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ADDRESS OF THE HON. S. S. FISHER, U. S. COMMISSIONER OF PATENTS BEFORE THE AMERICAN INSTITUTE.

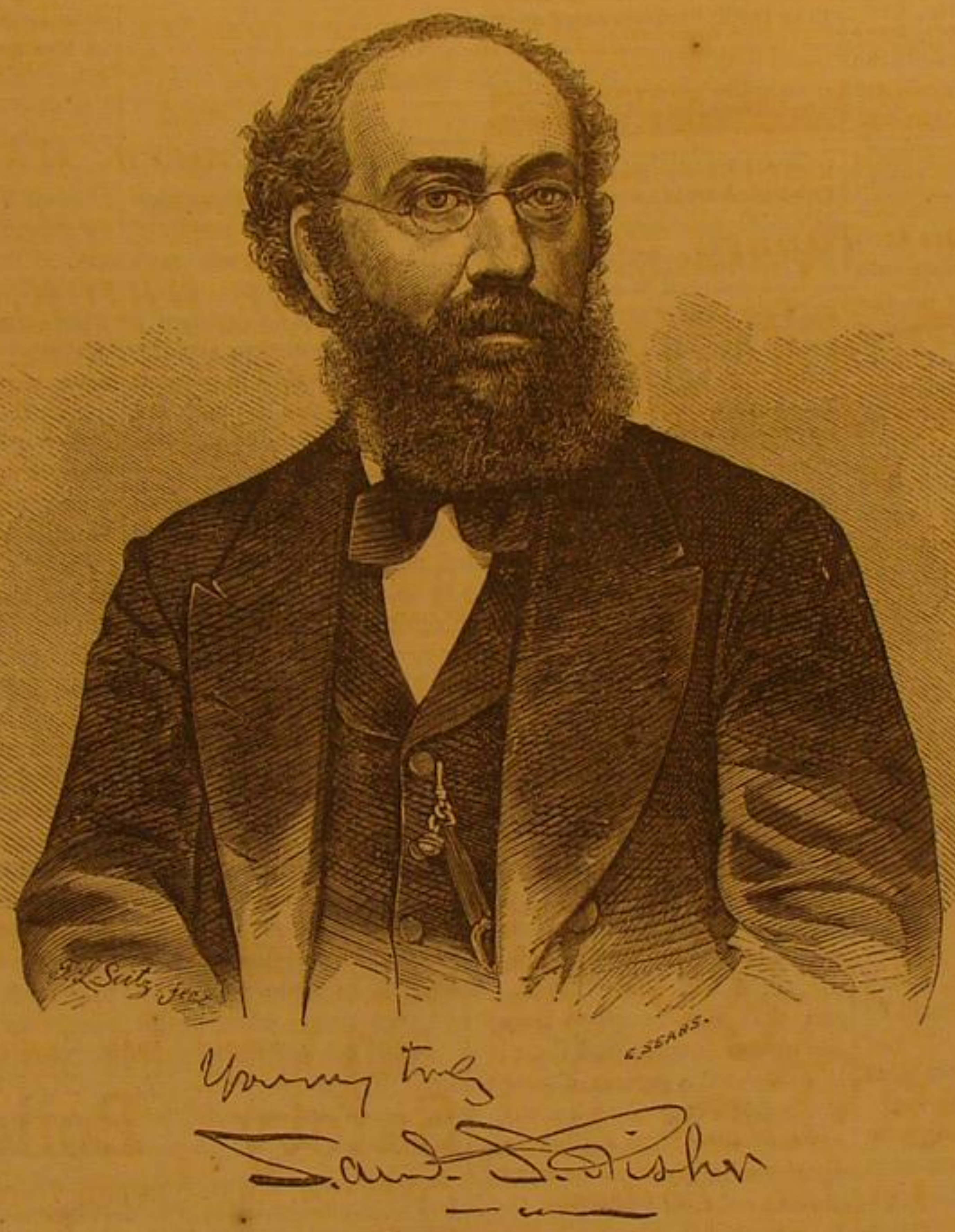
On the evening of the 28th September, the Fair of the American Institute was honored by the presence of the Hon. Samuel S. Fisher, Commissioner of Patents, who delivered an interesting address on the occasion, which is here given in full. We also present a portrait of this gentleman who has acquired great popularity by his energy and promptness in the transaction of business, as well as by the marked ability he has displayed in the performance of the arduous duties of his office. The vexatious delays which formerly tormented inventors no longer exist; and the whole business of the office has been systematized so thoroughly that it meets with universal approval.

No Commissioner of Patents has achieved greater popularity, in so short a time, than Mr. Fisher. This is due to the rare combination of natural talent and educational fitness he brings to bear upon the work of the office. As our readers are aware he resigned a lucrative legal practice, in accepting the Commissionership; and the legal acumen which had secured him this practice enables him now to grasp nice distinctions, and to decide quickly and soundly upon all cases which, in the routine of the department, are brought before him.

THE COMMISSIONER'S ADDRESS.

LADIES AND GENTLEMEN: I left Washington with no other object than to visit this exhibition and extend the right hand of fellowship to those who were endeavoring to secure its success. I had no thought of speaking to you, and should have been glad if the managers had been willing to accept the seeing of the eye for the hearing of the ear. I bring you, therefore, no well-considered oration, but desire only to offer a few plain words of greeting, and a thought which it has occurred to me this may be the proper time and place to express. Among the earliest reminiscences of my boyhood are the Fairs of the American Institute, which were held many years ago—so many that I fear to count them—in Niblo's and Castle Garden. Of details I remember very little, except that there were models of ships and steamboats, and that two or three boys lost their fingers by injudiciously turning the horse powers, and that everything wound up with fireworks and a grand flight of rockets by Mr. Edge, of pyrotechnic fame. Once, indeed, at Castle Garden, I believe, the closing exercises were varied by omitting the fireworks, and substituting the bombardment of the Castle of San Juan D'Ulloa by the French, which mimic siege we converted into real earnest in a few years thereafter. From the character of these recollections you will see that I must have been very young indeed.

One thing, however, was noticeable even by my young eyes, and may be noticed now—that nearly every article in the Fair bore upon it the imprint of that magic adjective "patented." Those were the days just after the passage of the great Patent act of 1836, which established what is now the distinctively American system in regard to the grant of letters patent, and yet already the Patent Office had become a power in the land, and was sheltering under its wings the little brood of new-fledged American inventions. I have said that the fact which I noticed in my boyhood may be noticed now. You cannot walk through any of these aisles without finding in every niche, upon every table, above and around you, articles which have themselves been patented or are the product of patented processes or machines. I suppose, if upon your outer wall a banner were displayed announcing that no article would be received for exhibition with the creation of which letters patent had nothing to do, that very few of the many things upon exhibition here to-night would be stopped at the threshold by the prohibition. For this result, this and kindred institutes and associations are, in part, responsible; a responsibility, let me hasten to say, for which they need in nowise be ashamed. These great exhibitions—displays—advertisements—as I think one of your papers has called them, have made many an invention familiar to the public that would otherwise have remained unknown; have given many an impulse to some halting enterprise that would otherwise have failed to reach the goal; have called capital to the aid of genius, by showing to capital where it might profitably be employed. Many an inventor has grown famous, and many a manufacturer rich, through the medium of your expositions, the awards of your juries, and the distribution of your diplomas and medals. The work of the Patent Office and of all such societies as this, is one. It has for its purpose the protection and development of the inventive genius of our country. We are more especially charged with protection, *you* with development, or, as I suppose you would prefer to phrase it, our motto is, "Protection to American genius," while yours is, "Protection to American industry." How both have prospered in their work may be learned by comparison of the earlier Fairs of this Society with the present, and by a glance at the Patent Office reports.



HON. S. S. FISHER, COMMISSIONER OF PATENTS.

WHAT HAS BEEN DONE IN FORTY YEARS.

During the forty years that this institute has been in existence, the department of huge vegetables, and of quilts with wonderful patchwork, has become sensibly smaller, while that of wonderful labor-saving machines and beautifully-wrought fabrics has become sensibly greater. (I believe I have seen a solitary pumpkin to-day). In the days when I gazed with delight upon Mr. Edge's fireworks, the click of the sewing machine was never heard; electricity had not yet condescended to come out of the lecture room and enter the lists as a practical science; india-rubber, hard and soft, with its manifold applications, was a mere black and sticky plaster for shoes and ugly overcoats. We had the steam engine, as it came from Watt, and the steamboat as it was left by Fulton.

As for these beautiful textiles, it would have seemed madness to have dreamed that we should ever dare to dream of them thereafter. In the Patent Office, under the act of 1836, the Commissioner and "one examining clerk" were thought to be sufficient to do the work of examining into the patentability of the two or three hundred applications that were offered. Now sixty-two examiners are overcrowded with work, a force of over three hundred employés is maintained, and the applications have swelled to over twenty thousand per annum. This year the number of patents granted will average two hundred and seventy-five per week, or fourteen thousand in the year. These numbers are so startling, when compared with the days of which I have been speaking, that people are sometimes ready, in their haste, to suppose that there must be something wrong about the system, and some have doubtless been prepared to join hands with a few of your disaffected cousins across the water and to demand the repeal of the Patent laws and the abolition of the system itself.

OUR PATENT SYSTEM DEFENDED.

It has occurred to me, that, standing here to-night as the official representative of this system, it would not be inappropriate for me to say a few words in its behalf. In the first place no comparison can properly be made between our system and that of other countries. In England and on the Continent all applications are patented without examination into the novelty of the inventions claimed. In some instances the instrument is scanned to ascertain if it covers a patentable subject-matter, and, in Prussia, some slight examination is made into the character of the new idea; but in no case are such appliances provided, such a corps of skilled examiners, such provision of drawings, models, and books, such a collection of foreign patents, and such checks to prevent and review error as with us. As a result, an American patent has, in our Courts, a value that no foreign patent can acquire in the Courts of its own country. This has rendered property in foreign patents exceedingly precarious. Such as are granted have not been subjected to examination; they have no *prima facie* weight. Yet they *may* be valid. It is true that no one knows this, not even the inventor; but the possibility that they may prove so makes them weapons in the hands of unscrupulous men to frighten and coerce manufacturers who have very imperfect means, short of litigation, of arriving at the truth or falsehood of the self-asserted pretensions of the patentee. On the other hand, the inventor is in as much doubt as the manufacturer. He does not know what to claim as his invention. As he alone is to fix the limit, as there is to be no revision, he may claim much or little, how much or how little he must always doubt. As a consequence, foreign patents are of doubtful value, and the whole system has fallen into some disrepute.

THE SUPERIORITY OF AMERICAN INVENTIONS IN EUROPE.

I suppose that the foreign patents of American inventors, that have been copies of patents previously granted in this country, are the best that are granted abroad, and I know that many an English or French invention that has been patented without difficulty there, has been stopped in its passage through our office by a reference to some patent previously granted in this country, or perhaps in the very country of its origin. In spite of our examination, which rejects over one third of all the applications that are made, or, more properly, because of it, invention has been stimulated by the hope of protection; and nearly as many patents will issue in the United States this year as in the whole of Europe put together, including the British isles. But a few days ago I took up a volume of Italian patents to see what progress the new Kingdom was making in invention, when I was amused and gratified to find on every page the name of the universal Yankee, re-patenting there his American invention, and, I suspect, much the best customer in the Patent Office of united Italy. The truth is, we are an inventive people.

A NOVEL CATALOGUE OF INVENTIONS.

Invention is by no means confined to our mechanics. Our merchants invent, our soldiers and our sailors invent, our schoolmasters invent, our professional men invent, aye, and our women and our children invent. Cheap protection has been a fertilizer that has produced much growth of brain and much fruit of discovery. One man lately wished to patent the application of the Lord's Prayer, repeated in a loud voice, to prevent stammering; another claimed the new and useful attachment of a weight, or other article possessing gravity, to a cow's tail to prevent her from switching it while milking; another proposed to cure worms by extracting them by a delicate line and a tiny hook baited with a seductive pill; while a lady patented a crimping pin, which she declared might also be used as a paper-cutter, as a skirt supporter, as a paper file, as a child's pin, as a bouquet-holder, as a shawl fastener, or as a book mark. Do not suppose that this is the highest flight which the gentler sex has achieved. It has obtained many other patents, some of which have no relation to wearing apparel, and are of considerable value.

THE VALUE OF PATENTS CONTRASTED.

But, I am asked, what proportion of all patented inventions prove to be valuable to their projectors or to the public? One-tenth? Probably not much more than that; but, let it be remembered, there are few failures so harmless as that of a useless invention. The patent gives it a chance to prove itself worthy of the public patronage. It simply declares that if it be good it shall not be stolen; but, if it be useless, nobody will want to steal it. But of all those who enter upon any occupation of life, how many succeed and how many fail? How many young men have entered the bar, and have failed to take rank with Evarts, O'Connor, or Brady? How many have launched their bark, laden with mercantile ventures, and have been stranded, while Claflin and Stewart were sailing into port? How many have been moved to "start a paper," who have lived as long, but not to as much purpose, as Raymond, Bennett, or Greeley? I suppose that nine failures to one success is a very fair proportion for the professions of the world, including that of the inventor; or, at all events, I do not suppose that the failures among inventors are more numerous than among every other class of workingmen. As to property in inventions, I shall not stop to discuss it. That a man having, by long experiment—by patient thought—by brilliant genius—by the expenditure of time and of means, conceived and brought to perfection and embodiment some new idea, having created some new substance, put in motion some new machine, put some old force to new work, or given to some new force a field for labor, is not entitled to call this which he has done his own and to set his price upon it, need not I think be argued before honest men? If we owe nothing to the men who have made this century so illustrious by their great conceptions, then we owe nothing to anybody, and repudiation ought to be the watchword of the age.

A CASH DEBT DUE INVENTORS—HOW TO REWARD THEM.

We do owe them much, not merely a debt of sentimental gratitude, but a debt payable in cash, which shall lift them above want, and place them upon such a pinnacle of happiness that the world shall say, "Thus shall it be done unto the man whom the nation delighted to honor!" How shall we give pecuniary consideration for inventions? There are two ways in which this might be done. One is by the purchase, for cash, by the Government of all inventions, for the use of the nation. This plan is met at the outset by the impossibility of determining the value. Every inventor supposes himself to have a fortune in every conception that he puts into wood and iron. Stealing tremblingly and furtively up the steps of the Patent Office, with his model carefully concealed under his coat, lest some sharper shall see it and rob him of his darling thought, he hopes to come down those steps with the precious parchment that shall insure him a present competency and that shall enrich his children. I should think if he were offered a million, in the first flush of his triumph, that he would hesitate about touching it without sleeping over it for a night. Yet fourteen thousand millions would be a pretty heavy bill to pay from a treasury not over full. Fourteen hundred millions might be thought an important addition to the national debt, or even one million four hundred thousand, which would be just $100 a piece for all the patented inventions of 1869. I think, therefore, that we may set aside the plan of purchase as impracticable.

HOW TO DEAL JUSTLY BY THE INVENTOR.

No commission could satisfy the inventor, and no price that we could afford to pay would take the place of the stimulus of the hope of unlimited wealth which now lightens his toil and shines like a beacon at the entrance of the harbor that he hopes to make. The other plan is to offer protection for a limited time, in payment for the new discovery. We may say to the inventor, "You have a valuable secret, which may benefit us. To disclose it without protection would be to lose it. To keep it would deprive us of its use. If you will disclose it to us by so describing it and illustrating it, as that we may fully understand it and may avail ourselves of it without difficulty, we will agree that for seventeen years you shall be protected in its use. You may make out of it what you can. When your limit of time has expired we shall have it without further payment. We cannot pay you in money, we will pay you in time." I submit that this is a fair bargain. A new thought developed, explained, described, illustrated, put on record for the use of the nation—this on the one side. The right to the exclusive benefit of this new thought for a limited time, and protection in that right—this on the other. This is the patent system. A fair contract between the inventor and the public—ideas paid for by time. It is manifest that the utmost good faith is required upon both sides. On the one hand there must really be an invention; no stealing of the ideas of other men, no crude notions resulting only in experiment. The inventor must have something to sell. On the other hand there must be protection—no infringement, no piracy, no stealing of the soul of the invention by clothing it in immaterial changes of form.

THE INVENTOR'S BEST SECURITY IS TO TAKE A PATENT.

To secure this fair dealing we have, on the one side, the Patent Office, with its examiners, its drawings, its models, its books, and its foreign patents, to scan and test the invention. On the other side we have the courts of law to protect the inventor and punish the thief. It is possible that these instrumentalities may do their work imperfectly. This may sometimes happen; but to the extent to which they do it, a fair contract for an honest and useful purpose is made and is maintained. This is the American system. Under its protection great inventions have been born, and have thriven. It has given to the world the steamboat, the telegraph, the sewing machine, the hard and the soft rubber. It has reconstructed the loom, the reaping machine, and the locomotive. It has trained up each trunk of invention until it has become a graceful tree with many branches, adorned with the fruits of many improvements and useful modifications. It has won from the older homes of the mechanic arts their richest trophies, and, like Columbus, who "found a new world for Castile and Leon," it has created new arts, in which our nation has neither competitor nor peer. Without the protection of our Patent laws, no such exhibition as this would have been possible. By far the greater number of the inventions which now crowd the shelves of the Patent Office would be missing. No doubt many weaklings would thus have been spared a contact with a cold and unfeeling world; but many vigorous children, that have come to a robust manhood, would have perished long since for want of sustenance. Men will not take the risk of introducing new inventions, of educating the people in their use, of overcoming opposition and prejudice, unless they can be assured of reasonable protection in their work until their capital has made return. They will not sow that others may reap, and, when the land is ready for the harvest, come forth with greater capital and more laborers, and thrust aside the pioneer who has borne the burden and heat of the plowing and cultivating. For the proper administration of such a system as I have attempted to sketch, it is manifest that much skill and honesty are needed in the Patent Office, in all its departments. Speaking for the gentlemen associated with me, I believe them to be both skillful and honest. They pass in review many valuable interests. They are attended by a body of skillful practitioners. They are beset by an array of eager inventors. If in the examination of twenty thousand applications they make no errors, they would deserve statues of gold. That they make no more, and that in all these years and in all their number well-founded charges of corruption have been few and far between, are strong tributes to their integrity and ability. On behalf of this great American bureau of invention, I bring you greeting to-night; on behalf of the one hundred thousand American inventors whom it represents, I bespeak for it your cordial support and sympathy.

ROQUEFORT CHEESE.

[From the Grocer.]

