the displaced water is the amount of cargo it will sustain.

(29) S. C.—The boiler is large enough for average work. Stopping off the opening for the forge will probably improve the draft, and increasing the hight of the chimney will do still more, though it may be as well to exhaust into the chimney. The flue should join the chimney in a gradual upward bend, instead of an abrupt elbow.

(30) S. asks: How many cubic feet of space are required to stow a tun of 2,000 lbs. of Lackawanna chestnut coal? A. From 43 to 48.

(31) S. F. B. asks: How can I project the form and appearance of a rainbow upon a screen? A. A diaphragm or slide of metal or cardboard, having in it a small slit in the form of an arc, is placed before the condenser in the position ordinarily occupied by the transparency. The light passing through the slit, from the lantern, is caused to traverse a prism placed immediately before it. The image formed is defined or focussed by the objectglasses in the usual way.

(32) C. R. says: Please give me an explanation of the following formulæ: $\frac{144}{\text{degree Baumé}+134}$ =specific gravity, and $\frac{144}{\text{specific gravity}}-134$=degree Baumé. I see these used constantly in describing the specific gravity of petroleum, but nobody can explain them to me. A. It is merely an arithmetical ratio which represents the relation in which the numbers obtained by the purely arbitrary divisions of the Baumé scale stand to the specific gravities. The second is derived from the first in the following manner: $\frac{144}{\text{degree Baumé}+134}$ =specific gravity. 144=(specific gravity ×degree Baumé) +(134×specific gravity). 144−(specific gravity×134)=specific gravity×degree Baumé. Dividing both terms by the specific gravity, $\frac{144}{\text{specific gravity}}$ −134=degree Baumé.

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

F. W. B.—It is *Haltica striolata*, an insect very injurious to young plants. It is of a polished black color, with a broad, wavy, buff-colored stripe on each wing cover, and the knees and feet are reddish yellow. Its length is considerably less than $\frac{1}{10}$ of an inch. We think the ravages may be prevented by watering the leaves with a solution of lime, a remedy employed in England for this purpose.—G. N. K.—The sample sent is pure hydrated red oxide of iron, and might answer for making a cheap red paint. But it is without action on either tin or lead, and the explanation of the corrosion is to be found by examining the water, and not from these settlings.—J.B.W.—The wood is in the course of that slow change (under water) which would slowly bituminize and mineralize it, and result in the production of a body resembling coal.—G. A. S.—It is silicate of alumina, and is useful for all the purposes to which a fine, soft, polishing powder can be applied.—E. L. P.—It is neither lead nor silver. It is blende, sulphuret of zinc. Follow up the coal outcrop.—G. E. S.—No. 1 is silex containing clay mixed with oxide of iron. No. 2 is tourmaline. No. 3 is crystallized quartz.—R. A.—It is composed of copper pyrites, iron pyrites, and sulphide of lead.—I. J. W.—It is copper pyrites.—M. A. H.—It is galena, valuable lead ore.—F. E. P.—It is stibnite, or sulphide of antimony, and contains sulphur 28 per cent and antimony 72 per cent.—H. E. S.—It is common mica, used in large plates in stoves, etc.

COMMUNICATIONS RECEIVED.

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

On Steam Boiler Explosions. By J. W. D.
On a Preventive of Shipwreck. By J. F. J.
On a Curious Fact in Flower Growing. By W. H. M.
On a Theory of Dissolution. By W. T. D.
On Utilizing Natural Forces. By T. A.
On Extracting the Square Root. By E. C.
On Ship Railways. By J. A.

Also inquiries and answers from the following:
F. G. H.—H. W.—J. J.—J. McI.—M. W. M.—J. C. G.—E. F. N.—R. I.—N. W. T.—A. B. F.—H. R.

HINTS TO CORRESPONDENTS.

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

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

Hundreds of inquiries analogous to the following are sent: "Who sells lathes with engine-turning attachments? Whose is the best dividing engine? Why do not makers of gas-making machines advertise in the SCIENTIFIC AMERICAN?" All such personal inquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week ending