The preparation and maturing of Roquefort cheese are the most elaborate, careful, and interesting of all cheese-manufacturing processes. In its rich color and blue vein marbling, it bears a close resemblance to our Stilton, the most esteemed by the *gourmet* of all native cheeses, of which, perhaps, it is the most carefully made. The art of dining is an eminently progressive art, and with the advance of knowledge and the refinement of taste, the Roquefort cheese increases in respect. The amiable and witty Brillat-Savarin, who was the most enlightened of gastronomes, has said that a dinner without cheese is like a lovely woman with only one eye. Many other gastronomes go further than this, and declare that no choicely concocted *menu* is complete without *fromage de Roquefort*. It cannot be regarded as a new favorite by any means; indeed it may be said to be as old as the hills which give it birth, for it was a familiar delicacy to the Roman palate, and its praises were sung by Pliny. The birthplace of Roquefort cheese is in the mountains which rise in the southeast of France, half way between the Eastern Pyrenees, and the beautiful but boisterous gulf of the Mediterranean, called the Gulf of Lyons. The village of Roquefort, in the French department of Aveyron, is a place somewhat difficult to get at. It is about ten miles from the railway station at Milhau. It lies on the flank of a mountain in one of the most beautiful valleys of France. It is sheltered by forests of superb chestnut trees, a limpid mountain stream runs before it, while behind tower the rugged sides of the plateau of Larzac, 1970 feet above the sea level. It is upon this plateau that the immense flocks of sheep from whose milk the cheese is made find their food. In the sides of these rocks is excavated a perfect cheese-citadel. The cliffs are honeycombed in every direction with caverns, natural and artificial, some of them five stories in hight. Hence we find in this district a happy combination of requisites; the summit of the plateau offering pasturage, the broad flanks of the rocks caves for warehousing and ripening, while the village so snugly nestling below supplies the human elements of the trade. The food which the ewes obtain upon the stony pasturage is composed of herbs of the choicest flavor, and a great deal of the superiority of this kind of cheese may be attributed to this cause; but it is to the caverns of Roquefort, above all, that the success of the comestible is due. The average temperature of these caverns is about 30° Fahrenheit. The learned have been fertile in theorizing as to the causes of this low and equable temperature; but, according to M. Turgan's great work "Les Grandes Usines de France," to which we are indebted for a great deal of the information to be found here, no generally accepted explanation has yet been given. Whatever may be the cause, these cool vaults were turned to good use by the local shepherds from the most distant times, and Roquefort cheeses are very often mentioned in old French charters. By an edict of the parliament of Toulouse, in 1550, the monopoly of the Roquefort cheese manufacture was granted to the village of that name, and other persons were prohibited from making it. As time went on, and commerce extended, the reputation of these caverns spread till the country folks, for miles around, came to offer payment for the privilege of depositing their cheeses in these rock-warehouses. A better system of trade was inaugurated at a later period. By this improved mode, which simplified the process of production and sale, the producers sold their wares to the proprietors of the caves, who kept the cheeses till they were perfectly ripened, and then sold them on their own account. Just before the close of the last century, the entire trade was in the hands of three rival firms, and the annual production was about 250 tuns. Between the years 1800 and 1815 the production rose to 500 tuns. After the fall of Napoleon, and until about 1830, there was an almost perfect stagnation of trade in France. The cheese fell in price, the three monopolists were ruined, and the Roquefort establishments passed into new and more numerous hands. Subsequently the trade was exposed to vicissitudes, out of which however, it came triumphant, and at the present day it is in a flourishing condition; it is better organized, and its commercial relations are widely extended. As we have stated, the cheese of Roquefort is made from the milk of ewes, of a particular breed, called the Larzac breed, named after the plateau of Larzac, which was their original feeding ground. Some years ago many attempts were made to improve the old style of manufacture, by using the milk of the cow and of the goat, as well as by introducing another breed of sheep; but these experiments always turned out unsuccessfully. Forty years since, General Saligunc put to the Larzac ewes some merino rams. He desired to try the effect of crossing—hoping to get blended in the cross-bred animal the milk-producing qualities of the ewes, and the silky merino of the ram. Unfortunately his experiments were imitated by others, for the result was a great falling off in the production of milk. A new order of things now prevails; the sheep-owners seek for animals of the pure race, careful feeding and the best hygienic conditions are relied upon to improve the quality of the fleece. But it is the milk-producing powers of these animals that occupy the farmer's most anxious care. At the present moment there are about 350,000 sheep. We may set down the rams, lambs, sick beasts, etc., at 150,000; the remaining 200,000 are milk-producing ewes. The average value of a three-year-old ewe is 20 francs. At the age of seven years they are fattened up for market, and are sold to the butcher at the September fairs, at an average of 15 francs each. It used to be the plan to feed the sheep exclusively on wild thyme, lavender, rosemary, sage, and mint, together with such other kinds of herbage as could be found growing in the rocky crevices of the stony plateau. A cow could never find sustenance in this region, even if she could pick her way over the rugged ground. Lately, however, various successful attempts have been made to introduce Burgundian hay, which has been found capable of sustaining the almost tropical heat of midsummer in this region. Each ewe yields an annual profit to her proprietor of 28 francs—that is to say, milk, 20 francs; wool, 5 francs; and lamb, 3 francs. The average annual production of six ewes is about 200 lbs., which is about double what they gave a century ago. This increased yield is due to careful keep of the animals; they never pass the night in the open air, but are brought home from the pasturages every evening to clean, spacious, and well-ventilated sheep-folds. After being allowed a rest of one hour, the whole of the ewes are driven out into a roomy courtyard, where they are milked. It requires seven persons to milk, twice a day, a flock of two hundred ewes. The way in which they are milked is somewhat peculiar; each ewe passes through three different hands. The first draws from the teat all the milk he can, by gently pressing the udder; this done, he passes on the animal to the milker seated next him. This latter gives two or three sharp blows with the back of his hand upon the teat, and then milks until the udder appears to be exhausted. The third milker then takes the ewe, strikes it in a similar way, and draws away whatever remaining milk there may be in the teat. It is usual to mix the evening's produce with that of the following morning, obtained before the departure of the flocks for the pasturage. The evening's milk is heated up, but as a rule the morning's milk is not. After being mixed and curdled by rennet in the ordinary way, the curds are subjected to very great pressure to get rid of as much whey as possible. The curd is then placed in earthenware molds, with holes pierced in them. Between the different layers of curd there is placed a small quantity of a bluish-green powder, which is supplied to the ewe-owners by the proprietors of the caves. This powder is nothing else than mold of bread prepared in a certain way specially for this purpose. The powder acts as a ferment, which, during the subsequent sojourn of the cheeses in the caves, hastens the production of those blue veins which the connoisseur exacts in his *fromage de Roquefort*. The cheeses are turned many times during the three days in which they remain in the earthenware molds. They are frequently wiped, so as to dry them without heat, and during the drying stage they are often wrapped in coarse cloths to prevent them cracking. When they have acquired the necessary consistency, they are transferred to the caves. The very best kinds of Roquefort cheese are produced in the immediate environs of the village of that name, but the adjoining valleys of Camarés and Sorgue produce a great quantity of less excellent kinds. The difference in quality is due to the fact that the pasturage is superior in the neighborhood of Roquefort. The cheeses are sold at the various fairs held during the year in the department of Aveyron. A society of proprietors purchases the cheeses from the producers at a fixed price; and by carefully drawn-up agreements the former engage to take all that the latter can produce. By this method, which appears to suit both parties, the precious cheeses escape being hawked about on hot and dusty country roads. They pass at once from the dairy to the caves. Many of the farmers forward their produce to the caves in carts, but for the most part the cheeses are taken thither on the backs of mules, which set out before sunrise so as to escape the heat as much as possible. Each description of cheese has its own distinctive mark, which shows from which dairy it has come. By this mark its maker can always be recognized. Should there be any faults of shape or quality, the maker has to answer for them to the cave proprietor. As a rule, however, the agriculturists never attempt fraud. At this stage, the cheeses weigh about 6½ lbs. each, are about eight inches in hight by four in diameter, and of a shining white color. They are all examined on entrance to the receiving room of the caves, after which they are forwarded to the salting hall, there to undergo special treatment. The temperature of this salting hall is not less than fifteen degrees lower than the outer receiving room. The light of day never enters here; every one is therefore provided with a lamp on his entrance.

Although at the period of our visit the weather was very hot and the village outside was infested by quite a plague of flies whose biting powers were perfect, we saw none in the caves—the coldness and darkness were too much for them. The salting-hall is a spacious vault in which the cheeses are piled up after having received a handful of salt on top and bottom. They are stacked up in threes, and every eight days they are turned. By this time the salt has gradually permeated them, and the floor is covered with a quantity of moisture. About six pounds of salt are used for fifty cheeses. From the salting-room they are carried to the more remote vaults, the temperature of which is still lower. These caves, which are mere apertures in the solid rock, afford that low and even temperature to which is due the success of the Roquefort cheese manufacture. A current of icy air runs so swiftly through these gloomy galleries, that an unprotected candle will be extinguished if held up. In these deep caves the cheeses are scraped, a process which is repeated several times. By these means the residuum of salt and other impurities are taken off. They are then piled up once more, in such a way that a free current of air may pass all round them, after which they are left to dry still further.

The women employed in this duty are very warmly clothed, with sabots, thick woolen shawls tied behind their back, and caps covered with a handkerchief. This toilet appears simple enough, but it is made with coquettish care. The hair is neatly braided over the temples, the cap is brilliantly white, the ribbons gay, and the handkerchief of the brightest colors. Nearly 300 women, most of them young, are employed in these caves; and as one goes downstairs at the entrance, one hears the sound of sabots and voices mingling together in a confused Babel of noises. To your sense of smell, there is the prevailing odor of cheese; to your sense of hearing, not an unpleasant vibration of voices. Indeed, some of these women excel in singing snatches from operatic melodies. A never-ceasing activity goes on in these dark caverns lighted only by the little portable lamps which the workwomen carry about with them. These women are called *canvanières*, and are engaged for a season of eight months at a salary of 200 francs. They sleep in dormitories provided by the cave-owners, who also board them. The dexterity of these cheese-scrapers is very great, and their style of manipulation most rapid. They hold the cheese in one hand, lightly pressing it against the breast, while with the other they rapidly pass the blade of a sharp knife over top, bottom, and sides. In this fashion the *canvanières* remove a certain kind of moldiness which is developed upon the exterior of the cheese under the influence of the cave atmosphere. The whiteness and fineness of this moldiness are held to attest the beneficial action of the caves as a maturing agent. If this moldiness ceases to be white and evenly deposited, and becomes more or less thickly coated and darkly marbled, it is a sign that the ripening process is going on badly. This, however, rarely happens, especially in the older caves. The first scrapings are edible, and are made up into little rolls, which are much relished, and find a ready sale in the country round about. After two or three weeks the cheeses no longer put on a white moldiness. The rapidly hardening cheese now assumes a gray tint, with reddish streaks and blue dots. Still the scraping goes on, but there is considerably less to take off. At length, after a stay of between six and eight weeks, the cheese is in a fit condition to be sent into the market. It has by this time acquired the proper reddish tint, streaked with blue veins.

This is the *fromage de Roquefort* so highly esteemed in France and elsewhere. In the months of August and September it is to be found on the table of every *restaurateur* in France; but if the connoisseur would taste it in its highest perfection, he must wait until the month of November, when, if carefully kept, it will be found of truly exquisite flavor.

SPONTANEOUS IGNITION IN WOOLEN MILLS.

John L. Hayes, Esq., editor of the *Bulletin of the National Association of Wool Manufacturers*, gives in an article published in the July number of that periodical, some interesting and important facts in regard to spontaneous ignition in woolen mills, a few of which we extract. Much has been said upon this subject, at various times, in the SCIENTIFIC AMERICAN, yet it is of so much importance, that any facts throwing light upon this source of conflagration, or calculated to put proprietors on their guard are always seasonable.

The combustion of oily wool waste, says Mr. Hayes, is familiar to all older manufacturers; that the cases do not more frequently come under the eyes of manufacturers is due to the precautions now generally in use. Mr. Kingsbury, of Hartford, has informed me of two cases which came under his observation where spontaneous ignition had taken place in barrels of oily waste left accidentally in woolen mills. In both cases, the fires were extinguished without damage. Mr. Gould related to me this circumstance: Some years since a large quantity of what was called clean woolen waste, used in the manufacture of coarse satinets, had been brought from a woolen mill, and stored in a wool-house in Pearl street, Boston. The insurance companies having been informed of the fact, notified the party storing the waste to remove it, on pain of forfeiture of his insurance. Objection having been made to the fastidiousness of the insurance offices, Mr. Gould himself piled up portions of this waste in a yard at the rear of his office in State street. The waste was found to be very oily on handling. The pile was exposed in a damp warm day in August. In less than twenty-four hours the pile took fire spontaneously.

Mr. Badderley, in his report on the fires of London for 1853, says, "The most remarkable case of spontaneous ignition that has occurred for some time, occurred at the residence of Mr. Fletcher, at the Library of the Philosophical Society, in George street, Manchester, who, on entering his room one afternoon, found the sofa on fire. Having dragged it into the yard, and extinguished the fire that was burning in the interior, he found, upon examination, that the sofa had been filled with cap bottoms and rovings, woolen materials, which being greasy had spontaneously ignited."

According to Mr. Gould, my informant, a workman who had been polishing a door of a house in Boston with linseed oil, at the end of his day's work requested that his oily woolen over-clothes might be left in the cellar, which was assented to. At half-past eleven at night, the occupants of the house were awakened by the smell of burning woolens. Upon making search from the attic to the cellar, the door of the latter was opened, and a flame started by the admission of the air showed the combustion in the oiled clothes of the workman. A fire took place at the house of Mrs. Colburn, a neighbor of mine, at Cambridge, Mass., from spontaneous ignition of woolen rags saturated with linseed oil, which had been used in cleaning furniture. Dr. Jackson relates a case where a fire occurred in a house newly-furnished, from spontaneous ignition in a pile of chips of oil-carpeting. The proprietor, from excessive caution, slept in the house before it was occupied by his family, and fortunately discovered the fire and ascertained its cause. Upon stating the case to Dr. Jackson, he says, "My floors are covered with oil-carpet chips; why do they not take fire?" "Because," says the chemist, "the chips not being in contact, the heat is conducted away. In a pile, they accumulate the heat originally induced from the drying oil in the chips attracting the oxygen of the air. Can you set fire to anthracite coal spread upon the floor? No: but pile up the lumps so that the heat may accumulate, and they are readily ignited."

The celebrated Mr. Braidwood, for nearly thirty years superintendent of the London Fire Brigade, says, "Sawdust, in contact with vegetable oil, is very likely to take fire. Cotton, cotton-waste, hemp, and most other vegetable substances, are alike dangerous. In one case, oil and sawdust took fire within sixteen hours; in others, the same materials have lain for years, until some external heat has been applied." He observes that spontaneous ignition is generally accelerated by natural or artificial heat.

The danger of spontaneous ignition in piles of charcoal dust is not generally apprehended. The liability of piles of fine charcoal to ignite has long been known to manufacturers of gunpowder. Mr. Hadfield, in a paper containing "Observations on the circumstances producing ignition in charcoal in atmosperic temperatures," published in the "*Philosophical Magazine*," states generally, "If twenty or thirty hundred of charcoal, in a state of minute division, be put together in a heap, and left undisturbed, spontaneous combustion generally occurs." He states the results of a series of experiments tried by him. The following experiment was the most remarkable: "On the 13th of October, 1831, small charcoal was thrown into a heap which covered about ten feet square, was about four feet deep, and contained two or three tuns in weight. In three days, the temperature had increased to 90°, though it was at first only 57°, that of the air. On the 19th, it was 150°, and on the 20th combustion had occurred in several places." He observes, "This experiment was the most satisfactory one that had come under my notice. The charcoal had been made at least ten or twelve days before it was put together, and had been lying during the interval in small heaps freely exposed in the open air."

I have obtained the following remarkable and instructive examples from Dr. C. T. Jackson. They were originally communicated to the American Academy. At the request of several insurance officers, who regarded the facts as very important, they were published in the Boston papers substantially as here stated.

"Three times," says Dr. Jackson, "I have set fire to charcoal at temperatures below that of boiling water. My first experiment or observation was accidental. I was preparing, while at Bangor, Me., for a lecture, in which I had occasion to show an artificial volcano. I took a tray filled with gunpowder and laid it on a stove to dry. I then took a paper of pulverized charcoal, such as is sold by the apothecaries for tooth-powder, the charcoal being wrapped in white paper, and placed it on the top of the gunpowder which was being dried upon the stove. Having occasion to go out, I took off the paper of charcoal and laid it on the table. When I came back, in about twenty minutes, I observed the paper smoking. The charcoal was completely consumed. During all this time, the gunpowder remained on the stove unexploded.

"My next observation was this: While at work in my laboratory, I had occasion to use a piece of charcoal for blowpipe experiments. I went down into my cellar, and brought up a piece of light, fine, round charcoal, suited for that purpose. It was damp. I laid it on the top of a column stove to dry, directly beside a tin pan containing water, which was not boiling, and never did boil there. I took the charcoal off the stove and laid it on my table. A short time afterward I discovered that it was on fire all through the piece. I laid it aside, and it burned entirely to ashes. The theory of the ignition of the charcoal under these circumstances struck me at once. Charcoal has wonderful porosity: it has the power of analyzing air, and absorbing the oxygen with comparatively little of its nitrogen. The pores of the charcoal were previously filled with moisture. Drying expelled this moisture. The oxygen of the air was condensed in the charcoal, taking the place of the moisture. The condensation of the oxygen produced sufficient heat to ignite the charcoal. I repeated this experiment again intentionally, watching it carefully, and with the same result." The instructive bearing of these remarks will be shown hereafter, in connection with the subject of heating with steam-pipes.

The theory of spontaneous ignition has already been intimated in the observations of Dr. Jackson upon the burning of charcoal. The spontaneous ignition of oily waste and of charcoal proceeds from the same cause—the absorption and condensation of oxygen. We observe that the contact of vegetable or drying oils with porous carbonaceous substances is most promotive of spontaneous ignition. The drying qualities of these oils, which fits them for paints, is due to their absorbing oxygen from the atmosphere. The porous oily materials absorb and condense the air within their pores. Oxidation then commences immediately, and raises the temperature, which again accelerates the oxidation; and the process goes on, with continually increasing rapidity, till at length the mass bursts into a flame. The low conducting power of such a porous mass greatly facilitates the combustion by preventing the dissipation of the heat generated. The massing of the materials in piles, boxes, or barrels promotes the retention and accumulation of the heat, at first excited by oxidation. Moisture also promotes combustion by supplying oxygen. Besides, it has been recently shown that the simple act of moistening such substances as cotton, hair, and wool, is attended with a slight though constant disengagement of heat. It should be observed that the paraffine oils, or the hydrocarbon oils from petroleum, do not absorb oxygen. Dr. Hoffman, the President of the London Chemical Society, warmly recommends their use for lubricating machinery; saying that "they are safer than many of the oils previously used, inasmuch as they no not absorb oxygen, and consequently cannot undergo spontaneous combustion when smeared upon cotton waste."

Managers and workmen should know that spontaneous ignition is not an accidental and exceptional phenomenon. With the proper conditions, it is as certain as the firing of gunpowder with a spark. The cask of gunpowder, so instinctively dreaded, will not explode till the spark is applied. The pile of oily waste, harmless and innocent to all appearance, slowly but surely takes from the oxygen of the air the means for its own combustion; itself lighting the conflagration, which, most frequently, bursts forth when manager and operatives are locked in slumber.

The Boiler Explosion at the Indiana State Fair.

The boiler of Sinker & Co., which was in use at the Indiana State Fair, at Indianapolis, exploded on the 1st October, killing nineteen persons and wounding about one hundred persons. The cause of the explosion was, at the time of our going to press, still undetermined.

The scene at the Fair Ground after the accident was most heart-rending. Many of the killed were torn in fragments. In one family, consisting of a mother and three children, the mother was killed and the two older children badly scalded; the youngest was unhurt. A gentleman and lady were walking together; the gentleman was killed and the lady unhurt. Everything is being done to alleviate the suffering wounded that can be done, though it is feared that several will die.

The whole country sympathizes with the sufferers from this fearful calamity, which, although resulting in less loss of life, yet considered in all its aspects is scarcely less terrible than the recent catastrophe at Avondale.

The Manufacture of Steel.

The Paris *Presse* says:—"An experiment of a most interesting character, and having the highest interest for the iron industry, has taken place at the Marquise Stock Works, in presence of two eminent persons of the Ecole Centrale. The object of this experiment was to make steel by one operation, a problem which has engaged all metallurgists, and if solved, would cause an industrial revolution. M. Aristide Berard, an engineer whose name is familiar to all who have occupied themselves with this question, proposed to change second class metal in course of refining into steel of at least ordinary quality, by means of a process alternately oxidizing and reductive. His efforts have been crowned with success. The product obtained by his process, in presence of two competent judges, proved to be steel of good quality, suitable for all purpose, and made with the facility necessary to its application to practical industry. The operation was effected in a reverbatory furnace, lasted about an hour and a half, and was accomplished with as much facility as puddling. In this process, instead of acting on 480 pounds of metal to obtain iron of number one quality, from 6,600 to 11,000 pounds of metal is made by only one operation into steel ingots ready for the workshop, and with an unexpected economy. We will be much deceived if this invention has not in it the germ of a complete revolution in metallurgy."

A patent has recently been granted for a method of refreshing horses while in harness, which consists in making the bit hollow, and having perforations in it. A rubber tube extends from one side of the bit to the carriage, and by pressing a rubber bag which contains water, the driver is enabled to refresh his horse whenever he chooses without stopping. For saddle horses the water bag is suspended from the horse's neck, or upon the pommel of the saddle.

CORNS.—The pain occasioned by corns may be greatly alleviated by the following preparation: Into a one-ounce phial ask a druggist to put two drachms of muriatic acid, and six drachms of rose-water. With this mixture wet the corns night and morning for three days. Soak the feet every evening in warm water without soap. Put one third of the acid into the water, and, with a little picking, the corn will be dissolved.—*Jessie Piesse.*

SIEMENS ON PATENTS.

Mr. Siemens, in his address before the Mechanical Science Section of the British Association, took occasion to make some remarks on the patent laws of England, of which the following is an extract:

"Closely allied to the question of educatior is that of the system of letters patent. A patent is, according to modern views, a contract between the commonwealth and an individual who has discovered a method, peculiar to himself, of accomplishing a result of general utility. The State, being interested to secure the information and to induce the inventor to put his invention into practice, grants him the exclusive right of practicing it, or of authorizing others to do so, for a for a limited number of years, in consideration or his making a full and sufficient description of the same. Unfortunately, this simple and equitable theory of the patent system is very imperfectly carried out, and is beset with various objectionable practices, which render a patent sometimes an impediment to, rather than a furtherance of applied science, and sometimes involve the author of an invention in endless legal contentions and disaster, instead of procuring for him the intended reward. These evils are so great and palpable, that many persons, including men of undoubted sincerity and sound judgment on most subjects, advocate the entire abolition of the patent laws. They argue that the desire to publish the results of our mental labor suffices to insure to the commonwealth the possession of all new discoveries or inventions, and that justice might be done to meritorious inventors by giving them national rewards.

"This argument may hold good as regards a scientific discovery, where the labor bestowed is purely mental, and carries with it the pleasurable excitement peculiar to the exercise and advancement of science on the part of the devotee; but a practical invention has to be regarded as the result of a first conception, elaborated by experiments and their application to existing processes in the face of practical difficulties, of prejudice, and of various discouragements, involving also great expenditure of time and money, which no man can well afford to give away, nor can men of merit be expected to advocate their cause before the national tribunal of rewards, where, at present, only very narrow and imperfect views of the ultimate importance of a new invention would be taken, not to speak of the favoritism to which the doors would be thrown open. Practical men would undoubtedly prefer either to exercise their inventions in secret, where that is possible, or to desist from following up their ideas to the point of their practical realization. If we review the progress of the technical arts of our time, we may trace important practical inventions almost without exception to the patent office. In cases where the inventor of a machine or process happened to belong to a nation without an efficient patent law, we find that he readily transferred the scene of his activity to the country offering him the greatest encouragement, there to swell the ranks of intelligent workers. Whether we look upon the powerful appliances that fashion shapeless masses of iron and steel into railway wheels or axles, or into the more delicate parts of machinery; whether we look upon the complex machinery in our cotton factories, our dye works, and paper mills, or into a Birmingham manufactory, where steel pens, buttons, pens, buckles, screws, pencil cases, and other objects of general utility are produced by carefully elaborated machinery at an extremely low cost; or whether we look upon our agricultural machinery by which England is enabled to compete, without protection, against the Russian or Danubian agriculturist, with cheap labor and cheap land to back him, in nearly all cases we find that the machinery has been designed and elaborated in its details by a patentee who did not rest satisfied till he had persuaded the manufacturers to adopt the same, and removed all their real or imaginary objections to the innovation. We also find that the knowledge of its construction reaches the public directly or indirectly through the patent office, thus enlarging the basis for further inventive progress.

"The greatest illustration of the beneficial working of the patent laws was supplied, in my opinion, by James Watt, when just about 100 years ago, he patented his invention of a hot working cylinder and separate steam engine condenser. After years of contest against those adverse circumstances that beset every important innovation, James Watt, with failing health and scanty means was only upheld in his struggle by the deep conviction of the ultimate triumph of his cause. This conviction gave him confidence to enlist the coöperation of a second capitalist, after the first had failed him, and of asking for an extension of his declining patent.

"Without this opportune help Watt could not have succeeded in maturing his invention; he would, in all probability, have relapsed into the mere instrument-maker, with broken health and broken heart, and the invention of the steam engine would not only have been retarded for a generation or two, but its final progress would have been based probably upon the coarser conceptions of Papin, Savory, and Newcomen.

"It can easily be shown that the perfect conception of the physical nature of steam which dwelt like a heaven-born inspiration in Watt's mind was neither understood by his cotemporaries nor by his followers up to very recent times, nor can it be gathered from Watt's very imperfect specification. James Watt was not satisfied to exclude the condensing water from his working cylinder, and to surround the same by by non-conducting substances, but he placed between the cylinder and the non-conducting envelope a source of heat in the form of a steam jacket, filled with steam at a pressure somewhat superior to that of the working steam. His successors have not only discarded the steam jacket, and even condemned it, on the superficial plea that the jacket presented a larger and hotter surface for loss by radiation than the cylinder, but expansive working was actually rejected by some of them on the ground that no practical advantage could be obtained by it. The modern engine, notwithstanding our perfected means of construction, had in fact degenerated in many instances into a simple steam meter, constructed apparently with a view of emptying the boiler in the shortest possible space of time.

"It is only during the last twenty years that the subtile action of saturated steam in condensing upon the sides of the cylinder when under pressure, and of evaporating when the pressure is relieved toward the end of each stroke, has been again recognized and insisted upon by Lechatelier and others who have shown the necessity of a slightly super-heated cylinder in order to realize the expansive force of steam. The result has been a reduction in the consumption of fuel in our best marine engines from six or eight to below three lbs. per gross, indicated horse-power.

"Would it be safe, in view of such facts as these, to discard the patent laws, which, as I have endeavored to show, lay at the very foundation of our modern progress, without making at all events a serious effort to remedy those evils, which, it admitted on all hands, now adhere to them? These evils need, for the most part, no special legislation, but can be traced to the imperfect manner in which the existing patent laws are carried into effect. It is a hopeful circumstance that, during the next session of Parliament, the whole question of the patent laws is likely to be inquired into by a special committee, who, it is hoped, will act decidedly in the general interest without being influenced by special or professional claims. They will have it in their power to render the patent office an educational institution of the highest order."

MACK'S IMPROVED FEED-WATER HEATER.

The great advantages of storing up heat in steam, from which it can be transmitted to water by condensing the steam in the water, have long been recognized in large establishments devoted to dyeing, soapmaking, and other industries necessitating the use of large quantities of hot water. The

Fig. 1.

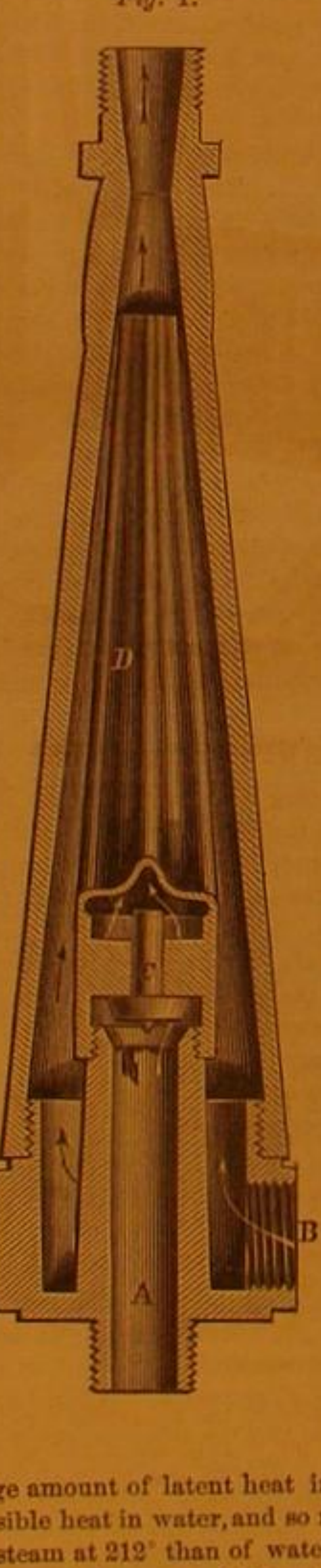


Fig. 2.

large amount of latent heat in steam is thus converted into sensible heat in water, and so much greater is the latent heat of steam at 212° than of water at the same temperature, that one pound of steam at 212°, condensed in five and a half pounds of water at 32°, will give a result of six and one half pounds of water at 212°. Thus one pound of steam will cause five and a half pounds of water to boil, and, as the transfer of the heat to the steam is extremely rapid, this method is employed with economy and great convenience to heat water held in wooden tanks, etc., at a distance from the furnace, which may be so constructed as to conduct the heat to the boiler and retain it therein more effectively than could be possible were the heat applied to the bottom of an open vessel.

There are, however, some drawbacks to this method as hitherto practiced, which, among other things secured, the invention herewith illustrated is designed to obviate. During the admission of the steam into water at any ordinary temperature, the steam being discharged directly into the water, there is a constant succession of loud reports, very disagreeable to listen to; and when the temperature rises towards the boiling point, steam will begin to escape from the surface of the fluid undergoing the process of heating, and thus more or less heat will be lost unless care is taken to constantly adjust the flow of steam to the rate at which condensation takes place.

The apparatus under consideration obviates both these difficulties by mixing steam and water together in constant streams, which can be proportioned so as to deliver the water into a tank or locomotive boiler at any temperature required between 32° and 212°

Its external shell is of the conical form, shown in Fig. 2, while its internal construction is shown in section in Fig. 1. A is the water induction port, and B the steam induction port. The water entering at A is forced on, by the pressure of its head, or by a force pump, through a corrugated pipe, D, and discharged through it at a short distance from and within the apex of the external conical case. This pipe is formed so as to present four corrugations, leaving very thin spaces between their inclosing walls, through which the water flows in very thin strata. This pipe is also formed of thin sheet copper, and therefore transmits heat with great rapidity to the water from the steam, which flows all around, within the space inclosed between this water-induction pipe and the outer cone.

The steam thus imparts its heat gradually to the water, and whatever residuum there may be left, on its reaching the end of the water-induction pipe, is condensed there in the current of water, with which it mingles, both then flowing out together, in the form of water heated to a temperature regulated by the proportional flow of the water and steam.

A check valve, C, prevents any return flow which might ensue upon too great an increase of steam pressure in proportion to the water pressure inadvertently applied.

Those acquainted with the theory and applications of heat and steam will recognize in this instrument perfect compliance with scientific principles, and its convenience, in large laundries, dye houses, breweries, etc., etc., will be apparent.

The temperature obtainable in the water heated, of course, depends upon dimensions and capacity of boiler, velocity of induction of both steam and water, and the temperatures of the steam and water; but as all these things can be adjusted and are susceptible of mathematical determination, any temperature between 32° and 212°, for any quantity of water required is attainable, and even the time required to heat it may be computed. There is, therefore, no element of uncertainty in the operation.

The instrument has been used in the soap and candle works of the inventor, hose being employed to deliver heated water to any part of the building to increase the temperature of fluids flowing from one vat to another, etc. It has also received warm commendations from prominent steam engineers in the West, and has been adopted after trial in the House of Correction, at Detroit, for heating the baths in that institution, etc. It is well adapted for cooking and laundry purposes in penitentiaries, prisons, almshouses, hospitals, hotels, etc., and, the inventor informs us, is being adopted by the Michigan Central Railroad for washing cars. Many other applications of this invention will suggest themselves to practical men, one of which is likely to be its application to heating water for locomotive boilers after they are blown off. It now takes about three hours to blow off, clean out, refill, and get up steam in an ordinary locomotive boiler. By the employment of this heater taking steam from a stationary boiler, the boiler might be washed out with hot water, and immediately filled with water at 212°, thus enabling it to start in one third the time now occupied for this purpose.

These heaters are made to deliver streams varying from one half an inch to two inches in diameter.

Patented, July 13, 1869, by Wm. B. Mack, 23 St. Antoine street, Detroit, Mich., whom address for State and Territorial rights.

A New Alarm Bell for Locomotives.

A new alarm bell was tested on the Detroit and Milwaukee Railroad lately. The invention consists of an ordinary bell, weighing about 100 lbs., placed on the platform of the locomotive, immediately over the cow-catcher. A rod attached to the eccentric shaft causes a clapper to strike the bell each turn of the driving wheel. The bell is suspended loosely, and revolves from the force of the stroke it receives, so that all parts of the surface are equally exposed to wear. The advantages of this arrangement are a continuous sound, slow or rapid in proportion to the speed of the engine, each 15 ft. producing a stroke of the bell. In case of an accident, the railroad company can always prove that their bell was ringing according to law; and owing to the position in which this bell is placed, the sound can be distinctly heard about three miles in day-time, and by night four miles or more, the ground and the continuous rail, both excellent conductors of sound, assisting in carrying the vibrations. The Detroit and Milwaukee Railroad have twenty-four of these alarms already in use, and intend to provide all their passenger engines with them. Mr. Ben. Briscoe, the inventor, went to Detroit in 1837, and in 1842 took charge of the Detroit and Pontiac, then a strap railroad, with pony engine and one little car, and performed the duties of master mechanic, engineer, fireman, and sometimes of conductor. In those days signal bells were unnecessary, because the train did not run fast enough to hurt cattle.

GEORGIA STATE FAIR.—The State Agricultural Society o f Georgia will hold a Fair at Macon, Ga., beginning on Tuesday, Nov. 16, 1869, and offer an extensive premium list, only a portion of which is limited to the State of Georgia, most of the premiums being open for competition to exhibitors from any part of the United States. Information may, we presume, be obtained on application to the Secretary, D. W Lewis, Esq., Sparta, Ga.

Improved Cotton and Hay Press.

A notice of this press was given in an article on the Exhibition of the American Institute, published on page 217, current volume of this journal. It may now be seen at the fair exhibited by Mr. Champman, the patentee. It was there stated to have been manufactured and exhibited by Whitney & Co., instead of which the name should have been Campbell, Whittier & Co. We herewith give an illustration and brief description of this press, which will give a general idea of its form and operation.

By the engraving it will be seen that the bale is made at the bottom, and that the side and end doors are easily removed, thus giving free access to the bale from all sides.

The follower block, shown as at the top, may be swung over to one side when the press is to be filled, leaving the top of the press perfectly open to receive the material to be pressed. When full the follower is returned to its place, shown by the dotted lines, and worked down. The levers are compound, and also adjustable, so that the fulcrum may be altered to make a short stroke, when the article is loose and little power is needed, or a long stroke, as it becomes more compressed and great force is obtained.

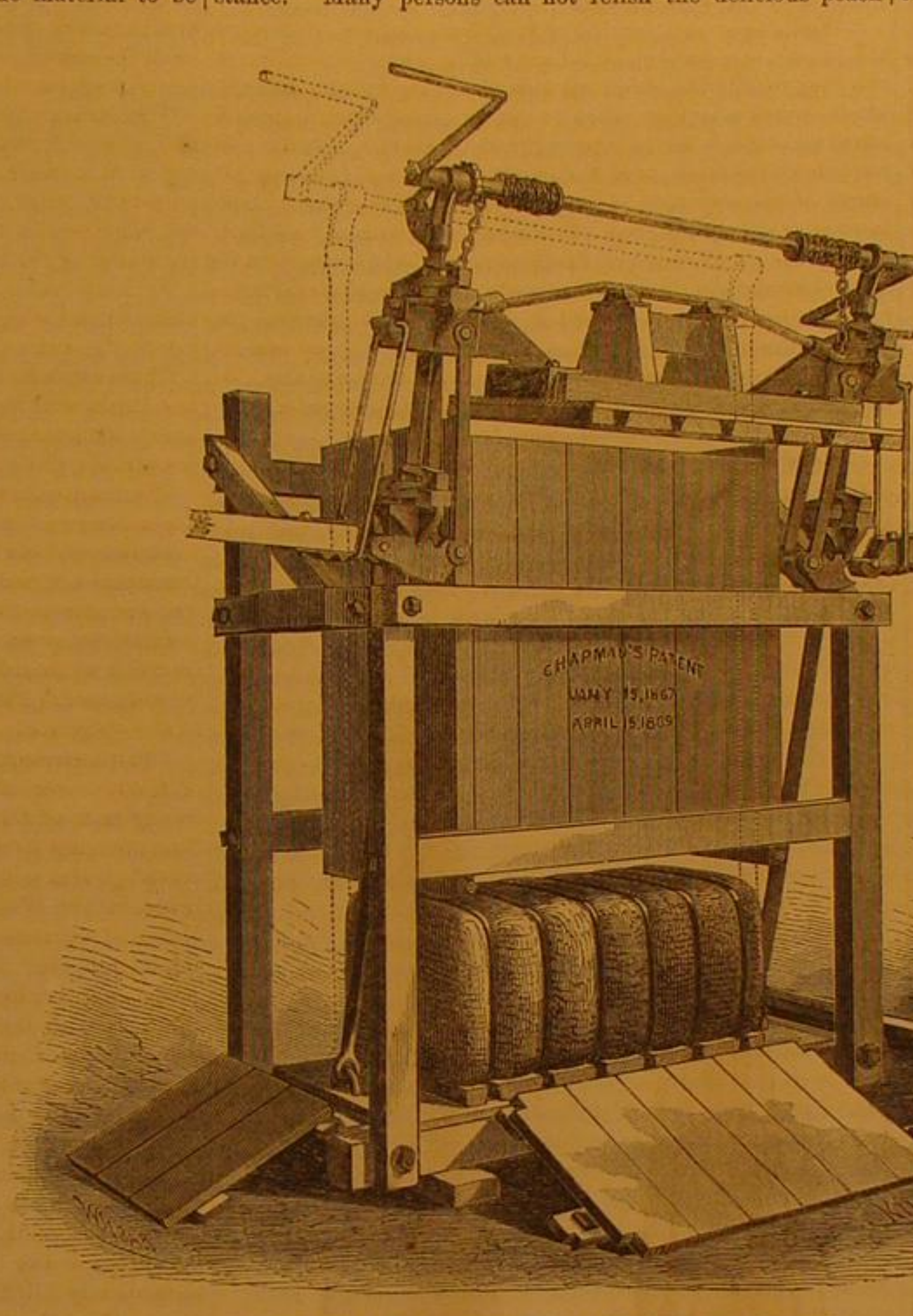
By the peculiar arrangement of the levers and clutches, the follower may be raised very quickly and independently of the levers. In most other presses it requires as much, or nearly as much time to raise the follower block as it does to compress the cotton.