June 1, 1875,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

Alarm, burglar, J. Andrews 163,960
Amalgamator, W. H. Carson 163,847
Anchor, J. S. Williams 164,065
Bale tie, J. S. Carson (r) 6,468
Baluster, P. J. Hardy 163,993
Battery, flume, D. F. Hawkes 163,867
Bed bottom, spring, J. Wagner 163,902
Bedstead fastening, W. H. Elliot 163,982
Belting, machine, C. A. Jewell 165,002
Billiard table, H. W. Collender (r) 6,469
Binder, temporary, Peirce *et al.* 164,030
Bird cage hook, extension, V. Balcom 163,909
Bit stock, D. F. Sutton 163,896
Boat-propelling mechanism, T. W. Pratt 164,033
Boiler, wash, W. P. Casperson 163,916
Boot heels, etc., making, J. J. Sawin 163,948
Bridge, metallic arch, J. B. Eads 163,854
Buckle for suspenders, A. Shenfield (r) 6,474
Burner, gas, W. J. Herriott 163,929
Burner, lamp, A. Kimber 164,006
Butter package, J. C. Tilton 163,899
Button holes, cutting, J. D. Westgate 163,904
Car brakes, F. L. Kirtley 164,007, 164,009
Car coupling, B. S. Kearney 163,931
Car coupling, J. McNabb 164,017
Car coupling, O. L. Taylor 163,897
Car coupling, automatic, J. Miller 164,020
Car heater and ventilator, J. Amory 163,908
Car, refrigerating, R. Armiger 163,961
Car starter, A. H. Smith 164,049
Car starter, F. Stafford 163,895
Carpet stretcher and tack driver, G. A. Alger 163,907
Carriage top slat iron, F. B. Plumb 163,885
Casting articles of cement, L. A. Tartiére 164,057
Chain links, device for welding, P. H. Standish 163,949
Chair, adjustable and reversible, Voth & Hyatt 163,953
Chair, folding, J. E. Wakefield 164,060
Chair, folding, J. A. Ware 164,061
Chronometers, etc., regulating, L. Eaton 163,981
Chuck for metal drills, G. M. Pratt 164,032
Churn, reciprocating, Price & Hoover 164,034
Clock, pendulum, V. Himmer 163,868
Clothes dryer, W. Bloomer 163,972
Clothes dryer, E. S. Heath 163,928
Coat patterns, laying out, Z. Bauer 163,911
Cocoanut, preparing, A. P. Ashbourne 163,962
Columns, etc., construction of, P. J Hardy 163,994
Columns, construction of marble, P. J. Hardy 163,995
Compasses, mariner's, D. Baker 163,836, 163,837, 163,838, 163,839, 163,840
Cooler, beer, A. Roos 164,040
Cooler, milk, R. Smith 164,048
Corset, H. G. Emery 163,983
Culinary steamer, H. M. Welch 164,063
Cultivator, A. Dart 163,921
Doll, paper, W. H. Hart, Jr 163,866
Drills, chuck for metal, G. M. Pratt 164,032
Elevator, water, Hoag & Junkerman 163,999
Emery to metal, applying, S. G. Morrison 163,880
Engines, injector for steam, G. H. Little 163,876
Exercising apparatus, G. W. Wood 163,957
Exhaust, variable, Leseur & Michel 163,934
Fabrics, tentering, W. H. Palmer, Jr 164,026
Feather renovator, H. E. Rowe 163,889
Fence, barbed wire, Watkins & Scutt 163,955
Fence, farm, W. E. Cary 163,848
Fence post, J. E. Warren 163,954
Fifth wheel, C B. Wood 164,067
Fire kindler, W. C. Philbrick (r) 6,472
Fish hook, E. L. Dunlap 163,980
Flour dressing machine, G. Smith 164,050
Fruit dryer, H. E. Bidwell 163,968
Furnace, air-heating, S. W. Davenport 163,978
Furnace grate bar, J. Clark 163,975
Fuses, slow match for lighting, A. S. Wall 163,903
Game apparatus, C. L. Browne 163,845
Gas regulator, D. P. Mayhew 163,937
Gas retort, J. C. Tiffany 164,058
Grading apparatus, E. Church 163,849
Graining roller, A. J. Taplin 164,056
Gun feed case, D. C. Farrington 163,922
Hame and horse collar, E. Stroud 163,950
Hand rail, P. J. Hardy 163,996
Harrow, A. Ross 164,042
Harrow, corn, J. McCormick 164,013
Harvester, S. S. Stultz 164,055
Hat, A. A. Richardson 164,036
Hat fastening, C. R. Blackwood 163,913
Heater and condenser, J. E. Coughlin 163,917
Hoe, H. D. Mills 164,021
Hoe, D. and E. Moore 164,023
Hold-back, J. V. Phillips 163,884
Horseshoe, C. Hartmann 163,997
Horseshoe bar roll, H. H. Gilmore 163,864
Horseshoe calk die, J. Palmer 163,882
Horseshoe die, W. Russell 164,044
Horseshoe bending machine, A. Barton 163,841
House, wooden, M. Rogers 163,888
Ice, storing and removing, A. Hunt 164,001
Index, C. H. Bradley 163,973
Indicator, station, C. A. Blomquist 163,844
Indicator, station, S. P. Littlefield 163,936
Injector, W. P. Patton 163,027
Insect powder injector, A. Meyer 163,877
Iron and steel, making, J. B. Pearse 164,029
Jack, lifting, J. C. Bird 163,969
Journal, stud, or crank pin, O. E. Seymour 163,892
Knitted trimming, G. M. Geinshym 163,985
Ladder, extensible, W. B. Elliott 163,856
Lamp, C. McKinnon 163,016
Lathe cutter holder, J. R. Mitchell 163,878
Laundry polish, C. L. Holland 163,869
Leather work, etc., forming staples, T. K. Reed. 164,010
Letter and picture block, D. Birmeli 163,912
Letter box, A. Rosenstjerna 164,041
Locomotive cylinder cock, C. H. Hopkins (r) 6,464
Loom for tubular fabrics, J. E. Gillespie 163,925
Loom heddle frame, H. Parsons (r) 6,466
Marble, artificial, Cowman and Barber 163,977
Marble for building purposes, P. J. Hardy 163,990
Mats, making wooden, J. M. Hall 163,986
Match box, E. S. Burchett 163,846