In this the follower is run up quickly and swung over to one side, thus being entirely out of the way for refilling.

These presses are sold cheap, and are durable and substantially made, and from the construction we judge them to be very effective.

Patented January 15, 1867.

For further particulars address Campbell, Whittier & Co., Manufacturers, Boston, Mass.



CHAPMAN'S COTTON AND HAY PRESS.

Nervous Dyspepsia.

Those persons who use their brains much, and who have but little tone or power to their stomachs, should above all things avoid purgatives. So says the *The Herald of Health*, and adds that very much of the natural distress which this class of dyspeptics feel, is caused by the large intestine becoming weakened, dislocated, and filled up with offending matters which there is not strength to remove. In such cases, it is important that the patient do less work with his head, and more with his muscles. If there is strength enough, the daily use of ax or hoe for three or four hours will prove highly beneficial. Riding on horseback is an excellent exercise, providing the saddle is a comfortable one and the horse an easy goer. Hard-trotting horses are not good ones for invalids to ride. A galloping horse is the best for such a person. Those who live in the country can easily take either of these forms of exercise, but they are not always available in the city. In such cases the gymnasium or movement cure are valuable means of treatment. Half an hour daily for a nervous dyspeptic in a movement cure will work wonders.

The diet should be plain and nutritious. It will not do to overload the stomach, yet as much food as can be digested well should be taken. Mastication should be slow and thorough. Such invalids are apt to eat too fast. The remedy for that is to talk a great deal at the table ; to get if possible into a good humor before taking a mouthful, and keep in it to the end of the meal. It is generally best to omit the dessert. Fruit is often condemned by the nervous dyspeptic. We are sure, however, that it is not always the fruit which is at fault, but the way of using it. Let it be taken in the morning, and before anything else is eaten, if possible ; at first, take small quantities to accustom the stomach to it, Avoid fine bread, vegetables, and pastry ; also tea, coffee, and tobacco. Omit the supper, or at least, let conversation at the table be much and eating little.

It is often advisable to cover the abdomen with the wet compress in this disease for an hour or two daily. The compress should be covered with a dry one. A sitz bath at bed time is very serviceable if there is a disposition to sleeplessness, as sleep is very necessary. Patients can not have too much sleep. If mental labor is performed, let it be done between 9 in the morning and 1 P. M. After this, dine and recreate, or perform light physical labor. The after-dinner nap may be useful, providing it does not not interfere with sleep at night, in which case an hour of quiet and rest is better.

The habit of drugging for this disease with all sorts of quack nostrums is very absurd. Hygiene medications will do all that can be done much better. The grand rule should be to live naturally and happily, and throw medicines to the dogs, and nine cases out of ten the sufferer will get well.

Impaired Taste.

Of all the senses, that of taste is the worst treated, the most perverted. The delicate little nervous fibers which are distributed to the minute papillæ that cover the surface of the tongue, soft palate, and fauces, and which constitute the organ of taste, are boiled by hot tea and coffee, burned by hot food, and irritated and inflamed by salt, pepper, spices, vinegar, liquors, etc., until it is a wonder that they can distinguish a peach from a potato. That these things *do* blunt and injure the finer susceptibilities of the nerves of taste, there is not a shadow of doubt. The only wonder is that they do not destroy the sense of taste entirely. Persons accustomed to using these things freely can not distinguish the delicate natural flavors of food, and therefore lose a large share of that gustatory enjoyment which they should experience, and which those who still possess a healthy taste do experience. To an unperverted taste water is the sweetest and most agreeable of drinks, while to many it is scarcely endurable, unless it has mingled with it some sharp, strong-flavored substance. Many persons can not relish the delicious peach even, without peppering and spicing it highly, and then it is not the peach that they taste but the condiments used with it. To such persons, plain, simply-prepared food tastes insipid, while those whose organs of tastes are unperverted such food is filled with delicious flavors. Those who have impaired their sense of taste can, to a certain extent, have it restored, by carefully avoiding the use of the substances which caused the injury. The increase of gustatory enjoyment which they will experience from such a change, will only be believed after thorough trial. There is scarcely one in a thousand whose taste is not more or less perverted and blunted by the use of highly seasoned food or drinks. Simple, healthful food is the exception, while rich, strongly-flavored, and complicated dishes are the rule, because demanded by the perverted tastes of the people.—*Herald of Health*.

THE AUGUST METEORS.

From the Spectator.

A very ancient tradition prevails in the mountain districts which surround Mount Pelion, that during the night of the Feast of the Transfiguration (August 6) the heavens open, and lights, such as those which surround the altar during the solemn festivals of the Greek Church, appear in the midst of the opening. It has been thought by Quetelet, and Humboldt considered the opinion probable, that this tradition had its origin in the successive apparition of several well-marked displays of the August meteors. If this be so, the date of the shower has slowly shifted—as that of the November shower is known to have done—until now another holiday is associated with it, and the simple peasants of Southern Europe recognize in the falling stars of August the "fiery tears of good St. Lawrence the Martyr."

It is wonderful to contemplate the change which in a few short years has come over all our views respecting these meteors. Ten years ago it was considered sufficiently daring to regard the August system as part of a zone of cosmical bodies traveling in an orbit as large perhaps as that of our own earth. Now, the distance even of Neptune seems small in comparison with that from which those bodies have come to us, which flash athwart our skies in momentary splendor, and then vanish forever, dissipated into thinnest dust by the seemingly feeble resistance of our atmosphere. Accustomed to associate only such giant orbs as Saturn and Jupiter, Uranus and Neptune, with orbits which must be measured by hundreds of millions of miles, the astronomer sees with wonder these tiny and fragile bodies traversing paths yet vaster than those of the outer planets. And even more remarkable, perhaps, is the immensity of the period which the August shooting star has occupied in circling around the central orb of our system. Each one of these bodies has been in the neighborhood of the earth's orbit many times ; yet the last visit made by them took place years before the birth of any person now living, since the period of meteoric revolution has been proved to be upwards of 118 years.

Another strange feature of the August meteor system is the enormous volume of the space through which, even in our neighborhood, the meteor stratum extends. The famous November system is puny by comparison. Striking that system at a sharp angle, the earth traverses it in a few hours, so that if the earth went squarely through it the passage would occupy, it has been estimated, less than a hundred minutes. Thus the depth of the November meteor bed has been calculated to be but a hundred thousand miles or so. But the earth takes nearly three days in passing through the August meteor system, although the passage is much more direct. For the August meteors come pouring down upon our earth almost from above, insomuch that the radiant point on the heavens whence the shower seems to proceed is not very far from the North Pole ; whereas the November meteors meet the earth almost full front, as a rain storm blown by a head wind drifts in the face of the traveler. Thus the depth of the August system has been estimated at three millions of miles; and this depth seems tolerably uniform, so that along the whole of that enormous range (to be counted, as we have said, by hundreds of millions of miles), through which the August ring extends, the system has a depth exceeding some four hundred times the diameter of the earth on which we live.

Yet it is probable that the whole weight of the August system, vast as are its dimensions, is infinitely less than that of many a hill upon the earth's surface. For the weight of the separate falling stars of the system has been determined (by one of the wondrously subtile applications of modern scientific processes) to be but a few ounces at the outside ; and even during the most splendid exhibition of falling stars the bodies which seemed to crowd our skies are many miles apart, while under ordinary circumstances thousands of miles separate the successively-appearing meteors. Indeed, it is well remarked by an eminent member of the Greenwich corps of astronomers, that the planets tell us by the steadiness of their motions that they are swayed by no such attractions as heavily-loaded meteor systems would exert. "The weight of meteor systems must be estimated by pounds and ounces, not by tuns," he remarked.

The spectroscope has taught us something of the constitution of these bodies, though they never reach the earth's surface. Professor Herschel, third in that line of astronomers which has done so much for science, has employed an August night or two in trying to find out what the August meteors are made of. With a spectroscope of ingenious device, constructed by Mr. Browning, F.R.A.S., for the special purpose of seizing the light of these swiftly-moving bodies, Professor Herschel was successful in analyzing seventeen meteors. The most interesting of his results is his discovery that the yellow light of the August meteors is due to the presence of metal sodium in combustion. This metal has a very striking and characteristic spectrum, consisting of two bright orange yellow lines very close together; and this double line was unmistakably recognized in the spectrum of the August meteors. To use the words of the observer, "their condition (when rendered visible to us by their combustion) is exactly that of a flame of gas in a Bunsen's burner, freely charged with the vapor of burning sodium ; or of the flame of a spirit lamp newly trimmed, and largely dosed with a supply of moistened salt.

It is strange to consider what becomes of all the sodium thus dispersed throughout the upper regions of the air. There can be no doubt that in some form or other—mixed or in combination—it reaches the earth. The very air we breathe must at all times contain, in however minute a proportion, the cosmical dust thus brought to us from out the interplanetary spaces. Nay, for aught we know, purposes of the utmost importance in the economy of our earth, and affecting largely the welfare of the creatures which subsist upon its surface, may be subserved by this continual downpour of meteoric matter. We know already that the different meteor systems are differently constituted. For instance, the white November stars are much less rich in sodium than the yellow August ones. Each system, doubtless, has its special constitution, and thus the air we breathe is continually being dosed with different forms of metallic dust—now one metal, now another, being added, with results in which did we but know it, we are doubtless largely interested. Nor is it certain that deleterious results do not occasionally flow from an overdose of some of the elements contained in meteors. It might be plausibly maintained on evidence drawn from known facts and dates, that occasionally a meteoric system has brought a plague and pestilence with it. The "sweating sickness" even has been associated (though, we admit, not very satisfactorily) with the 33-year returns of great displays of November shooting stars. Without insisting on such hypotheses as these, which scarcely rest on stronger evidence than the notion that the destruction of Sodom and Gomorrah was brought about by an unusually heavy downfall of sodium-laden (that is, salt-laden) meteors, we may content ourselves by pointing out that the labors of eminent chemists have shown that the air is actually loaded at times with precisely such forms of metallic dust as the theories of astronomers respecting meteors would lead us to look for.

THE MANUFACTURE OF SULPHURIC ACID.

From the Report of J. Lawrence Smith, United States Commissioner to Paris Exposition.

I.—APPLICATION AND PROGRESS OF THE MANUFACTURE.

When we glance over the chemical products that influence to the greatest extent the useful arts of society, we find them among the acids and alkalies; for by the chemical reaction of these compounds, furnished by nature or art, the manufacturing and domestic arts generally obtain a multitude of useful compounds. But of all substances that have made their imprint on the modern progress of the arts, there is no one approaching sulphuric acid in importance, produced as it is from the cheapest materials furnished by nature, and of which there seem to be inexhaustible supplies. Glass making, soap making, bleaching, calico printing, dyeing, etc., are all debtors to sulphuric acid.

It is said that the consumption of sulphuric acid in any country will show, with that of iron, its industrial activity. The low price of the acid is one of its great merits; the ordinary form known as oil of vitriol, being the most concentrated form in ordinary use, is now made in France at a cost of about one and a quarter cent per pound, and in England for a shade less; in this country ill-advised legislation makes a much higher and fluctuating price.

No material change has taken place in the last ten years or more in the manufacture of sulphuric acid. The well-known method of converting sulphur into sulphurous acid, and completing the oxidation of it by the oxygen of the air, aided by one of the oxygen compounds of nitrogen, is still the predominant method; and, in fact, all of this acid that is manufactured, except the small quantity made by distilling copperas, and called Nordhausen acid, is made by this process.

It will not, however, be unprofitable to the readers of this report to enumerate some of the various attempts made in the last twenty years to supplant the present method in lead chambers. Leland and Deacon, in 1854, suggested the use of chambers made of stone, or earthenware. Simon, in 1860, proposed vulcanized gutta-percha, but on trial this substance was found more destructible than lead. Peter Ward, in 1862, proposed a series of glass sheets to increase the surface and hasten the reaction; that, however, had been used before, and as the formation of sulphuric acid is not dependent on surface action, it is of no advantage. Philips and Kuhlmann, as far back as 1838, proposed the use of heated air, and sulphurous acid passed over spongy platinum, but this has been almost forgotten. Fouché and Lepelletier, in 1850, employed a series of large Woolfe bottles instead of the lead chambers, at Javelle, near Paris, but this has been long since abandoned. Kuhlmann proposed to pass a mixture of sulphide of hydrogen, obtained by proper means from soda waste, through nitric acid in stoneware bottles, but the method was never put in practice. Petrie, in 1860, applied a system of stoneware columns, filled with pebbles, through which currents of nitric acid and sulphurous acid in proper proportions were passed; but this has not been successfully applied. Several years ago Persoz accomplished the oxidation "by passing the sulphurous acid gas through nitric acid, diluted with from four to six volumes of water, and heating to 212° Fah., or through a mixture of nitric acid, or a nitrate with hydrochloric acid. The reaction takes place in a comparatively small vessel of suitable material; the gas arising from the deoxidation of the nitric acid is reconverted into nitrous acid by air and water. Theoretically, it works without a loss of nitric acid; nevertheless the process has never been adopted in practice, possibly from want of suitable material to withstand the combined action of the two strong acids.

II.—SUBSTANCES EMPLOYED IN THE MANUFACTURE OF SULPHURIC ACID.

Sulphur.—There was a most beautiful display of specimens of sulphur from the south of Italy and from Sicily; and these countries furnish all the sulphur that is employed in the arts and in agriculture, except some little that is employed for domestic use in countries producing it, of which notice will be taken a little further on.

While we now obtain the larger proportion of sulphuric acid made in Europe from pyrites, it is very much to be desired that new and abundant supplies of sulphur may be found, for the acid made from this substance directly is purer, and the apparatus required less expensive than when pyrites is used. Besides the sulphur exhibited from Southern Italy and Sicily, there were specimens from Apt, in France, which locality furnishes a poor sulphur mineral. Also in the neighborhood of Constantine, in Algiers, there is native sulphur. In central Italy, near Bologna, there is a vein of sulphur ore about fifteen miles long, but the mineral is not rich, and is necessarily taken from a great depth, sometimes over 800 feet. About 12,000 tuns are produced here annually, which is almost entirely consumed in the neighboring country for diseases of the vine. From the Papal States there were also specimens of sulphur, but the quantity produced there is very small, not exceeding 500 tuns. The Spanish specimens come from Murcia and neighboring localities, where there are some fine mines of sulphur.

Besides the above, there were specimens on exhibition from Galicia, near Cracovy, from Corinthia, in Hungary, from the Grecian island of Milo, from Tripoli, Isthmus of Suez, on the borders of the Red Sea, province of Rio Grande, in the north of Brazil; but, as already stated, it is from Sicily that we obtain the great bulk of sulphur used in the arts. In this island the strata of sulphur extend over a length of about 170 miles, superimposed one on the other to a depth of from three to twenty-five feet and containing about thirty per cent of sulphur. The mines are owned by various influential individuals, who, by restricting the supply and by rude and imperfect mining, keep up the price to the present standard. There have been as many as 1,000 mines opened, but at the present time not more than one half are worked.

The manner of obtaining the sulphur has been frequently described, and was formerly of a crude character. The method now in most frequent use is that of Tucci, the inspector of of mines of Catanisette and Catania. It is by means of a species of furnace called *calarones*, by which very large amounts of the mineral can be operated upon at once. These *calarones* are simply circular furnaces of a conical form, having an inclination of from 20° to 45°, according to the nature of the gangue (which is calcareous or of gypsum), so that the viscous sulphur can descend and run off at the bottom. The walls of the furnace are about one foot thick and ten feet deep, and made of a capacity to hold more than 1,000 cubic yards of the ore; at the bottom of the furnace there is a hole to run off the melted sulphur, being the outlet of a channel coming from the interior of the furnace, which channel is continued for a little distance outside the furnace, and is branched and arched over by laying masses of the mineral so as to form little tunnels leading to a reservoir.

The furnace is charged by putting large lumps in the middle, and then smaller fragments on the outside, and finally covering all over with previously exhausted ore. Around the upper part of furnace are several small chimneys going down a foot or two; by these the furnaces are kindled at the top and air is supplied by percolation from above. One operation requires about twelve or fourteen days. The sulphur which has been collected in the reservoirs is cast into molds. The furnace requires twelve or fourteen days to cool down, when it is cleaned out and recharged; and this operation is repeated so long as the furnace lasts.

There are recent processes of separation proposed by Fangére, and by Emile and Pierre Thomas, depending on heat, but they deserve no special notice.

The most novel method is that of Deiss; namely, to dissolve out the sulphur by sulphuret of carbon, and an apparatus has been erected to extract by his process several tuns of sulphur daily, but practical difficulties still exist and prevent it from becoming a complete success. The quantity of sulphur produced in Sicily has gradually increased from 46,000 tuns in 1832, to 300,000 tuns at this time, worth from $22 to $24 a tun at the port of exportation. This increased consumption of sulphur, in spite of the diminished use of it in the chemical arts (for it will be shown a little further on that pyrites to the amount of 800,000 tuns, representing 250,000 tuns of sulphur, has taken its place), is due to the very large and increasing amount used for preventing diseases of the vine—diseases that have been almost exterminated by its use; but its use is kept up, as it is considered of great importance to give the vineyards an annual treatment of sulphur. If, however, sulphur should fall in price a little below what it is now, it would again come into general use in the manufacture of sulphuric acid.

Sulphur from Soda-Waste.—In the German section were shown the results obtained by the process of M. Mond, a chemist, of Utrecht, by which he extracts sulphur from soda-waste. The soda-waste has ever been a great nuisance, as well as a great loss in the manufacture of soda by Leblanc's process. It has become so great a nuisance in many of the large factories, that stringent sanitary laws have been passed concerning the disposal of it; and in some places, where it has been scattered over large surfaces, birds have been known to be asphyxiated while flying over it, and to fall to the ground.

A large amount of sulphur is thrown away in this waste, so that for forty or fifty years chemists have endeavored to solve the problem of turning it to some account. The prospects now are that it can be made to yield up much of its sulphur, and the residue to furnish a valuable fertilizing agent, instead of a pestilential nuisance. Some idea may be formed of the abundance of this waste when it is stated that for every tun of alkali manufactured one and a half tuns of dry waste is produced, furnishing the accumulations referred to, that during moist and rainy weather emit sulphureted hydrogen gas, and in solution, poisoning waters of all kinds in the neighborhood.

Besides the process of Mond there are two others brought forward, one by M. Schaffner, and the other by P. W. Hoffman; and seven works exhibit sulphur prepared by one or other of these processes. All the processes are based on the same principle—the conversion of the insoluble sulphide of calcium in the waste into soluble compounds, by bringing it freely in contact with air, in order to oxidize it; lixiviation of the oxidized mass, and precipitation of sulphur in these liquids by a strong acid, as muriatic acid.

(To be continued.)

Reverie is not thought, though many people mistake it for thought. Thought is systematic; reverie is disjointed and fragmentary. Thought is laborious; reverie is the reverse.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Heat from Percussion and Heat from Friction.