Measure and funnel, J. D. Humphrey 164,000
Mirror, A. Huber 163,930
Motor, electric, C. J. B. Gaume 163,924
Mucilage holder, H. T. Cushman 163,919
Music holder, sheet, B. J. Beck 163,966
Music recorder, automatic, G. Landrien 163,932
Music stand, folding, E. A. White 163,905
Package holder, G. Lewinson 163,935
Painting, base for, Thielepape and Kroeschell 163,898
Paper box, L. A. Kettle 164,005
Paper, planishing, W. E. Lockwood (r) 6,470
Paper pulp wood grinder, J. O. Gregg 163,926
Paper pulp wood grinder, A. M. Zimmer 163,958
Pencil attachment, slate, J. Poznanski 163,886
Pessary, J. Kean 163,871
Piano attachment, A. Steinway 164,052, 164,053, 164,054
Pictures, apparatus for view, E. S. Ritchie 163,946
Pipes, stopping leaks in, J. B. Peake 164,028
Planter, hand corn, J. Beers 163,967
Plow, H. Olson 164,025
Plow iron, Moore and Curkendall 164,022
Plow, reversible, J. McCabe 164,014
Pot scraper, U. Cramer 163,918
Poultry coop, F. M. Blanc 163,971
Press, cider, H. Sells 164,045
Press, cotton, E. Van Winkle 163,900
Printers' leads, cutting, Hawkins and Dodge 163,998
Pump, chain, C. Fishbaugh 163,859, 163,860
Pump for deep wells, J. T. Whipple (r) 6,477
Railroad crossing signal, King and Nunn 163,875
Railroad rail joint, W. M. Spacht 164,051
Railroad signal circuit, etc., H. W. Spang (r) 6,476
Rake, horse, J. Pennypacker (r) 6,471
Roof, cement, I. Mills, Jr 163,938
Rope traction way, endless, A. S. Hallidie 163,865
Sash balance T. I. Dale 163,920
Sash balance, E. Johnson 164,003
Sash balance, T. J. W. Robertson 164,038
Saw filing machine, W. B. Bizzell 163,970
Saw for sawing stone, S. G. Morrison 163,879
Saw sharpening machine, P. D. Burgher 163,974, 164,068
Sawing machine, scroll, H. L. Beach 163,843
Scraper, road, E. A. Beach 163,842
Seeds, moistening, A. B. Lawther 163,933
Sewer trap, J. Naughten 164,024
Sewing machine, C. F. Bosworth (r) 6,463, 6,467
Sewing machine cover, G. Rehfuss 164,043
Sewing machine embroiderer, I. M. Rose (r) 6,473
Sewing machine straw, Smith & Ricker 164,047
Sewing machine tension, J. Reece 164,035
Sheet iron, manufacture of, J. Ells 163,857
Ship's berth, swinging, T. P. Ford 163,861
Ship's berth swinging, W. Von Auer 163,901
Shirt bosom, S. S. Fleishman 163,984
Shoe dressing, J. I. Eastman 163,855
Signal, etc., electric, W. J. Philips 164,031
Skate, P. Rodier 164,039
Slate-cutting machine, T. W. Parry 163,944
Slate framer, W. A. Miller 164,019
Smoking tube, J. C. Cook 163,976
Smoothing and fluting iron, W. D. Mayfield 164,012
Spinning frame bobbin, T. B. Wattles 164,062
Spring machine spindle, A. M. Wade 164,059
Spinning ring and ring rail, G. Richardson 163,887
Spool, N. I. Allen 163,959
Square, adjustable, C. B. Kirkpatrick 164,008
Steam brake, T. Wilson 164,066
Steering gear for vessels, D. Scattergood 163,890
Stereotype block, A. N. Kellogg 163,873, 163,874
Stereotype plate holder, A. N. Kellogg 163,872
Stone-cutter's gage, E. R. Batchelder 163,910
Stone for building, P. J. Hardy 163,992
Stone to walls, applying, P. J. Hardy 163,989
Stove, J. Spear 164,046
Stove attachment, cooking, F. Enos 163,858
Stove, cooking, D. E. Paris (r) 6,465
Stove, heating, P. J. Hardy 163,987, 163,988
Stove, heating, L. B. Stuart 163,951
Stove, magazine fireplace, J. J. McCormick 164,015
Stove pipe lid holder, Denman & Barfoot 163,852
Stove, reservoir cooking, D. E. Paris 163,883
Street mains, laying, A. O'Neill 163,942
Table and desk, combined, T. W. Moore 163,939
Table extension, T. White 164,064
Table, ladies' work, C. R. Snyder, (r) 6,475
Tar, treating, T H Dunham 163,979
Telegraph, duplex, M. Gally 163,923
Telegraphs, station for submarine, R. F. Bradley 163,915
Thrashing machine band cutter, E. L. Beard 163,964
Tide power, T. Beche 163,965
Torpedo for oil wells, J. Taylor 163.952
Toy, cartesian, A. Demuth 163,851
Track clearer, S. G. Smith 163,893
Track scraper, S. A. Otis 163,943
Trunks, spring buffer for, E. N. Geer 163,863
Tubing, drawing and welding, G. Matheson 164,011
Type setting machine, A. C. Richards 164,037
Vessels, construction of, J. W. Norcross 163,941
Vessels, mast and sail for, J. W. Norcross 163,940
Vessels, steering gear for, D. Scattergood 163,890
Wagon axle, E. Balkema 163,963
Wagon bodies, stud for, C. Spencer 163,894
Wagon, side bar, M. Donnelly 163,853
Walls of buildings, covering for, P. J. Hardy 163,991
Wash bench and wringer, C. F. Hornbeck 163,870
Washing machine, Addison & Yates 163,906
Washing machine, Jones & Kidd 164,004
Washing machine, J. W. Melick 163,018
Washing machine, E. J. Robinson 163,947
Washing machine, J. Seaman 163,891
Water wheel, O. J. Bollinger 163,914
Water wheel, J. P. Collins 163,850
Water wheel gate, J. M. Hart 163,927
Weed turner, Mowry & Chance 163.881
Wells, torpedo for oil, J. Taylor 163,952
Whiffletree, T. T. Furlong 163,862
Whiffletree hook and clip, I. N. Pyle 163,945
Whiffletree trace fastening, J. L. Wingate 163,956

DESIGNS PATENTED.

8,358.—SILK FABRICS.—J. Coignet, New York city.
8,359 to 8,363.—INKSTAND SUPPORTS.—C. Kitschelt, New York city.
8,364.—FAN.—N. Metz, New York city.
8,365.—MEDAL.—J. H. Schreiner, Philadelphia, Pa.
8,366.—MEDAL.—I. Townsend, Philadelphia, Pa.
3,367.—COOKING RANGE.—N. Vedder *et al.*, Troy, N. Y.
8,368.—VASE.—J. W. Fiske, New York city.
8,369.—FORK HANDLE.—J. F. Fradley, Brooklyn, N. Y.
8,370.—SPOON HANDLE.—J. F. Fradley, Brooklyn, N. Y.
8,371.—LAWYER'S BADGE.—S. L. Harmon, Batesville, Miss.
8,372.—TEA POTS, ETC.—J. D. Rice, Philadelphia, Pa.

APPLICATION FOR EXTENSION

CONVERTING MOTION.—A. J. Hathaway. August 4.

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 filing a Disclaimer $10
On an application for Design (3½ years) $10
On application for Design (7 years) $15
On application for Design (14 years) $30

CANADIAN PATENTS.

LIST OF PATENTS GRANTED IN CANADA, June 5 to June 9, 1875.

4,791.—G. H. Palmer, Monmouth, Ill., U. S. Army equipments. June 5, 1875.
4,792.—N. Louerin, Montreal, P. Q. Historical centograph. June 5, 1875.
4,793.—A. J. Small, Woodstock, N. B. Barrel lifter. June 5, 1875.
4,794.—J. E. Finley, Memphis, Tenn., U. S. Churn dasher. June 5, 1875.
4,795.—J. J. Roberts *et al.* Steam packing ring. June 5, 1875.
4,796.—T. S. Dickerson, Chicago, Ill., U. S. Making gas from petroleum, etc. June 5, 1875.
4,797.—C. Hutchings, Kansas City, Miss., U. S. Rein holder. June 5, 1875.
4,798.—E. E. Gold, New York city, U. S. Hot air furnace. June 5, 1875.
4,799.—J. B. Robert, Montreal, P. Q. Lime kiln. June 5, 1875.
4,800.—A. J. B. Berger, Easton, Pa., U. S. Burglar-proof lock. June 5, 1875.
4,801.—D. B. Pond, Woonsocket, R. I., U. S., *et al.* Washing machine. June 5, 1875.
4,802.—Wm. Abercrombie, Hamilton, Iowa, U. S., *et al.* Polishing machine. June 5, 1875.
4,803.—F. E. Town, Boston, Mass., U. S. Gang saw mill. June 5, 1875.
4,804.—L. Bradford, Plymouth, Mass., U. S. Machine for making boot shank pieces. June 5, 1875.
4,805.—G. E. Dayton, New York city, U. S. Metallic skylights. June 5, 1875.
4,806.—J. B. Smith, Amable, Ont. Car coupler. June 5, 1875.
4,807.—Wm. Randall, Salem, Mass., U. S. Boiler injector. June 5, 1875.
4,808.—Wm. Hardy, Ancaster, Ont. Horse collar. June 5, 1875.
4,809.—D. Mackinnon, Stratford, Ont. Pen and ink holder or reservoir. June 5, 1875.
4,810.—Wm. Buck *et al.*, Brantford, Ont. Heating stove June 5, 1875.
4,811.—B. Atwood, Stanstead, P. Q. Mowing machine June 5, 1875.
4,812.—Wm. Challenger, Mitchell, Ont. Trace buckle June 5, 1875.
4,813.—H. N. Colby, New York city, U. S. Wire stove shelf. June 5, 1875.
4,814.—L. Maltus, Hamilton, Ont. Car fare box. June 5, 1875.
4,815.—J. Stauffer *et al.*, Toronto, Ont. Sash fastener June 5, 1875.
4,816.—V. R. Taylor, Syracuse, N. Y., U. S., *et al.* Black smith's tweer. June 5, 1875.
4,817.—A. Robbins, Yarmouth, N. S. Waterproof process for tanning. June 5, 1875.
4,818.—J. L. Isaacs *et al.*, St. Louis, Mo., U. S. Universal ladder. June 5, 1875.
4,819.—H. Foster, Westerly, R. I., U. S. Railroad snow plow. June 5, 1875.
4,820.—B. Ackerman, New York city, U. S. Preparation of fertilizer. June 5, 1875.
4,821.—D. E. Roe, Ayer, Mass., U. S. Fly trap. June 5, 1875.
4,822.—H. Martyn, Boston, Mass., U. S. Metal pan and mechanism for its manufacture. June 5, 1875.
4,823.—J. Scott, Jr., Hamilton, Ont. Composition stamp. June 5, 1875.
4,824.—J. Sale, Jr., Toronto, Ont. Pocket book or purse. June 5, 1875.
4,825.—W. D. Westman, Toronto, Ont. Rip and scro saw. June 5, 1875.
4,826.—J. Z. Walling, Red Wing, Minn., U. S. Horse trot training apparatus. June 9, 1875.