Messrs. Editors:—On page 149, current volume, under the head of "Hammering Iron until it is Red Hot," I find the following, which I quote: "It has been asked whether iron could be hammered cold until it became red hot." And it is stated that, as an experiment to prove the affirmative, "when a piece of very tough iron was hammered with a moderately heavy hammer it became hot, but would not scorch a piece of paper. It was then hammered by two men, one of whom used a sledge hammer, but with no better result. Presently another workman took a horseshoe nail, and after hammering for less than two minutes with a light hammer part of the nail was brought to a bright red heat. The blows were light but frequent, and the nail was partly turned at each blow."

Now, is this not in strict accordance with the vibratory theory of heat?

No doubt a great part of the muscular force imparted to the hammer was, in both cases, changed into sonorous vibrations in the material sustaining the shock; this, of course, would produce the sensation of sound instead of heat.

The blows of the heavy hammer did not, directly, produce heat, but as the iron was not sufficiently elastic to recover from so great a compression, it was condensed, which caused a certain part of its latent heat to become sensible, but beyond this nothing was obtained. The light hammer, if at all, condensed the iron very little, and, the blows being "light but frequent," its force was expended in producing the very rapid molecular vibrations necessary in bringing it to the red heat which it acquired.

The human arm is incapable of striking very rapid blows, but if to the periphery of a wheel a series of small hammers be attached so that by the revolution of the wheel they will rapidly and in succession strike on a piece of iron it would probably produce a red heat much sooner than is possible by the hand alone. By greatly reducing the size of the hammers and increasing their number we would nearly approach what would seem to be the best mode of producing the desired result. Now let us look at the file, the saw, and the grindstone, and see if they do not furnish direct proof in support of theory.

What else than percussion would a piece of iron receive if pressed against the teeth of a revolving circular saw? Except the saw be put in too rapid motion the jumping of the iron from one tooth to the next would, in effect, be the same as so many distinct blows.

The same holds in relation to the grindstone. As it revolves hold one end of a nail against it, and it will soon, by leaping from one granule of the stone to another, acquire such an inconceivably rapid molecular vibratory motion as to become red hot. That a piece of iron under these conditions will soon become intensely hot is well known. The coarser the grit of the stone the more apparently is its action analogous to percussion.

These remarks lead us to see the close connection between friction and percussion—the one being insensibly graduated into the other; the difference is only in degree. Who can draw a line of separation? SPECTRUM.

Havana, N. Y.

The Gerner Boiler.

Messrs. Editors:—Permit us to correct an error in your statement, in your issue of October 9, respecting the amount of heating surface in the small Gerner boiler you tested at Paterson, N. J.

The boiler is 10 feet long, 2 feet front, and 3 feet rear diameter, giving a total heating surface of $83\frac{3}{10}$ square feet, instead of 144, as stated. The results obtained by you being over 15-horse power shows $5\frac{1}{4}$ square feet in these boilers to be sufficient to produce a horse power, and illustrates the efficiency of the heating surface. KASSON & Co.

New York city.

On the Flow of Elastic Fluids.

Messrs. Editors:—On pages 50 and 118, of the current volume of the Scientific American, are articles "On the Flow of Elastic Fluids through Orifices or Pipes." The theory of this subject which appears to be accepted by the writers of these articles, is the old theory, and the only one, so far as I know, that has as yet found its way into treatises on physics. It is, however, a theory which is widely at variance both with sound theoretical philosophy and with the results of experiment. It is, in fact, nothing more than the theory of inelastic and inexpansible fluids applied to those which are elastic and expansible; it being assumed that there is no difference between the two in respect to the law of their flow except what is due to the smaller ratio of weight to pressure in the elastic fluids.

The effect of the expansibility of elastic fluids is such as to take them entirely out of the law which governs the flow of those that are inelastic. It causes the flow into a vacuum in a given time to be only half as great as the old theory calls for; and this, not because the velocity of the flow is less than that theory assigns, but because the density of the flow is only half as great as the theory assumes it to be.

Another curious and important fact which results from the expansibility of a fluid, is that when it flows from one vessel into another containing fluid of less density, the fluid in the receiving vessel has no effect whatever to obstruct or retard the flow, unless its density exceeds half the density of that in the other vessel. In other words, steam at 20 pounds pressure in the cylinder, will discharge itself into the condenser already containing steam, of not exceeding 10 pounds, just as rapidly as into a perfect vacuum. The bearing of these facts on the question of the proper size for ports and pipes in steam engines will be readily seen.

It appears from the first clause of the article on page 50, that some of the readers of the SCIENTIFIC AMERICAN are seeking information on this subject. I would refer such to the *American Journal of Science*, 2d series, vol. 5, page 78, where they will find the true law of the flow of elastic fluids set forth and mathematically demonstrated, and to vol. 12, page 186 of the same journal, where they will find the same law completely confirmed by experiment.

New Haven, Conn. ELI W. BLAKE.

Business Correspondence.

MESSRS. MUNN & CO.:—I herewith acknowledge the receipt of the official notice allowing a patent for my Can Opener, and I deem it my duty to thank you for your prompt and able management of my case. This is the third patent which you have obtained for me this year.

I have received several circulars from various patent attorneys residing in Washington, who offer their services free of charge until a patent is obtained. But I assure you, gentlemen, that I would sooner pay you your charges in advance, and run the risk of losing the amount along with the first Government fees, than to trust such agents with any business of mine. Therefore I care not whether they are capable or honest so long as I am satisfied with your manner of doing business.

I will cordially recommend your Agency to such of my friends as may need the assistance of patent attorneys.

I am, sirs, very respectfully yours,

WM. M. BLEAKLEY.

Verplanck, N. Y., Sept. 29, 1869.

MESSRS. MUNN & CO.:—I have received the two patents, one on a Bolt Heading the other on a Hook-Bending Machine, which you have obtained for me. Allow me to express my appreciation of the able manner in which my specifications and claims have been prepared, and to thank you for having so speedily obtained favorable decisions from the Patent Office.

Any influence which I can have in this part of the country, I assure you will be in your favor. Truly yours,

D. G. MORRIS.

Catasauqua, Pa., Sept. 16, 1869.

MESSRS. MUNN & CO.:—I received the patent on the 17th and the copies on the 20th.

I am so well satisfied with the manner in which you prosecuted the application to a successful termination that I shall give all such business to you in the future, and will influence any person—needing the services of a trustworthy and intelligent attorney—among my acquaintances, to give their business into your hands. I am truly yours,

LEVI S. IVES.

Pittsburgh, Pa., Sept. 21, 1869.

MESSRS. MUNN & CO.:—We have received our patent, and are highly pleased with the way in which the business has done. The ability which carried it through, and the care bestowed on its preparation, are above praise, and we will gladly intrust to your hands any further business we may have to do. Very truly yours,

J. H. WILDASIN & J. A. PECK.

St. Charles, Iowa, Sept. 24, 1869.

[We are constantly receiving warm commendatory letters like the above, from our many clients. The Patent Soliciting Department of this Office is going on with marked success, and inventors who contemplate taking out patents for their improvements can always avail themselves of our advice and assistance on the most favorable terms.—EDS.

New Cornish Engine.

We learn from the *Press* (Philadelphia) that the Cornish engine just started to work at the Schuylkill Works differs from the ordinary Cornish engines in having the heavy lever beams placed down upon each side of the cylinder, with their bearings resting directly upon the bed-plate and stone foundation, instead of over the cylinder, in the usual manner.

By this plan much greater stability is secured, and expensive alterations and additions, which would have been necessary with the ordinary form of engine, were avoided.

The size of the steam cylinder is 72 inches diameter and ten feet stroke, and the pump plunger is 36 inches diameter and ten feet stroke. The beams weigh about 28,000 pounds each, and the load in the plunger is about 60,000 pounds. This machine is capable of raising 7,500,000 gallons of water per twenty-four hours.

The action of the engine is peculiar. The steam is admitted upon the top of the cylinder, and after the piston has passed through about one-third of its stroke, the steam is cut off, the rest of the stroke being made by the expansion of the steam in the cylinder. The plunger has now been raised to the top of its stroke; a valve is then opened allowing the steam on the top of the piston to pass to the underside of it, thus putting an equal pressure on both sides of it, and allowing the plunger and its weight to fall by its own gravity and thus force the water to the reservoir. It will be seen that this plunger must, therefore, be heavy enough to lift the load of water in the main, and also to overcome the friction of the water in the pump and pipes.

The engine was designed by the Chief Engineer of the Water Department, Frederick Graff. In order to be able to make the contractors for the building of the engine (Messrs. Merrick & Sons) entirely liable, they were intrusted with the design for the details of parts, and are by their contract held responsible for the strength and proportions of these details. The engine is a splendid specimen of massive machinery, and reflects great credit upon Mr. Graff and Messrs. Merrick & Sons. The water is forced into the stand-pipe at the works, and thence through a main 36 inches in diameter and 312 feet long to the reservoir.

The engine is at present worked by the old boilers. The appropriation for the new set of boilers intended for her was delayed more than eight months by the refusal of the Democratic members of Select Council to vote for the loan asked for their erection. They are now in place at the works, and will be put into use in a few weeks.

(For the Scientific American.)

DETERMINATION OF THE AMOUNT OF EXPANSION OF MINERAL OILS.

BY PROF. VANDER WEYDE.

In order to remove all doubts concerning the amount of expansion of petroleum, to prove that it does not expand more than whisky, and less than alcohol and most of the acids and oils, as stated in my communication to the SCIENTIFIC AMERICAN, page 38, current volume—I give here some of the data on which my statement was founded; and will exhibit only a few of a great number of determinations which I have made to settle this question, selecting those which recommend themselves by simplicity, because of the round numbers obtained

First Method by Means of the Specific Gravity Bottle.

A small bottle, with ground-glass stopper, made so as to contain, when entirely full, exactly 50 grammes of pure distilled water at 65° Fah., was filled with heavy kerosene, the product of the last stages of distillation, marking 30° on Baumé's hygrometer; it contained at 32° Fah. exactly 44 grammes of the oil. When heated to 212°, a certain quantity of oil did overflow, and after cleaning and cooling [the weight of a hot object cannot accurately be determined on a sensitive balance, because of the air currents generated; this as a hint to young chemists] it was found to contain 41·15 grammes, proving an expansion of 2·85 grammes, or 6·5 per cent of the whole. As, however, the glass of the vessel expands, according to Regnault one 290th of its volume, this fraction of the 44 grammes has to be added for correction; it is nearly 0·15 grammes, which makes the expansion of the oil from 32° to 212° Fah., equal to 2·85 + 0·15, or 3 grammes, which is one 14·7th part of 44 grammes, and an expansion of 6·8 per cent., or 0·068. Other determinations with the same oil gave sometimes 0·069, 0·070, and 0·071.

Common kerosene of 49° Baumé was placed in the specific gravity bottle, and one of the samples gave, at 65°, exactly 40 grammes; heated to 125° it gave, after correction for glass expansion, 1 gramme less, being 0·025 for 60°, consequently 0·075 for 180°. When cooled to 35° it gave a contraction in bulk of 0·048 gramme, or 0·012th part of 40 grammes, corresponding to an expansion of 0·012 for 30°, or 0·072 for 180°. When heated from 120° to 180°, the expansion was found to give a co-efficient of nearly 0·079.

On these facts I founded my statement referred to, that the rate of expansion is less between 32° and 60°, and more at about 180° than the mean expansion, which is 0·076.

Light gasoline of about 90 Baumé was experimented upon, one sample gave for contents of spec. gr. bottle at 30° Fah., 32·43 grammes, and at 60° exactly 32 grammes. This gave an expansion of 0·43 grammes for 30° Fah. of heat, or one 74th part of the whole, which would give for 180° a little more than one twelfth, or 0·083—a rate of expansion only slightly larger than ether and turpentine, equal to most animal oils, but considerably smaller than alcohol, nitric acid, olive, and linseed oil.

In crude petroleum the expansion was found always between 7 and 8 per cent, and in proportion as they were heavy or light, it was nearer to the first or to the second of these numbers.

Second Method by Means of the Hydrometer.

When placing a thermometer and hydrometer in kerosene of 40° Baumé, at 65° Fah. temperature, and heating it to 125°, the hydrometer will sink and indicate 46°; as now 40° Baumé corresponds with a specific gravity of 0·83, and 46° Baumé with 0·819, it indicates an expansion of 0·83—0·819, or 0·021, which is the 40th or 0·025th part of 0·83, this amount for 60° gives 0·075 per 180°, the same as found above.

It will be found, in general, that for every ten degrees increase of the thermometer the hydrometer sinks one degree lower, and *vice versa*. For the lighter oils, a little above nine degrees Fah. will correspond with one degree difference in the hydrometer, and for the heavier oils 10·5° to 11° Fah. of heat will be required to make this difference, but in general ten degrees heat for one degree gravity is near enough for practical purposes; and, in fact, this is so well known that it is depended upon by experts as a necessary correction in determining the quality of different grades of oil. As 50° and 60° Baumé, respectively, correspond with a specific gravity of 0·785 and 0·709, the difference of these last numbers, 0·076, correspond with 18° of Baumé's scale, which, again, correspond with the expansion for 180° heat. Every degree of Baumé's scale corresponds thus with 0·076 divided by 18, or 0·00042, nearly, for the corresponding difference in specific gravity.

Third Method by Means of the Thermometer alone.

When taking a correctly graduated alcoholic thermometer, breaking the top open, heating the bulb so as completely to remove the alcohol, and then filling it with petroleum to such an extent as to make the freezing point of water 32° Fah. on the scale, to correspond with the surface of the petroleum in the tube when cooled to 32°, then placing this thermometer in hot water of 122°, as indicated by another thermometer, then the petroleum thermometer will only indicate about 100° on the scale; as the scale was constructed for the alcohol, its degrees are as much too large for the petroleum degrees as the expansion of alcohol exceeds that of petroleum; in this case it is found that 122—32 or 90 parts of alcohol correspond with 100—32 or 68 parts of petroleum; these numbers—90 and 68—are nearly in the same ratio as 0·100 and 0·076, the numbers expressing the ratio of expansion of alcohol and petroleum—another verification of the statements in the table published on page 38, already referred to.

When we consider the simplicity and reliability of all these methods, by which the rate of this expansion may be determined, and the perfectly accurate manner in which they corroborate one another, it is indeed surprising that M. Deville, before the French Academy, dwells so largely on the "very great expansion in bulk which mineral oils undergo by increase of temperature," and that when "barreled during the cold season it will expand largely with the first appearance of hot weather, and burst the vessels, on the same principle that ice ruptures our hydrants." [See SCIENTIFIC AMERICAN, page 376). That M. Deville does not communicate the ratio of this, according to him, so extraordinary expansion, is not truly scientific, and makes his whole statement unreliable.

I adhere to my opinion expressed before, that the cause of leakage of petroleum barrels by heat, is the elongation of the iron of which the hoops are made, which makes the staves loose; besides this, the staves will contract from the same cause, which increases the leakage; add to this the extreme penetrating power and volatility of the lighter portions, chymogene, gasoline, etc., which is so largely increased by any rise in temperature, and we have a perfectly satisfactory explanation of the increase of danger in hot weather.

Why Coffee is a Stimulant.

The changes which heat effects in the elements contained in the green coffee berry have been little studied; we merely know, from the researches of MM. Baitron and Fremy, on the one hand, and of M. Payen on the other, that the brown bitter substance and the aromatic principle are produced by the decomposition of that part of the coffee bean which is soluble in water, and that a large part of the caffeine disappears during the roasting. It is said that this (caffeine) is carried away with the volatile products generated in the operation.

By roasting coffee in an apparatus which allows of the recovery of all the volatile products, I have ascertained that if caffeine be carried away with the volatile products, it can only be in such small quantity as is not appreciable by weight, and cannot explain the considerable loss which takes place during roasting carefully performed. The loss is experimentally found to equal nearly one-half of the caffeine originally existing in the coffee. I have succeeded in demonstrating that the lost caffeine has been transformed into a volatile base—methylamine, or methylammonia (C_1H_5N), which was discovered by M. Wurtz. The following are the facts which prove the change of caffeine into methylamine during coffee-roasting:

If pure caffeine be submitted to the action of heat, and the vapor be carried through a tube heated to about 300° Cent. (about the heat which is necessary for roasting), and filled with fragments of pumice-stone, which delay the passage of the vaporized matters, only a feeble decomposition occurs; the greater part remains unchanged, and the little that is decomposed gives no characteristic product except cyanogen. This experiment tends to prove that it is not the caffeine which furnishes the volatile alkaloid existing in roasted coffee. But a very different result is obtained if, instead of acting on free caffeine, we experiment on caffeine in analogous circumstances to those in which it exists in green coffee. M. Payen has, in fact, shown that caffeine exists in that berry in the form of the *tannate, i. e.*, a combination of caffeine with a tannin peculiar to coffee. On submitting to the action of heat the tannate of caffeine which has been prepared with tannin of gall-nuts, we obtain, as with green coffee, methylamine: this compound behaves, under the influence of a temperature of about 300° Cent., in a manner similar to the tannate of caffeine first isolated by M. Payen. The whole of the methylamine produced during the roasting of coffee is not found in the solid residue; a certain proportion escapes with the volatile matters. It is easy to extract the alkaloid from roasted coffee by distilling the extract of coffee, made with cold water, with a weak base, such as lime. The addition of this alkali to an infusion of coffee immediately liberates the methylamine, the special ammoniacal odor of which is readily perceptible.—*M. Personne.*

Advertising Made Easy.

At a recent meeting of the "Society of Practical Engineers," one of the Society's M. D.'s read an elaborate paper on water meters, and closed with an eloquent description of a meter which the speaker had himself invented. He believed that he had made the most accurate, the most simple, the most durable, and the cheapest water meter in the world and he invited for it the closest scrutiny and investigation of all concerned. This apparatus, he said, could be furnished at two dollars apiece.

This is certainly cheap enough; we had no idea that an accurate, simple, durable water meter could be had for so small a sum of money. Besides, we are pleased to notice the liberal conduct of the learned society, in permitting the discoverer to eulogize the merits of the meter in the proceedings of the evening. The Secretary of the Society will please send us its advertising terms.

THE Snorer's Companion is the name of a newly patented device to be attached to the backs of church pews, forming a comfortable head rest, and enabling the owner to sleep through the dullest sermon with the greatest satisfaction.

DEMUTH'S IMPROVEMENT IN GLASS WINDOW LIGHTS.

This invention is one of the simplest character, and can be described in very few words; notwithstanding which fact it possesses several important advantages which the practical mind will at once recognize.

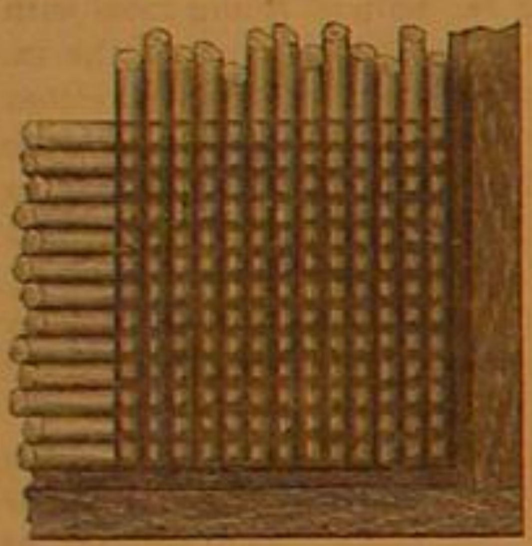
In place of figured, ground, or stained glass used for transmitting light without permitting objects to be viewed through them, for office windows, screens, signs, etc., the inventor employs a series of glass rods cut to the proper length and placed side by side in grooves cut in the frame or sash, as shown in Fig. 1; or two or more series of glass rods placed across each other at right angles, as shown in Fig. 2, or at any other angle desired to produce a given effect.