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

$50 to $10,000 Has been invested in Stock Privileges and paid 900 per cent. profit. "How to do it." A book on Wall Street, sent free. TUMBRIDGE & CO., Bankers, 2 Wall St., N. Y.

STEEL STAMPS.

List and Samples free. E. M. DOUGLAS, Brattleboro', Vt.

KNITTING MACHINES.

The BICKFORD AUTOMATIC FAMILY KNITTING MACHINES will knit anything ever knit by hand, in far better style, and a hundredfold faster. A good operator will knit from 20 to 40 pairs Men's Socks a day! These machines are simple, durable, and cheap. Every family should have one. General and Local Agents wanted everywhere. For Circulars and full particulars, address BICKFORD KNITTING MACHINE MANUFACTURING COMPANY, Brattleboro, Vt.

PATENT WOOD WORKING MACHINERY

PLANING & MATCHING, MOULDING, MORTISING, TENONING, RESAWING, SHAPING BAND & SCROLL SAWS &c. &c.

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

STEEL CASTINGS.

Solid and Homogeneous Guaranteed tensile strength, 25 tuns to square inch. An invaluable substitute for expensive forgings, or for Cast Iron requiring great strength. Send for circular and price list to McHAFFIE STEEL CO., Evelina St., Philadelphia, Pa.

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

P. BLAISDELL & CO.,

Worcester, Mass.,

Manufacturers of the Blaisdell Patent Upright Drills and other first-class Mechanic's Tools.

DYNAMO ELECTRIC MACHINES for depositing SILVER or NICKEL; prices $1,000 and $1,500. CHARLES STOWELL, No. 2 Beverly Street, Boston, Mass.

The HOADLEY PORTABLE STEAM ENGINE. WITH AUTOMATICAL CUT OFF REGULATOR AND BALANCED VALVE

STATE WHERE YOU SAW THIS

THE BEST & MOST ECONOMICAL ENGINE MADE SEND FOR CIRCULAR. THE J.C.HOADLEY CO. LAWRENCE, MASS.

WELLS' EVERY MAN HIS OWN LAWYER AND BUSINESS FORM BOOK. By JOHN G. WELLS. **A Complete Guide in all Matters of Law and Business Negotiations.** FOR EVERY STATE IN THE UNION. With full Instructions for Proceeding Without Legal Assistance in Suits and Business Transactions of every description. Containing: Legal Forms of Deeds, Mortgages, Leases, Affidavits Depositions, Bonds, Orders, Contracts, Powers of Attorney, Certificates of Citizenship, Agreements, Assignments, Awards, Declarations, Demands, Letters of Credit, Arbitration, Partnership, Releases, Wills, Codicils, Submissions, Land Jointures, Tenants' and Landlords' Receipts, Public Lands, Land Warrants, Composition with Creditors, Oaths, Satisfaction of Mortgages, Pre-emption Laws, Marriage and Divorce, Patent Laws, with full instructions to Inventors; Pension Laws, with full instructions to enable the discharged soldier or sailor to procure back pay, pensions, bounties, and all war claims; the Laws of the Different States concerning Property Exempt from Execution. Collection of Debts, Mechanics' Liens, Contracts, Limitation of Actions, Usury, Qualifications of Voters, Licenses to Sell Goods, etc. Also, containing the Internal Revenue Laws, Stamp Duties, Post-Office and Custom-House Regulations. Constitution of the United States, with Amendments, the whole action of the Government in Relation to Reconstruction and the Freedman, Seals of the Different States, with descriptions, etc.

There is no class of the community, male or female, who have, or expect to have any property, or who have any rights or privileges which require protection, who will not be greatly benefited and advantaged by the possession of the book. It will save them money, save them trouble, save them time, save them litigation and lawyers' fees, and give them information which nobody can afford to be without.

The Work embraces 650 large 12mo. pages, and is printed on fine paper, handsomely bound. Price, Cabinet Library Binding.......... $2.25

Sent post-paid on receipt of price. Address JOHN G. WELLS, No. 27 Clinton Place, New York.

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

New Method of Engraving. Moss' Process. Photo Engraving Co. 62 Courtlandt St. New York.

Relief Plates for Book, Newspaper, Catalogue and Circular Illustrations Cheaper than Wood Cuts. The Scientific American uses our plates. Send stamp for Illustrated Circular.

MANUAL OF PATENT LAW AND "SALE OF PATENTS." For Inventors and Manufacturers. Commended by this paper. Postpaid, $2 50. Address, for circulars, W. E. SIMONDS (Counsellor in Patent Law), Hartford, Conn.

STEVENS' MITRE BOX.

The best machine ever invented; sets to any angle, and will last for years. Price $3.00. Sent to any address, on receipt of price. G. M. STEVENS, P. O. Box 1986 Portland, Me

FIRE PROOF SHUTTERS.

CLARK & CO'S SELF-COILING ROLLING STEEL SHUTTERS (Burglar Proof), For Store Fronts and Rear Windows, require no machinery or balance weights, and can be applied to any opening; also Rolling Wood Shutters for Stores and Dwellings. Thousands are in daily use, and are acknowledged the best shutters in the world. Send for Catalogue to JAMES G. WILSON, Manager, 218 West 26th St., New York, and at London, Paris, Vienna, and Berlin.

STEAM PUMPS.

FIRST PRIZES, VIENNA, PARIS, NEW YORK, BALTIMORE, BOSTON.
Send for circular of recent patented improvements.
THE NORWALK IRON WORKS, South Norwalk, Conn.

BLAKE'S PATENT

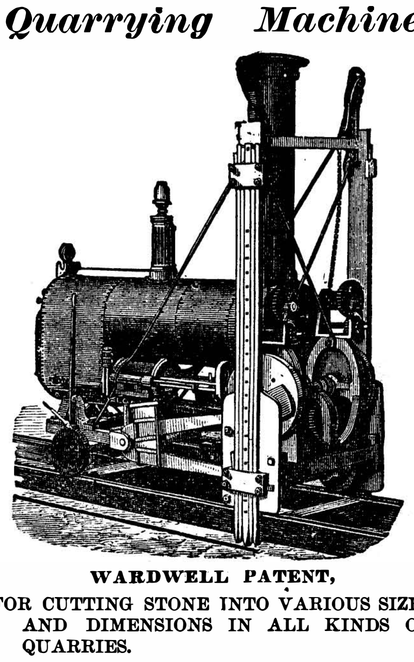
Stone and Ore Breaker

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

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

DITCHING AND DRAINAGE MACHINES furnished at a moderate cost, cutting ditches of any width and depth in ground free from stumps and rocks. Machines worked by from four to six horses, and two men will do the labor of fifty men a day at least State and County Rights for Sale. Address RANDOLPH BROTHERS, 111 Broadway, New York City.

Stone Channeling OR *Quarrying Machine,*



WARDWELL PATENT,

FOR CUTTING STONE INTO VARIOUS SIZES AND DIMENSIONS IN ALL KINDS OF QUARRIES.

STEAM STONE CUTTER CO., RUTLAND, VT.

SOLE PROPRIETORS AND MANUFACTURERS.

WORCESTER FREE INSTITUTE.

School of Applied Science. For catalogue, address PROF. C. O. THOMPSON, Worcester, Mass.

Special Notice to Dealers in and Users of

Wood Working Machinery.

WORCESTER, MASS., May 25, 1875.

The undersigned, having purchased the entire Manufacturing Establishment of R. BALL & CO., including PATTERNS, PATENTS, GOOD WILL, CORRESPONDENCE, and everything pertaining to the business (book accounts excepted), will continue the manufacture of Wood Working Machinery, and be prepared to furnish new machines, or parts for repairs, as furnished by either concern in years past.

We shall at once remove our present Works to our new quarters—uniting the two establishments—and be able to furnish customers with improved Machinery, both in quality of stock and workmanship, and at reasonable prices.

We would take this opportunity to return our thanks to our old friends and customers, and would be most happy to see them at our new quarters (26 Salisbury Street), and would remind them that we shall continue to manufacture Wood Working Machinery generally, making a specialty of Woodworth, Daniels' and Dimension Planers, Surfacing Machines, Tenoning, Mortising, and Re-Saw Machines, Saw Benches, &c. Yours, respectfully, WITHERBY, RUGG & RICHARDSON, 26 Salisbury St., Worcester, Mass., U.S.A.

STONE SAWING MACHINERY.

MERRIMAN'S PATENT. ALSO, HAND AND STEAM DERRICKS & TRAVELLERS, THOMAS ROSS, RUTLAND, VT.

MACHINERY, NEW & SECOND-HAND. Send for Circular. CHAS. PLACE 103 Reade St., New York.

IMPROVED CENTERING ATTACHMENT.

It is designed to be fitted to the revolving Spindle of any Lathe, for the purpose of finding and drilling centers in round iron. Send for descriptive circular. KELLY & LUDWIG, Philadelphia, Pa.

LeCount's Patent

MACHINIST'S TOOLS.

Reduced Prices.

Set Iron Dogs, ⅜ to 2 in.	$ 5.60
" " " ⅜ " 4 "	$12.00
" Steel " ⅜ " 2 "	$ 6.30
" " " ⅜ " 4 "	$13.00

Iron & Steel Clamps, Die Dogs, Clamp Dogs, Vice Clamps, Expanding Mandrels, &c. Send for latest Price List to C. W. LE COUNT, South Norwalk, Conn.