Fig. 1.

The light, in passing through these rods, becomes broken up so as to cut off vision through them, at the same time that the illuminating power of the light transmitted is not materially impaired when plain white glass is employed.

The advantages claimed for this method of using glass in window lights, screens, etc., are, that a much cheaper light can be made in this manner than by grinding, etching, or staining glass; that in case of breakage only the broken rods need be removed and their places supplied with new rods at a comparatively small cost; while, by using rods of various colors, in a single or crossed series, as shown in the engraving, very striking and showy effects can be produced by the transmitted and refracted light through such a series; the combinations of color being practically without limit.

Fig. 2.



This invention was patented through the Scientific American Patent Agency, by William A. Demuth, September 22, 1868. The agent for all sales is Victor E. Mauger, 110 Reade street, New York, who may be addressed for further information.

THE DRIVE WELL.

A recent number of the *Country Gentleman* contains an interesting communication from Dr. S. J. Parker, an old resident of Tompkins County, New York, showing conclusively that the drive well is an old invention, and was in actual use at Syracuse, New York, between 1840 and 1847. Dr. Parker says:

A piece of cast iron about six feet long, both with and without side holes, was made, and a hole four to six inches in diameter in the center. This cast iron point was fastened to a wooden log ten or more feet long, and pressed down in the mud near the lake. Then to this log, joining like the common aqueduct log, everywhere in use, the second log was secured, and so on a third and fourth and more logs, as one after the other they were sunk to the salt water. A shed with earth and stones to weight the part of the logs and of the ground so as to sink the log tube was used. Here is truly, in 1840 to 1847, the American driven well, for it had a point, a tube sunk without the removal of the earth upwards, holes near the point, and what is singular the tube itself was used as the pipe of the pump, for the line of logs, nearly or quite a quarter of a mile long to the Salina pump-house, was attached to the top of the tube, and drew the water that distance; that is, drew the water up one hundred and sixty or eighty feet, thence along the level many rods to the pump-house, and up to the great cylinder worked by the canal water wheel, and forced it, a boiling stream, to the top of the tanks; whence a similar line of logs conveyed it to the fires that boiled the water. There were wells over twenty years ago, seen by tens of thousands of our citizens, with every principle or device of the American driven well that inventive skill can name. The substitution of one material, gas-pipe, for log-pipe, is not invention but the choice of a mechanic, artist, or engineer.

In some cases a wooden plug was driven in the cast iron pipe, which weighed several hundred pounds, and the well sunk to near the salt water by the pressure of the stones that lay near by—the tube being dry and clear over 100 or 150 feet, when a heavy bar on the end of a rope was let down and the plug driven out. The tube was thus cleared at the point after being sunk.

In 1860, Dr. Parker had occasion to drive a tube well for his own use, and employed for this purpose two old locomotive flues, which he had welded together, making a pipe 16 feet long. This he pointed with a block of wood, drove it down with an axe, then with an iron rod pushed out the wooden point, and thus in an hour's time, at a cost of only $2·50 he had a good well, which has been in operation ever since. The Doctor was advised to apply for a patent, but as he had only copied the plans which he saw used several years previous, he felt that he could not conscientiously take the oath of invention. Other parties saw the pump at the time the Doctor started it, and since that time several patents have been granted for improvements. It remains to be seen whether the original patentees of the drive well can sustain their broad claims in view of the facts above presented.

ANDREWS' PATENT SAW HANGINGS AND SAWS.

The improvements to which the attention of our readers is invited in this article, and which are illustrated in the accompanying engravings, are, in our opinion, the most important recently made in methods for hanging mill saws. These improvements, however, not only include the hanging of the saw, but an inspection of the engravings will show an important change in the saw itself.

Fig. 1

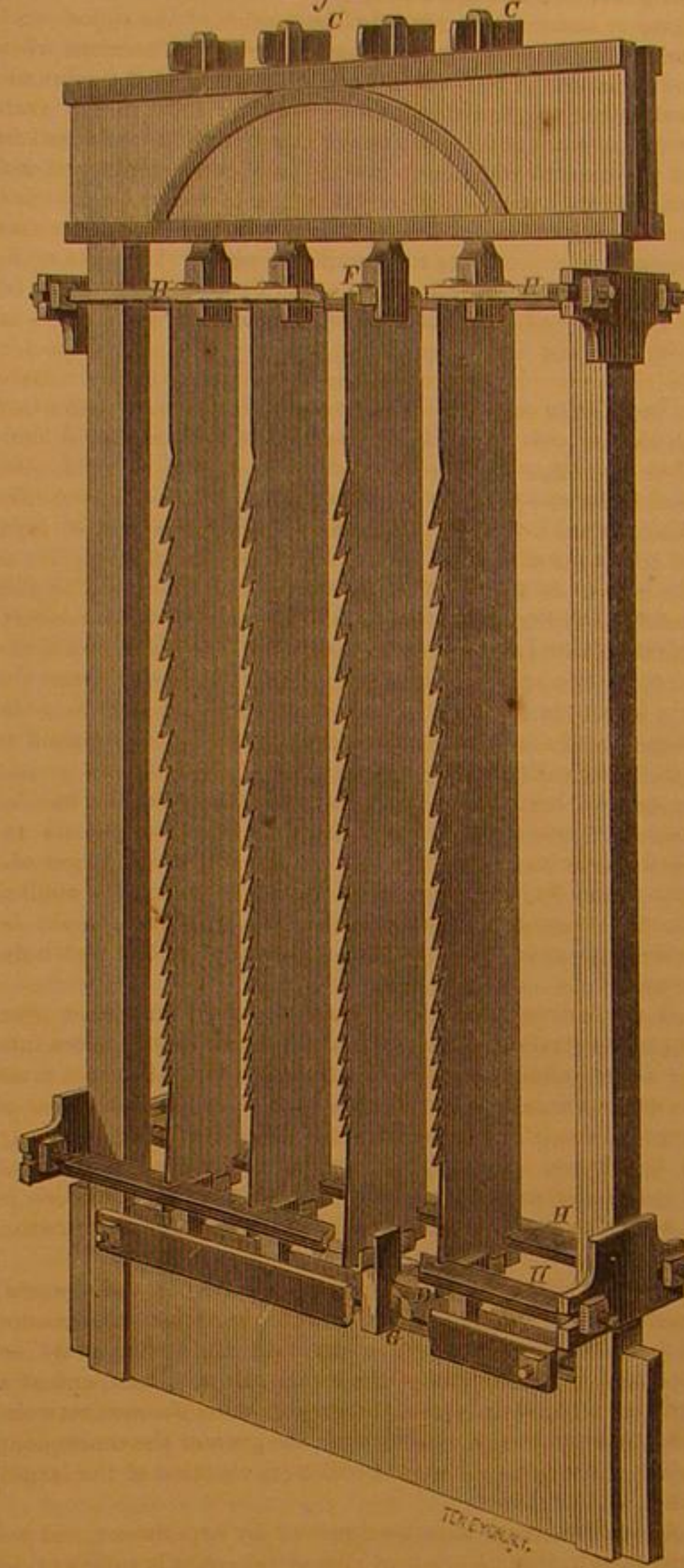


Fig. 2

Fig. 5

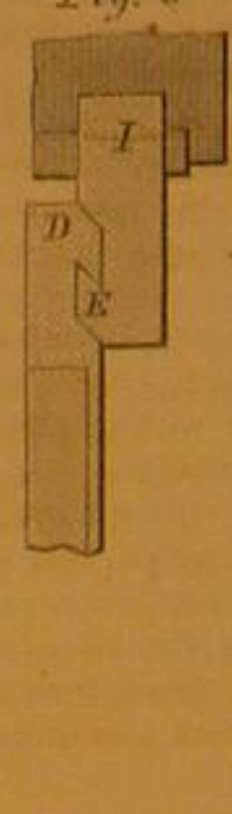
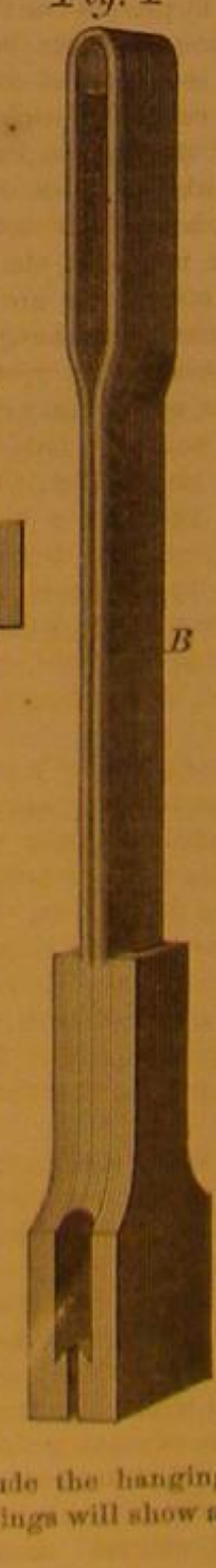


Fig. 3

Fig. 4



The objects sought in these improvements are five; namely, to do away entirely with punching or drilling saws at the mill; to allow the strain to be placed at any desired part, and to be gradually changed as the saw wears away; to enable the sawyer to adjust the "rake" of the saw, or, as it is commonly styled, the "overhang," in a very short time; to permit the employment of thinner saws and thus reduce waste in the kerf; and, finally, to obviate the objections against the exclusive use of fine teeth, or of coarse teeth, on such saws, by a compromise between them; the teeth at the upper part of the saw being coarse and gradually becoming finer toward the bottom.

We shall treat the means by which these objects are attained in the order of their statement; but we ought, perhaps, to state first that they are the result of long experience in the cutting of lumber, and that an intelligent analysis of first principles has been brought to the aid of experience in bringing them to their present state of perfection.

The punching of the saw at the mill is avoided by placing over the end of the saw a piece of metal, the form of which is shown in Fig. 2, drilled and permanently riveted to the saw.

Upon this piece of metal is slipped the hook shown in Fig. 3, the slot, A, of this hook being made to admit and fit closely the metallic piece shown in Fig. 2, and a short portion of the saw blade below it. The bearing at the upper part of the slot, A, is curved, as shown at the dotted line, I, Fig. 5, to permit parallel strain in adjusting the overhang. Fig. 3, however, is the hook used at the bottom of the saw, while Fig. 4 represents the application of the same method to the upper end of the saw blade; the shank, B, of the stirrup passing through the upper girt of the saw gate, and being keyed up in the usual manner, as shown at C, Fig. 1. A metallic plate, D, bolted to the lower girt, Figs. 1 and 5, and grooved to fit the hook, as shown in section at Fig. 5, forms the means for making the attachment of the saw at the lower end. These attachments are shown at F and G, Fig. 1, parts being broken away for the purpose. This engraving gives a good representation of a gang of saws mounted in the manner described.

It will now be seen that any desired rake, or overhang, may be given to the saw, and that the strain can be placed at any desired part by simply tapping loose the keys, C, and sliding the blade in the slots A of the hook, Fig. 3, or the stirrup, Fig. 4.

These advantages lead naturally to the securing of the fourth object above enumerated; namely, the employment of thinner saws than could otherwise be used, as the strain may be adjusted in a line parallel and very near to the teeth. The distance between the saws is regulated by the bars, H, having slots sawed on their inner edges to fit the thickness of the blades.

The manner in which the fifth object sought is attained has already been stated in general terms; but as this involves a new principle in the construction of mill saws some further explanation is needful.

It is well known that hand rip saws are made with coarser teeth at the heel than at the point, or so that fine teeth commence and coarse teeth finish the cut. Fine teeth cut at the outset much more smoothly than coarse ones, but as soon as they become clogged with sawdust they lose their efficiency to a great degree. As this partial clogging becomes most troublesome at the latter end of the stroke, the arrangement adopted in these improvements brings the larger teeth into play just where they are needed, and obviates the rank tearing of coarse teeth at the commencement of the cut, and reduces the amount of splintering at the bottom of the kerf. Thus a much smoother action and better work are obtained.

These improvements have secured the warmest approval from some of the most extensive lumber manufacturers in the United States. Among these we may mention Benjamin W. Thompson, superintendent of the celebrated Dodge Mills, Williamsport, Pa., and J. G. Marvin, foreman of the same, who state that they should be very unwilling to dispense with their use. Numerous other testimonials from prominent men in the lumber trade, have also been shown us, which leave no room for doubt as to the value of the improvements.

It is almost unnecessary to mention that these improvements may be adapted to double hook gates as well as to single hooked ones, or that the attachment shown in Fig. 2, when clasped and riveted to the saw, must greatly strengthen the plate. They are also equally applicable to muley saws.

A patent for the improvements in saw hangings was obtained April 21, 1868, one on the improved construction of the mill saw, December 29, 1868, and on the strap or tab, June 1, 1869, by E. Andrews, of Williamsport, Pa., who may be addressed for further information.

S. H. K., of Ky., sends us a sample of eggs of the Rear Horse, and says, "In your current volume, page 181, I notice a cut and concise history of the Rear Horse. They have been known to me by the name of 'Devil Horse.' I have always been afraid of them, not because they ever did me any harm, but because they looked as if they might if they had a chance, and I have always killed them. The mother of this bundle of eggs, I suppose I killed only a few days before I received your statement about them. It is a source of relief to me to know that they are harmless, as I frequently meet them.

DYNAMITE.—A correspondent writing from St. Louis, says, "Will you please, in your paper, inform venders of "Dynamite" that a subscriber thinks if they would advertise with you, they would increase their sales?"

Scientific American,

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NEW YORK, SATURDAY, OCTOBER 16, 1869.

Contents:

(Illustrated articles are marked with an asterisk.)

THE HYDROSTATIC PARADOX.

Such has been the term applied to the enunciation of the truth, that any column of water, however small, may be made to raise any weight, however large, experimentally shown in the familiar piece of apparatus known as the water bellows. This proposition is theoretically correct, although there are practical limits to its application. Why it should be considered paradoxical, however, any more than the action of a lever, has always been a puzzle to us. Theoretically, it is just as true of the lever, that any weight, however small, may be made by its means to raise any weight, however large, as of the water bellows, or the hydrostatic press.

In either case, on the principle of "virtual velocities," the weight of the body which raises, multiplied into the distance it moves, will always equal the weight of the body raised multiplied into the distance it moves, friction being supposed to be nothing. And, practically, in all cases, the weight which raises must be enough heavier than would be found by this equation, to overcome the friction of the apparatus, whether bellows or lever.

Some of our correspondents are puzzling their heads over the theory of hydrostatic pressure as applied to the press of Brahma, and we are in receipt of not less than a dozen inquiries in regard to this subject. We will endeavor to answer these inquiries definitely in this article. The subject only becomes obscure, when we attempt to get back of nature's laws, to find out *why* things are as they are. We shall confine ourselves to the simple question of *how* they are. The equilibrium of fluids was ascribed by Pascal to the principle of virtual velocities above mentioned. This principle or law of nature has been thus enunciated: "Forces in equilibrium must be to each other as their velocities." It may be added, that when any two forces are so related to each other that the motion which each tends to produce is in an opposite direction to that of the other, and so that the distances through which each would move, if an additional force were made to aid either, would be inversely as the forces themselves, then unless an additional force be made to aid one or the other of the two forces thus related, neither will produce motion.

An example of two forces thus related would be two springs, one having a strength equal to the support of two pounds, the other a strength equal to the support of four pounds, attached to fixed supports, and acting upon the ends of a lever six feet long, resting upon a fulcrum placed two feet from one end and four feet from the other—the two-pound spring acting upon the longer arm, and the four-pound spring upon the shorter. In this case, no motion would take place unless one of the springs were assisted by an additional force. The two forces would be in equilibrium.

Now, when a small column of water supports a larger column, their weights are two forces, exactly so related. Neither column can descend without the other ascends, *i.e.*, moves in an opposite direction, and the distances through which the columns would move would be inversely, as their weights. That either may move, an additional force must be applied to at least one of them, which will cause a motion in both. But an infinitesimal additional force applied to one column would be sufficient to destroy the equilibrium, unless some resistance or counteracting force should immediately impede the motion of the other column. Moreover, the properties of fluids are such, that the weights of any two columns of fluids, connected at their bases by a fluid medium, invariably sustain the relation we have described, unless some other force acts upon one or both columns.

It is unnecessary for our present purpose to complicate the question by a consideration of columns of unequal diameters in different parts, the columns here spoken of being those of uniform diameter throughout.

Further, although this law of virtual velocities has been the subject of many explanatory efforts, we know no more about it to-day than we do about the nature of gravity. All we can do is to recognize its existence as we do that of gravity, all else must be merely fruitless speculation.

The hydrostatic press of Brahma, applies an additional force to one of two fluid columns in equilibrium, to not only destroy the equilibrium, but, also, to overcome a counteracting force or resistance opposed to the motion of the opposite column. We have said the two forces in two such columns when no additional force is applied, are the weights of the columns; but as the weights of the columns are to each other as their sectional areas, these areas may be used as the representatives of the two forces, and it will be more convenient to so consider them. But as these areas, when geometrically similar, are to each other as the squares of their diameters, we may operate still more conveniently by making these the representatives of the two forces.

Let the small column of a hydrostatic press be one inch in diameter, and the large column be two inches in diameter. When these columns are in equilibrium, the weights will be to each other as their sectional areas, which are to each other as the squares of their diameters, or as one is to four. Here we have a force of one balancing a force of four, simply because they are so related, that if motion should take place by the action of an additional force on either column, one must move in an opposite direction four times as far as the other. It follows that, as the motion produced by this force must be transmitted through the fluid medium connecting the two columns at their bases, and as this medium is the condition which establishes the peculiar relation between the two forces, the ratio between the force applied and the resistance it will overcome must be exactly the same as existed at first between the two columns, so that if a force of six pounds be applied through a piston resting on the top of the smaller column, it will balance a weight of twenty-four pounds applied through a piston resting on the top of the larger column; and any less force than twenty-four pounds, applied through a piston, to the top of the larger column, would be raised one inch for every four inches the smaller piston descends.

It also follows, that the quantity of fluid displaced from under the smaller piston is exactly equal to that injected into the larger cylinder, and that the stroke of the small piston must always be through a greater distance than the movement of larger piston in the same time, the distances being inversely as the forces. The principle which underlies the action of of this machine, namely, the principle of virtual velocities, is as immutable and as inscrutable as the existence of matter and force.

We have here, also, a reason why great hydrostatic power, generated by a small column of water in such a press cannot be made to generate a motion any more rapid than could be produced by the motion of the small column itself, and as a further and final deduction, the greater the difference between the diameters of the pistons, and the greater the consequent power of the press, the slower will be the motion of the larger piston.

All of these facts have been proved by experiment, and we have shown that the law of virtual velocities is sufficient to account for them.

THE WANDERING OF PHOSPHORUS IN PLANTS.

Phosphorus, long known as a chemical rarity costlier than gold, but at present one of the most extensively used of chemicals, is prepared from bones. However, bones can only be règarded as organs of collection, as originally it is derived from the earth. Phosphorus is not found in a native or uncombined state, since its affinity for oxygen is very great. United with this latter element it mostly forms phosphoric acid, which again is met with in union with such bases as soda, lime, magnesia, etc.