Bradley's Cushioned Hammer

has larger capacity, is more durable, takes up less room, does more and better work with less expense for power and repairs than any other Hammer in use. Guaranteed as recommended. Address **BRADLEY Manufacturing Company,** SYRACUSE, N.Y

$60 to $90 a week and expenses to all. Articles new, staple as flour. Samples free. C. M LININGTON & BRO., N. Y. or Chicago.

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

OTIS' SAFETY HOISTING Machinery.

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

Planing & Matching,

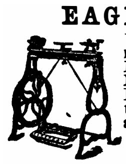
Moulding, Re-sawing and Tenoning Machines. Scroll Saws and General Wood-Working Machinery. JOHN B. SCHENCK'S SONS { Matteawan, N. Y. 118 Liberty St., N. Y. City. Send for Catalogue.

Machinists' Tools.

All sizes at low prices. E. GOULD, Newark, N. J.

A. S. GEAR, BOSTON, furnishes all kinds of **Machinery & Mechanical Supplies** at popular prices.

EAGLE FOOT LATHES,



With Scroll and Circular Saw Attachments, Slide Rest, Tools, &c.; also Small Engine Lathes, Metal Hand Planers, &c. Neatest designs, superior finish. **Low Prices.** Our new Catalogue describes these and every tool necessary for the Amateur or Artizan. Send for it. WM. L. CHASE & CO., 95 & 97 Liberty St., New York.

PATENT

Planing & Matching

and Molding Machines, Gray and Wood's Planers, Self oiling Saw Arbors, and other wood-working machinery. S. A. WOOD'S MACHINE CO., { 91 Liberty St., N. Y. 67 Sudbury St., Boston. Send for Circulars, etc.

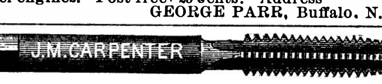
Model Steam Engines,

FROM 50 CTS. UPWARDS, FROM GEORGE PARR'S UNEQUALED MODELS OF

Steam Cranes.	Vertical Engines.
Circular Saws.	Paddle Engines.
Steam Lathes.	Steam Hammers.
Horizontal Engines.	Locomotive Engines.
Portable Engines.	Steam Boilers.
Steam Pumps.	Marine Screw Engines.
Beam Engines.	Powerful Engines.
Steam Winches.	Water Motor Engines.
Electric Engines (requiring no fuel).	Fire Engines. Miniature Machine Shop.
Engines to run with Kerosene Oil or Gas, for domestic purposes.	Miniature Mechanical and and Comical Figures and Saw Mills run by
Upright Engines.	above appliances.

Also, Celebrated Amateur's Lathes, Tools and Fittings of every description. Inimitable Castings, for $1 00 per set and upwards, by means of which numbers of the above Steam Engines, Lathes, &c., have been successfully made by Amateurs. Thousands prove the unparalleled success of the above models and castings.

For full description and prices of the above, together with the requisite tools, see "Parr's Technical Guide," containing over 400 illustrations, with all necessary information, how to buy, how to use, and how to make model engines. Post free 25 cents. Address GEORGE PARR, Buffalo, N. Y.



J. M. CARPENTER

Manufacturer of First Class Taps, Pawtucket, R. I.

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

TWIST DRILL GRINDING MACHINES, EXpanding Boring Bars, Self-Feeding Hand Drills, Rotary Shapers, Planers, Drilling Machines. C. VANHAAGEN & CO., makers of Improved Machine Tools, Phila.

Shaping Machines

Have novel device for changing length of stroke while in motion, also, automatic down feed, and quick return. Four sizes. Patented 1868, 1871, 1874. **Wood & Light Machine Co. Worcester, Mass.** Manufacturers of all kinds of Iron Working Machinery Shafting, Pulleys, &c.

IMPROVED MACHINERY for STAVE

HEADING, SHINGLE AND HANDLES, CABINET MAKER'S MACHINERY, BAILEY GAUGE LATHE, DURKEE'S AUTOMATIC SAW MILL (improved), KEY SEAT CUTTING, PULLEY BORING AND MILLING MACHINES, RADIAL DRILLS, STEAM ENGINES, & BOILERS, VENEERING MACHINES, CABLE & SHEAVES, for transmitting Power, etc. etc. T. R. BAILEY & VAIL, Lockport, N. Y.

Machinery of Improved Styles for making

SHINGLES HEADING, AND STAVES

Sole makers of the well known IMPROVED LAW'S PATENT SHINGLE AND HEADING SAWING MACHINE. For circulars address TREVOR & CO., Lockport, N. Y.

IMPORTANT FOR ALL LARGE CORPORATIONS AND MANUFACTURING CONCERNS.—**Buerk's Watchman's Time Detector,** capable of controlling, with the utmost accuracy, the motion of a watchman or patrolman, as the same reaches different stations of his beat. Send for a Circular **J. E. BUERK, P. O. Box 979, 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

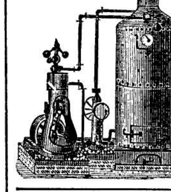
PATENT COLD ROLLED SHAFTING.

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 list mailed on application to JONES & LAUGHLINS. Try Street, 2nd and 3rd Avenues, Pittsburgh, Pa. 190 S. Canal st., Chicago, Ill. Stocks of this Shafting in store and for sale by FULLER, DANA, & FITZ, Boston, Mass. GEO. PLACE & CO., 121 Chambers street, N. Y. PIERCE & WHALING Milwaukee, Wis.

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 Street, New York. 17

MAGNETS—Permanent Steel Magnets of any form or size, made to order by F. C. BEACH & CO., 246 Canal St., New York. Makers of the celebrated Tom Thumb and Miniature Telegraph Instruments.

12 Beautiful French Oil Chromos, size 9x11, mounted ready for framing, sent postpaid for ONE DOLLAR. Grandest chance ever offered to Agents. For particulars send stamp. Address F. P. Gluck, New Bedford, Mass.



YALE IRON WORKS,

New Haven, Conn.,

Builders of the YALE VERTICAL the *best* and most *Economical*, either for land or marine use; also HORIZONTALS, with or without the *Rider* Cut-off.

SPECIAL TOOLS made to order, all at prices that defy competition. Send for Circular.

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

MACHINERY.

IRON & WOOD WORKING MACHINERY OF EVERY DESCRIPTION.

Cold Rolled Shafting.

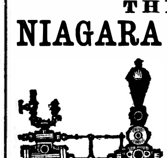
HANGERS, PULLEYS, COUPLINGS, BELTING, &c &c. Send for Illustrated Catalogue and Price List.

GEORGE PLACE & CO., 121 Chambers & 103 Reade Sts. N. Y. City

THE IMPROVED

NIAGARA STEAM PUMP,

93 to 97 Pearl St., Brooklyn, N.Y. Agency at 40 John St., New York.



Hubbard & Aller.

SOLE MANUFACTURERS, ENGINES AND BOILERS, *Pulleys, Shafting and Hangers a Specialty.*

7,000 IN USE. BLAKE'S STEAM PUMPS FOR EVERY POSSIBLE DUTY GEO. F. BLAKE MFG CO. 79 & 81 LIBERTY ST. N.Y. CAUSEWAY & FRIEND STS. BOSTON. 50 CANAL ST. CHICAGO. SEND FOR ILLUSTRATED CATALOGUE.

Ladies Can make $5 a day in their own City or Town. Address ELLIS M'F'G Co., Waltham, Mass,

TENTH INDUSTRIAL EXHIBITION, UNDER THE AUSPICES OF THE

Mechanics' Institute of San Francisco.

Manufacturers, Mechanics, and others are advised that the above EXHIBITION will be opened in San Francisco on the 17TH DAY OF AUGUST next, and continue open at least one month.

The Board of Managers invite all who desire to exhibit to send in their applications for space, without delay, to Mr. J. H. CULVER, *Secretary*, 27 POST ST., SAN FRANCISCO, CAL., who will promptly answer all inquiries.

700,000 persons, from all parts of the Pacific, visited the last Exhibition, to see what could be learned or purchased in San Francisco and the United States.

San Francisco, with its population of a quarter of one million, is in intimate relations with Japan, China, Australia, Mexico, Hawaiian Islands, British Columbia, the various Islands of the Pacific, and contiguous domestic Territory. There is no charge for Exhibition Space; and power for driving machinery, etc., is furnished free.

By order of the Board. A. S. HALLIDIE, *President.*

PROSPECTUS

OF THE

SCIENTIFIC AMERICAN,

FOR 1875.

THE MOST POPULAR SCIENTIFIC PAPER IN THE WORLD.

THIRTIETH YEAR.

VOLUME XXXII.—NEW SERIES.

The publishers of the SCIENTIFIC AMERICAN beg to announce that on the second day of January, 1875, a new volume commenced. It will continue to be the aim of the publishers to render the contents of the new volume more attractive and useful than any of its predecessors.

To the Mechanic and Manufacturer.

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

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

TERMS.

One copy, one year (postage included)	$3.20
One copy, six months (postage included)	1.60
One copy, three months (postage included)	1.00
One copy of Scientific American for one year, and one copy of engraving, "Men of Progress"	10.00
One copy of Scientific American for one year, and one copy of "Science Record" for 1875	5.20

Remit by postal order, draft, or express.

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

MUNN & CO.

37 PARK ROW, NEW YORK

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 right.

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.

To Make an Application for a Patent.

The applicant for a patent should furnish a model of his invention if susceptible of one, 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 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.

Canadian Patents.

In order to apply for a patent in Canada, the applicant must furnish a working model, showing the operation of the improved parts; the model needs not to exceed eighteen inches on the longest side. Send the model, with a description of its merits, by express, or otherwise, to Munn & Co., 37 Park Row. Also remit to their order by draft, check, or postal order, the money to pay expenses, which are as follows: For a five years' patent, $75: for a ten years patent, $95; for a fifteen years' patent, $115. The five and ten years' patents are granted with privilege of extension to fifteen years.

Trademarks.

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

Design Patents.

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

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

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

Copies of Patents.

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 Streets, opposite Patent Office.

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