These compounds are termed phosphates, and are widely distributed over the globe, although they rarely occur in large masses on one spot. They occur in the soil—in most limestones, and in many clays and marls—which fact accounts for their value as fertilizers. Nearly all iron ores contain traces of phosphates; these are reduced in the process of smelting, phosphorus being set free; hence its presence in cast iron, wrought iron, and steel. The excellent Russian iron from the furnaces of Prince Demidoff, near Nischnetagilsk, according to Schafhäutl, owes its qualities to a trace of phosphorus. Still, this admixture is not always desirable, since, if exceeding certain limits, it makes the iron cold-short.

Phosphorus is also a component part of our own body; it exists there not only as phosphoric acid, but also in a de-oxidized condition united with organic substances; as, for instance, in the fatty matters of the brain, whence the well-known sentence of Moleschott, "No thought without phosphorus!"—a sentence, it may be stated, that has been the subject of considerable abuse. However, it is not only in the brain that phosphorus is met with, for, according to Ronalds, a part of the phosphorus of the urine, from which this element had first been separated, occurs also united with an organic compound.

How does the phosphorus pass into the human body? Through plants especially. To them the part has been assigned to withdraw it from the soil and to prepare it for the food of man. Before phosphorus was known to exist in the animal kingdom, its presence in plants had been considered as an acknowledged fact; indeed, phosphorus was found in them before it had been ascertained in the urine of man. The number of vegetables greatly increased in which the element in question was met with; it remained unknown for a long time that it had to be ranked among their constituent parts, and even when this could no longer be doubted, its origin remained an enigma. Although Fownes had already stated that many volcanic minerals contained phosphorus, this assertion was not regarded as true. To modern times it was reserved to throw light upon this subject. In the molybdate of ammonia, chemistry now possesses an exceedingly sensitive reagent for phosphoric acid, which is so very important for the growth of plants. It has been ascertained by Forchhammer that a soil in which phosphoric acid can scarcely be detected, contains of this material not less than 790 pounds per acre, to a depth of one foot. Is it therefore surprising that phosphates occur so frequently in mineral springs and rivers? It seems that the phosphates in plants serve especially for the formation of the albuminous bodies, that are so all-important for the building up of the human framework. With regard to the wandering of phosphorus in plants, we present the following interesting facts of Corenwinder:

Young plants always yield ashes rich in phosphorus. However, after the maturity of the seeds or fruits (for which phosphoric acid is especially needed), the stems and leaves are found to contain only traces of this acid; and when all the seeds have reached perfect maturity, the stems, leaves, and roots are generally devoid of phosphorus. This element appears to occur in an intimate combination with the albuminous principles of vegetables. Indeed, if these are dissolved with water or other liquid, the phosphates pass also into solution, while they become insoluble, when the albuminates are coagulated by boiling water. The vegetable organs which lack phosphorus, seem also to be free of albuminous substances, at least not a trace of phosphates could be met with in the woody pericarp of certain fruits, as in the almonds and hazelnuts, the ashes of which yield principally silica and lime.

The exudates of plants generally contain no phosphoric acid; at least such is the case with manna and gum-arabic. It is known that in exhausting the pulp of young roots with water, fibrin is obtained, which contains pectose and the incrusting substances. It follows, therefore, that the skeleton of vegetables owes its solidity not to the phosphates, as is the case with that of the animals. The leaves that remain in the forests during winter yield ashes rich in iron, silica, and lime, but free of phosphorus. It is also worthy of note that, although analysis has as yet failed to discover phosphates in the sea, the maritime plants contain considerable quantities of this substance.

Corenwinder, at least, has searched in vain for phosphoric acid in the water of the North Sea, as well as in the boiler sediments of vessels crossing the ocean. The pollards of flowers and the spores of cryptogams are rich in acid of phosphorus; this being especially the case with the pollards of *Lilium candidum*. It is remarkable that the ashes of pollards and those of the semen of animals are nearly alike in their component parts, they being both rich in phosphoric acid!

From all we know, it is certain that the presence of phosphates in plants is necessary to the formation of the organic substances in question. For agriculture it would be highly important to know whether there exists a relation between the quantities of the phosphates and those of the albumenoids, but unfortunately very little is known about this subject, and it will demand manifold and extensive researches before satisfactory information will be obtained. But such researches are very desirable, for it should be the duty of agriculturists to look rather to the production of highly albuminous matters, than to endeavor to bring certain organs of plants to a high state of development without regard to their nutritive value.

THE EXHIBITION OF THE AMERICAN INSTITUTE.

A writer in the New York *Tribune* has given expression to singular views in regard to the character of American inventors. He says that "with some notable exceptions, they have exhibited their powers of invention with reference to secondary rather to general principles; more by using the discoveries of other people than their own." "Of course," he continues, "we shall be told that there are but few general principles, while the details may be considered as infinite, and we shall be reminded, too, that upon Dr. Franklin's discoveries in electricity almost a whole science has been founded—that steamboat navigation, the use of ether in surgery, the mowing machine, are ours, and the power-printing press, the telegraph, and the sewing machine, were all conceived beneath the skies of this new world. We grant that these, and others which could be named, are proud achievements, and their application to so many of the wants of daily life gives them especial prominence; still, we ought to consider that, in compass, acuteness, and perseverance, the English mind is unexcelled, for to it we owe the discovery of the use of steam, the invention of the steam engine, of the power loom, of the spinning jenny, and of the locomotive and railway, all of which required the application of grand principles, and they are of such immense utility that they have an influence upon almost every being on the face of the globe. However, the art of printing from movable types clearly was a necessary preliminary, and it would seem that the German nation was not to be deprived of some share in the great work of modern progress."

The writer of this paragraph has evidently not comprehended the distinction between invention and discovery. Invention is the application of general principles to the construction of new machinery or the development of new processes. Discovery has nothing in common with it. The former either discards experiment, or uses it only to verify the truth of previous conceptions arrived at by a process of pure reasoning. The latter progresses only through experiment—theory only pointing out probable paths of discovery in which to conduct experimental research.

The inventions alluded to by this writer were all, in this regard, secondary, or based upon general principles previously discovered.

While we grant to England a large share of honor, both for discovery and invention, we not only accord to Germany and France equal shares of honor in the development of general principles, upon which England and America have based their inventions, but we unhesitatingly assert that, when the age of these nations is taken into account, America has led them all, both in discovery and invention.

The length of this article will forbid entering upon an argument to prove the truth of this claim, but we shall not hesitate to take up the gauntlet in its defense at a future time should it meet with denial.

Ample illustration of the originality and comprehensive character of American inventive genius may be found in the

MACHINERY DEPARTMENT

of the American Institute Exhibition, to which, after two weeks' enforced delay, we now invite the attention of our readers. Much of the delay was caused by the tardiness of exhibitors, and also to the fact that the unexpected magnitude of the display in this department took the managers by surprise. Preparations to transfer a portion of the machinery to the main floor were necessitated; the structure specially erected for this purpose proving too small to place all who desired room. This compelled extension and modification of the original plan, the erection of new lines of shafting, etc.; but at last all these obstacles are surmounted, and every machine, we believe, which demanded power has been or will be accommodated.

THE BOILERS

which supply the main driving engines with steam are three, known as the Root, the Harrison, and Salisbury boilers. The former is made and exhibited by the Root Steam Engine Co. of New York. It was illustrated and described on page 273, Vol. XX., of the SCIENTIFIC AMERICAN, to which the reader is referred. The Harrison boiler is of peculiar construction, being composed of hollow cast-iron globes or shells communicating with each other in all directions, by short tubes, so as to permit of a free circulation, around and between these globes and tubes the heated gases of combustion play. Immense heating surface is secured in this way, while each of the globes may be considered as a separate small boiler, having only the same liability to explode that would attend an isolated boiler of the same size and construction. There can be no doubt that these boilers will endure, with safety, enormous pressures, and their steam-generating power is said to be highly satisfactory. This boiler is made and exhibited by Joseph Harrison, of the Harrison Boiler Works, Philadelphia.

The Harrison boiler has attached to it Berryman's Patent

LOW-WATER ALARM,

constructed on a novel principle, and evidently a very sensitive instrument. It consists of a globe and steelyard, with counterpoise. When the water is at the proper hight the globe stands full of water, and its weight counterbalances the weight on the steelyard. As soon as the water falls too low, steam immediately replaces the water in the globe, and the counterpoise falls a short distance, opening a whistle valve, which gives an alarm. The same instrument might easily be adapted to control the feeding of a boiler by means that will readily suggest themselves to engineers.

The Salisbury boiler is a new claimant for public favor, and we hear it spoken well of. We are, however, unable to give details of its construction. At the present writing it had not yet been used to supply steam to any of the engines, though we were informed that Rider's engine mentioned below would be driven by it.

These boilers are placed outside the main building under an open shed, the managers not permitting any fires on the floor of the building in which the exhibition is held. In this shed are also placed some of the engines exhibited, which we will notice in passing.

Adjacent to the Root boiler stands the Roper

IMPROVED CALORIC ENGINE,

Illustrated and described on page 257, Vol. XX., of this journal, to which we refer the reader. We have no doubt that this engine deserves to rank among the best of its class now in market, and as a small, portable, safe motor, it may be advantageously applied where steam is out of the question.

Here stands, also, the portable engine invented by William Baxter, of Newark, N. J., illustrated and described on page 353, Vol. XX., of this journal. It is quite evident from the interest taken in this engine by engineering visitors to the Fair, and the warm encomiums bestowed upon it, that this engine is to occupy a prominent place among improvements of a similar character in this country. The engine is placed disadvantageously on account of the conditions of the lease above specified, but notwithstanding this drawback it will make its mark. It consumes the smoke so thoroughly, and employs such a small quantity of steam, that notwithstanding the exhaust enters the smoke-pipe, no sign of either smoke or steam can be seen issuing from the end of the smoke-pipe. It is driving two blowers, requiring four-horse power, as tested by Neer's dynamometer, and does this work with a surprising economy of fuel. These blowers will be more particularly noticed in a subsequent article, together with others on exhibition. On the

MAIN FLOOR

of this department are placed a number of large horizontal engines, which are well finished, and the peculiarities of which are well known to engineers, we shall not, therefore, in our notice of these, enter much into details, but confine ourselves to such general remarks as suggested themselves to us in the brief time we could allot to each of them. The designs of these

STEAM ENGINES

show much taste and skill, and most of them are highly ornamented in their finish.

The Fishkill Landing Machine Works exhibit a thirty-horse horizontal engine having tapering, cylindrical, and, consequently, balanced valves, so adjusted that their wear can be taken up by a set screw. The ports in these valves are formed analogously to those of the gridiron slide valve. The movement of the valves is obtained by a system of plain and bevel gearing, the induction valves being actuated by a differential cam, which, through the action of the governor, gives the required cut-off. The exhaust valves are worked by a simple eccentric, driven by the same gearing which imparts motion to the differential cam.

The Novelty Iron Works horizontal engine, illustrated and described on page 161, current volume, of the SCIENTIFIC AMERICAN, will be exhibited although not yet in place.

A stationary engine of eighty-horse power made and exhibited by Babcock & Wilcox, of New York, is a good engine. The motions of the valves are shown through glass plates. The peculiar features of this engine were fully described and illustrated on page 257, Vol. XVII., of this journal, to which we refer the reader. The cut-off valves are actuated by the steam itself. The governor is of peculiar construction, by which all variation, consequent upon the movement of the balls in an arc of a circle, is obviated, these balls having a parallel motion instead of the ordinary one. The valves also have a constant travel under all circumstances by which many advantages are secured. Altogether this engine will repay careful examination from engineers visiting the department.

The Delamater Engine Co., of New York, exhibit a very handsomely designed horizontal engine of the Rider's Patent, and also an upright engine constructed on the same general principle. In this engine the cut-off valve ports are cut obliquely to the longitudinal axis of the main valve, on the back of which plays the cut-off valve. The cut-off valve face is convex, and the seat is turned out to the true arc of a circle. The form of the valve is triangular in plan, and the two oblique parts in the seat are placed relatively at the same angle as the corresponding sides of the valve. A partial rotation of this valve on its spindle, therefore, opens or covers these ports sooner or later in the stroke, and the motion which performs this partial rotation is derived from the governor. The cut-off may be made, therefore, at any point of the stroke desired, the parts employed to accomplish these results being very few and simple.

William A. Harris, of Providence, R. I., exhibits one of the celebrated Corliss engines of eighty-horse power. It would be entirely superfluous to dwell upon the construction of this engine, which is well known to engineers throughout the civilized world. There is no doubt in our minds that in economy, beauty of finish, and a happy combination of all the essentials to a perfect steam engine, it ranks among the first, not only in America but in the world. The reader will find some remarks upon this engine in the SCIENTIFIC AMERICAN for October 24, 1857, setting forth the advantages gained by the Corliss improvements; and during the twelve years which have succeeded the engine has had a history which its inventor may justly regard with pride.

The engines exhibited this year show that American engineers are giving most careful and earnest attention to economy in the production of steam power, and although the number shown is not large, it may safely be said that they represent all that is best in American steam engineering practice.

Charles E. Emery, General Superintendent of the Fair (partially known to our readers through a series of articles on "Modes of Testing the Power and Economy of Steam Engines," published in Vol. XIX. of the SCIENTIFIC AMERICAN), informs us that a competitive test of these engines will be made ere the close of the Exhibition. The judges have not, however, yet been appointed.

We also notice in this connection Tupper's

FURNACE GRATE BARS,

exhibited by L. B. Tupper, of New York, an illustrated description of which will be found on page 360, last volume of this journal to which the reader is referred. The bar is designed to secure the best draft, while its great depth enables it to conduct away the heat from the upper surface and prevent the grate from rapidly burning out. Ample provision is also made for expansion and contraction.

Another good thing appears to us to be the

FIRE-PROOF CEMENT,

exhibited by the inventor, Mr. Barnum, of Troy, N. Y., intended as a non-radiating covering for boilers, steam pipes, etc. It is much cheaper than felt, in our opinion more efficient, and is said to be more durable. We are informed that it has been adopted in the Bessemer Steel Works at Troy, and is giving good satisfaction.

One of the most important machines now running at the exhibition is

LYALL'S POSITIVE MOTION LOOM.

A description of this loom, published on page 17, current volume, of the SCIENTIFIC AMERICAN, with engravings showing its operation has been more extensively copied in American and foreign scientific and mechanical papers and periodicals than probably any article of a similar character ever published in this country. This is a sufficient evidence of the importance of the improvement, which we stated in that article, was consequent upon its radical character.

The statements we then made in regard to it have all been sustained in practice, insomuch that some would-be authorities on mechanical subjects who took exceptions to the radical character of the invention, and even its originality, have been compelled to acknowledge all the points claimed in our descriptive article. We do not hesitate to pronounce this loom the chief attraction of the Fair to the manufacturing public. There are two on exhibition, one of which is running on dress silk and the other is weaving drugget six and a quarter yards in width. The operator of the drugget loom is a young girl, who is able to manage it with perfect ease, and can control its speed at will, the character of the work being the same no matter how low the speed may, within any reasonable limit, be carried. This is the only loom in the world which can weave goods of any required width.

Any one examining the beautiful silk texture, in the smaller loom, will be convinced of its value as a silk loom. We must however pass from this interesting feature of the department to a cursory review of the collection of

WOOD-WORKING MACHINERY,

undoubtedly the best ever displayed at any one exhibition in this country. One of the first improvements that catches our eye in this department is the

BLIND STILE MORTISING MACHINE,

invented and patented by Leonard Worcester, and exhibited by the agent for its sale Mr. Martin Buck, of Lebanon, N. H. It does its work automatically, rapidly, and excellently; and fully sustains all that was claimed for it in a descriptive illustrated article, published on page 152, current volume, of our journal.

John J. Sanders, of New York, exhibits a combined

SAWING AND MITERING MACHINE,

very substantially constructed, and capable of performing a great deal of work very accurately. It was illustrated and described in our issue of October 7, 1868.

The method of setting and securing the planing bits, or cutters, in this machine is peculiar and very effective; it can be also applied to any tenoning, grooving, or planing machine, as it leaves a clear throat for the discharge of chips, unimpeded by bolt head or other devices, and does not necessitate the slotting of the bit which is simply a plain plate.

Geo. L. Cummings, of New York, exhibits a

FLUTING MACHINE

for banisters and all similar work, the peculiarity of which is, that the cutter-head, once set, remains immovable, the work being lowered away from the cutters by an adjustable center. By this means perfect uniformity in the work is secured. We were much struck with the simplicity and beauty of this machine. This gentleman also exhibits a saw table with a circular grooving saw, which works equally across or lengthwise of the grain, the saw being set inclined to the arbor. He also exhibits a 6-inch four-sided molding machine which is evidently capable of doing good work and a good deal of it.

C. B. Rogers & Company, of New York, display a set of improved

SAW ARBORS,

with self-oiling boxes. These arbors are made of the best English steel, and are elegantly finished. The boxes are cast on a solid bed, which connects the two together in such a manner that it is impossible for them to get out of line. They also exhibit an upright shaping machine, very neat and strong, with iron frame self-oiling steps and boxes. Also a pin and dowel machine with power feed, in which the operator has only to start the rod into the head and it will come out finished. Also a patent molding machine, working four sides at once, capable of making every variety of moldings, from the largest and most complicated down to the smallest. This machine also does double surfacing and matching to 10-inch, planing and matching staves, planing siding, sticking stair rail, etc. They also show a slat-sticking machine for blind slats, small moldings, etc., which works four sides simultaneously the same as the larger machines. An entirely new machine also exhibited by them is an

OUTSIDE HEAD-MOLDING MACHINE,

which works four sides at once, and does work from twelve inches deep by 9 inches wide, down to any required size. They claim that this machine will stick 20,000 feet per day. All of the machines exhibited by this firm are highly finished and substantially made.

A. S. & J. Gear & Co., of New Haven, Conn., and Concord, N. H., exhibit an elegant and substantial

VARIETY MOLDING MACHINE,

a simple and perfect piece of mechanism for planing and cutting straight, waved, circular, and elliptical moldings, spiral work, and all irregular forms. The forms produced are of endless variety, graceful and elegant, and scarcely more expensive to produce than plain moldings. This is one of the most attractive machines displayed.

Among

PLANING, TONGUEING, AND GROOVING MACHINES,

the principal firms represented are: John B. Schenck & Son, Matteawan, N. Y., and S. A. Woods, of Boston and New York.

Some recent improvements on the Schenck Woodworth Machine were illustrated and described on page 241, last volume, of the SCIENTIFIC AMERICAN, to which the reader is referred. As now constructed it is a massive and powerful machine, easy to take apart and clean, and kept in perfect running order without difficulty.

The Woodbury's patent planing, tongueing, and grooving machine is also a good machine, and worthy of special mention. This is exhibited by S. A. Woods, of Boston and New York, who also exhibit a very complete

SAW-GUMMING AND SHARPENING MACHINE,

the working parts of which are constructed upon a tringular iron frame, upon the top of which is suspended a swing frame, the back end having a driving shaft (forming the hinge with tight and loose pulleys; from this, power is transmitted to the arbor upon which is secured a vulcanite emery wheel. The arbor on which the saw is placed is so arranged that universal motion is readily obtained to accommodate any size or shape of tooth desired. The wheel is held away from the saw by means of a coil spring, under the swing frame. The frame is pressed down, bringing the wheel in contact with the saw with one hand, and the saw turned on the arbor with the other—thus the slightest touch can be given to the tooth of the saw without injury. The position of the operator is such that he can look directly across the tooth of the saw, and judge correctly when it has received the finishing touch.

The same firm exhibit a set of self oiling saw arbors with patent self-oiling boxes, by the use of which sufficient oil can be applied to run a saw for months, and all waste of lubricators is obviated.

A large variety of

CIRCULAR, SCROLL, GIG, AND ENDLESS BAND SAWS ARE EXHIBITED,

among which we notice Grosvenor's adjustable saw bench, with both cross-cut and slitting circular saws, exhibited by J. P. Grosvenor, of Lowell, Mass., and a combined gig and circular saw, by Hassenpflug Brothers, of New York, to be worked by hand power

Beach's Patent Scroll Saw, exhibited by C. B. Rogers & Co., of New York, is one of the best scroll saws we have ever seen. Perfect tension of the saw is attained and maintained, this tension being secured by direct connection, and equalizing the power on both halves of the stroke. The saw may be run at great speed, and should either pin in the saw break, the saw stops instantly and can, in no case, be either doubled or broken.

McChesney's Gig or Scroll Saw, exhibited by Thos. L. Cornell, Birmingham, Conn., is also a very convenient machine and well made.

We were very much pleased with the Talpey's Self-feeding Hand-slitting Saw Machine, exhibited by the sole manufacturer, William H. Hoag, of New York, a most perfect-working, effective machine, requiring very little power. The power is applied from a winch, through a very simple and compact system of gearing, forming a very unique and ingenious device. This is one of the best things shown.

The Safety Band Saw, exhibited by the inventor and manufacturer, J. T. Plass, of New York, attracts much attention. It obviates all danger of injury to the operator in case of breakage. The details of its construction may be found, with illustration, on page 129, current volume, of this journal.

First & Pryibil, of New York, also exhibit an endless band saw machine, made entirely of iron except the table ; a very well made and elegant machine. They also exhibit an improved gig saw machine, which for all kinds of work is probably one of the best machines constructed.

In conclusion, we may express our conviction that in the perfection of wood-working machinery, this country ranks first in the world. The machines exhibited show a commendable regard for perfect workmanship, so essential to durability in all rapid-running machines, and the display is a credit, not only to the exhibitors, but to the institution under whose auspices this exhibition is held.

ANNUAL REPORT OF THE PRESIDENT OF THE WESTERN UNION TELEGRAPH COMPANY.

In some respects, this is a remarkable document. This Company have a capital stock of $41,063,100, including sinking fund, amounting to $494,800, which, deducted from the total capital stock, leaves a balance of $40,568,300, on which a dividend was paid last July. The net profits of the year ending July 1, 1869, were $2,801,457·48, less than seven per cent on this capital.

During three years, from the commencement of 1866, the net profits of the company have been $8,015,432·06. Out of these profits, $4,134,879·10 have been expended in the construction of new lines, purchase of telegraph property, redemption of bonds, purchase of real estate, interest on bonds, sinking fund, and miscellaneous expenditures, leaving a balance for dividends of $4,044,595·34.

No one will be disposed to think these profits too large ; but we have no doubt that the profits on all telegraph property in the United States might be made much larger by a general and large reduction of tariff. The present rates, while they do not afford the companies, on an average, seven per cent interest on the capital invested,—many of the smaller companies netting far less than this,—are still so high that the telegraph is not, as it ought to be, a rival to the postal system, in the transmission of messages. Until such a consummation can be approximated, large profits on telegraph property cannot be expected.

Another obstacle to progress has been, want of uniformity in the tariff of charges in different sections of the country. On this head, the Report under consideration gives us information, not only as to the cause of non-uniformity, but the influences which tend to perpetuate it. It says :

"This peculiarity was the result of the great number of separate organizations, having tariffs upon various bases, which required adding together at the termini of two or more lines, so that, upon a dispatch, which was transmitted a few hundred miles, two or three rates were sometimes charged. For instance, a few years since, there were five telegraph companies owning the lines c nnecting Portland, Maine, with Cleveland, Ohio, and the tariff between these two places was ascertained by the addition of the local rates from Portland to Boston, Boston to Springfield, Springfield to Albany, Albany to Buffalo, and from Buffalo to Cleveland. The same system prevailed thro gh out the United States until after the consolidation of the lines made it possible to transmit messages between places thousands of miles apart without the necessity of booking or re-checking at intermediate points. This result necessitated a remodeling of the tariffs, and the work has been going on uninterruptedly ever since ; but when it is considered that a complete revision of the system required a separate tariff book to be made out for over three thousand other offices, changing and equalizing the rates to more than three thousand other offices, the immense labor and responsibility incurred in the undertaking may be imagined.

"Various plans have been considered for simplifying and equalizing the tariffs, but some practical difficulties developed in all of them. The existence of rival lines, built by speculators, whose profit is in their construction, and which essay to do business at rates less than the cost of the service, necessitates the reduction of our rates upon certain routes disproportionately, and prevents the adoption of a general rate strictly proportioned to distance.

"Considerable reductions in the rates for both private and press dispatches have been made within the past year, amounting in some cases to fifty per cent, and while these abatements have taken place to the greatest extent in those sections of the country where there are rival lines, the tolls over some of these r utes being less than the cost of service, yet they have not been confined to these points, the rates having been decreased at more than one thousand offices where there is no opposition. A new tariff of rates is now preparing and will shortly go into operation, based upon air-line distances, irrespective of the routes over which the lines run.

"The following inventory shows the number of stations, miles of line and wire, and amount of machinery belonging to the Company :

"The Western Union Telegraph Company has 3,469 stations ; 52,099 miles of line ; 104,584 miles of wire ; 103 miles of submarine cables ; 2,607 instruments for reading by sound. 1,334 recording instruments ; 3,807 relay magnets ; 4,180 transmitting keys ; 132 repeaters ; 19 printing instruments ; 710 switch boards ; 1,887 cut-offs ; 1,666 lightning arresters ; 14,929 cups of main battery ; 7,210 cups of local battery ; 9 punching machines for the 'Fast' system, not in use."

A peculiarity of this apparatus will be observed to be, that it nearly all belongs to the Morse system ; but we cannot believe, with this report, that "the time will probably never come when this system will cease to be the leading system of the world." We grant that no device yet designed to supersede it has done so, and that it still is used on "95 per cent of all the telegraph lines in existence." We grant its simplicity and "peculiar adaptability to the telegraphic traffic of the country," but the man who hazards a prediction of permanency in regard to any mechanism employed in any department of industry or science in the 19th century, is certainly a bold prophet.

But we have not space to review this report further at this time. Some interesting remarks upon fast methods of telegraphy we reserve for a future number.

RETURN OF C. F. HALL, THE ARCTIC EXPLORER.

On the 26th of September, Mr. C. F. Hall returned to New Bedford, after completing the second of the Arctic explorations which were undertaken by him, for the purpose of ascertaining the ultimate fate and collecting the relics of Sir John Franklin's expedition. The method adopted by Mr. Hall in prosecuting the search, though at first sight it might appear extravagant, was, in reality, about the most likely to lead to success. Discarding the use of strongly built ships and costly equipments, he determined on a land search, trusting mainly to sledges as a sufficient means of transit, and to such food as might be had among the natives, for subsistence. He seems to have had, in early life, received no special training for an enterprise of this kind, and, it is said, that he had not even been to sea ; yet, with indefatigable zeal and with an adequate conception of the magnitude, difficulties, and perils of his self-imposed task, he went to work manfully, systematically, and patiently, to qualify himself for it. He departed from New London on his first journey, which was rather of a tentative character, on the 29th of May, 1860, and returned to the same port on the 13th of September, 1862. The result was satisfactory. Besides making some geographical corrections, he found that he could endure the rigorous climate and live as the Esquimaux lived ; he acquired their language and became familiar with their character and customs and, moreover, from information he then received, he was enabled to limit his field of inquiry, and even had grounds for believing that some of the crews might be still alive. In 1864 he published an account of this journey, and in the same year he set out on his second expedition, now completed.

The latest account made public of his recent exploration is a letter written by himself while at Repulse Bay, to his friend, Mr. Henry Grinnell, and is dated June 20th, 1869; the leading facts in which may be thus briefly stated :

There now can remain no doubt of the fate of Franklin's companions ; none of them reached even Montreal Island. Their bones lie scattered along the coast of King William's Land. Now a solitary grave was found, and again a place of encampment showed that whole companies fell and died there. What adds peculiar horror to this part of the narrative is the fact that were it not for the inhospitable and cruel character of the natives, some, at least, of Franklin's company might have been restored to civilized society. They were starved to death. The explorer considers that a summer search by a strong expedition, in King William's Land, would probably be rewarded by the discovery of the manuscript records which had accumulated during the Franklin expedition. He says that he had been informed by the natives that the records were deposited in a vault a little inward or to the eastward of Cape Victory. The refusal of his companions to abide by him, and the great probability of his meeting the fate of the gallant Crozier, alone prevented his making the summer search himself. About 150 articles, which belonged to the lost voyagers, were brought home by him, and there are hundreds of relics still in the hands of the natives. This letter closed with an account of a mutiny, on which unfortunate occasion he was obliged to shoot the ringleader.

THE NATURAL ADVANTAGES OF TENNESSEE FOR THE PRODUCTION OF IRON.

It has been the practice of many writers on political economy to regard pig iron as representing aggregated labor more than almost any other industrial product ; a view which is probably correct, although superficial thinkers might be led by such a statement to overlook the importance of certain natural advantages essential to the profitable production of this most valuable material. These advantages are the existence of ore of the right quality, fuel, and limestone, so situated that they can be brought together at little cost.

Pittsburgh lies in the center of enormous beds of coal, of which her extensive iron works consume much, and waste a great deal. Limestone can be quarried and plac d at the mouths of her furnaces, at small cost, but a large proportion of the ore used is brought from Lake Superior in the crude state. An air-line distance of about six hundred miles, increased by the tortuous routes of transportation to an average of, say, a thousand miles. This, notwithstanding the country all about abounds in ores of various qualities, but many of which can only be worked to advantage by the admixture of the Lake Superior ore.

If ore could now be discovered at Pittsburgh of precisely the quality brought from Lake Superior, and in an inexhaustible supply, it would largely add to the already immense mineral wealth of that locality.

It is also evident that there must be a brilliant future in store for any locality in this country, combining all the advantages named, with open avenues of communication by water or rail to the commercial centers of the United States.

Such advantages are claimed for sections in Tennessee, Northern Georgia, and Southern Alabama. A letter from George T. Lewis, Esq., published in the *Republican Banner*, of Nashville, Tenn., sets forth minutely the natural advantages of these regions, more particularly, however, of the vicinage of N shville, and on the line of the Nashville and Chattanooga Railroad ; and it must be confessed that he makes out a good case.

Assuming that the figures given by Mr. Lewis are reliable, the entire cost at which a tun of pig iron can be produced on the line of the above-named railroad, and delivered at Nashville, is $19, or $10·50 less than the same quality of iron can be made at Pittsburgh.

The following estimate of the cost of manufacturing, assuming cost of furnace to be $100,000, and its capacity to be 6,000 tuns per annum, is submitted :

Mining, loading, and transportation of 2 tuns ore	$4·00
Mining, loading, and transportation of 80 bushels coal	6·40
Quarrying, loading, and transportation of 1,000 pounds limestone	50
Superintendence, labor, etc., per tun	4·00
Wear and tear per tun	50
Interest on investment per tun	1·00
Incidentals per tun	50
	$16·90

The item $4 per tun embraces employés, viz.:

	Per annum.
1 Superintendent	$3,000
1 furnace manager	1,200
1 bookkeepeer	1,590
1 engineer	1,200
1 assistant engineer	800
1 blacksmith	1,200
1 assistant blacksmith	600
1 founder	1,200
4 filers	2,400
4 keepers	2,400
2 guftermen	1,000
2 cindermen	1,000
2 weighers	1,000
6 yardmen	3,000
Extra labor	2,500
	$24,000

Or $4 per tun.

The great advantage claimed by Mr. Lewis is the quality of the ores (hematite and fossil ores) while the coals he affirms show by analysis seventy per cent of carbon with less earthy matter and sulphur than the bituminous or "furnace coals" of Wales, Newcastle, Western Pennsylvania, and Ohio, and the limestone is of a quality unsurpassed for use as a flux.

By his showing the cost of a tun of pig iron at Steubenville, Ohio, from Lake Superior ore is $29.

The cost of a tun of pig metal made at Brazil, Northern Indiana (the ores from Iron Mountain and Pilot Knob, Missouri, and Lake Superior) is	$28·45
The cost of a tun of pig metal made at Pittsburgh, the Birmingham of America (ores from Lake Champlain and Lake Superior) is	29·50

On the other hand, the cost of a tun of pig metal in Nashville is as follows :

Mining, loading, and transportation of 2 tuns ore	$6·00
Mining, loading, and transportation of 80 bushels coal	9·60
Quarrying, loading, and transportation of 1,000 pounds limestone	1·00
Superintendence, labor, etc., per tun	4·00
Interest on investment per tun	1·00
Wear and tear per tun	50
Incidentals	50
Total	$22·60

These statements are certainly worthy of serious attention. The mineral wealth of this region has long been known, in a vague and general way, but we have not before met with so specific a statement as the one under review. Doubtless there are many iron masters in the country who have data to test the correctness of the figures given; but should some errors be found the margin of difference is so large that some radical miscalculation could only account for it, if the advantages claimed do not fully cover it.

Granted that the statements are reliable, and it follows that the future has large things in store for Nashville, capitalists are not blind, and the iron masters of this country are inferior in sagacity to no other class of manufacturers.

HOW TO FILE AND SET A SAW.

When Dan Rice invented that famous joke about "the greatest saw to saw that he ever saw saw," certainly the saw that he saw saw bore no sort of resemblance to many of the saws which we see saw. Saws that saw one's nerves as well as the timber, screeching and gnawing through wood instead of cutting it smoothly and sweetly, that make one's back ache to witness their operation, and heart ache to witness the useless expenditure of power and labor in much of the work performed by this useful and, when properly made, filed, and set, most effective tool.

A saw is a series of cutters, arranged either in one line or in two lines, according to the work to be performed; and all saws used in wood work (and it is such of which we speak) may be included in two classes—those which cut across the grain and those which cut lengthwise of the grain. The latter class has its teeth or cutters formed so as most to resemble a narrow chisel or plane bit. The teeth of the former class may be regarded as knives which cut, or ought to cut the sides of the kerf smoothly at the same time that they force out or split off the intervening wood.

Many mechanics are accustomed to take their saws to a professional saw filer and setter, acknowledging their own inability to perform the operation as it ought to be done, and preferring to incur expense rather than use a badly-sharpened tool. There is no necessity for this, and any man of ordinary intelligence and skill in the use of tools may easily acquire the simple art of saw filing and setting.

In order to do this, the following points must be observed: The teeth in cross-cut saws ought to cut both ways in traversing through the wood, and the teeth of both cross-cut and rip-saws should be as near as possible of equal length and sharpness. The bevel on the tooth should be more acute for soft than for hard wood. In order to secure the same bevel on all the teeth of a cross-cut saw the file must be held at the same angle in filing each tooth, and if the saw has been previously well filed, the same number of strokes of the file will be required for each tooth, provided an equable pressure is maintained.

If the teeth are uneven in length, their points ought to be first leveled with a flat file, and the beveling be subsequently governed by the point. As soon as the point becomes well defined on each tooth, provided the proper bevel has been maintained throughout, the operator should proceed to the next tooth, and so on.

The saw should be filed from the handle toward the point, as in no other way can a proper bevel be obtained and maintained throughout. If a cross-cut saw be found a little high in the middle, it may still work well, but in no case should it be lower in the middle than at the ends. The feather should be taken from the sides of the teeth by a straight, flat file, or a whetstone with a plane surface, laid along the sides of the teeth, and drawn smoothly along without much pressure. This may be done after the setting.

A rip saw will be found to work better in all kinds of wood if filed a trifle beveling, although in perfectly straight-grained wood it will work well if filed straight across. This bevel is best given to the teeth of these saws after they are set, the file being held at right angles to the teeth. Hard wood requires more bevel in the teeth of a rip saw than soft wood.

The setting of a saw is a matter of great importance. A large proportion of the power required in working a saw is caused by the friction of the plate on the sides of the kerf, and it is the object of setting to lessen this friction by increasing the width of the kerf. The making of saws thinner at the back than at the cutting edge is sound in principle, and saves much power that would otherwise be expended in friction.

A difference of opinion prevails among mechanics about the best way to set saws, some maintaining that the hammer and punch are superior to any of the patent setting tools now in use. A series of experiments which we saw performed some years since convinced us that the hammer and punch were imperfect tools for this purpose, although there is no doubt that the principle of the hammer and punch, as applied in some of the saw-setting tools which have been invented, is the best. A tooth bent and set by a blow will remain where it is put. This, on the contrary, cannot be said of teeth which are bent by sets which act on the lever principle. Nevertheless, we have seen saws very perfectly set by the latter kind of tools. Whatever means are adopted uniformity is the object to be secured; the amount of set required being dependent, of course, upon the nature of the work the saw is intended to perform, and therefore a matter to be left to personal judgment.

APPLICATIONS FOR EXTENSION OF PATENTS.

HORSE POWER.—Samuel Pelton, of Chester, Ill., has applied for an extension of the above patent. Day of hearing Dec. 6, 1869.

COTTON SEED PLANTER.—A. W. Washburn, of Yazoo City, Miss., has applied for an extension of the above patent. Day of hearing March 7, 1870.

THE TORPEDO PATENT CASE.

IMPORTANT DECISION IN THE U. S. CIRCUIT COURT BY JUDGE GRIER.

E. A. L. Roberts vs. *The Reed Torpedo Company* et al.—Within the last few years the production in oil wells has been greatly increased by lowering down into them large iron flasks containing from 6 to 10 pounds of gunpowder or nitro-glycerin, and then exploding the mass by means of a percussion cap on the top of the flask, on to which cap a weight was dropped from the top of the well.

It was established by proofs in the case that most remarkable results had been produced in the oil region by the introduction of the torpedo by Mr. E. A. L. Roberts, the plaintiff. Thus in the Eureka well, which was producing only three barrels a day, a Roberts torpedo was exploded, and its production was increased to 180 barrels a day. Hyner well was increased from 2 to 30 barrels per day, Keystone well from 5 to 175 barrels per day, Neill well from 3 to 80 barrels per day. Tarr Homestead well was increased 65 barrels per day. Keystone well from 15 to 200 barrels per day.

These were only a few out of numerous cases where Roberts had succeeded. The annual production of oil due to the use of the torpedo was admitted by defendants in their argument to already have reached several millions of dollars. After Roberts had succeeded in introducing his invention a man named Reed, of Titusville, united with a former agent of Roberts, named Marston, and set up a claim as a rival inventor to Roberts.

They organized the "Reed Torpedo Company," the object of which was to make and sell to oil men torpedoes at a low rate, and to defeat Roberts' patent. The defendants based their claim upon certain trials made by Reed of torpedoes in 1863. The defendants did not deny that they were infringing the Roberts patent, but insisted that it was void by reason of what Reed had done.

The plaintiff contended that Reed was merely an unsuccessful experimenter, who had abandoned his torpedo as worthless before Roberts' patent was issued.

The oil men united with defendants to defeat the patent, and raised a large fund. They were represented at the argument by Charles M. Keller, of New York, Hon. S. A. Purviance, and B. F. Lucas. Roberts, the patentee, was represented by Bakewell & Christy, of Pittsburgh, and George Harding.

Judge Grier yesterday delivered the following opinion, deciding in favor of the validity of plaintiff's patent, and granting a perpetual injunction:

OPINION.

As I write with difficulty I can only state the conclusions to which my mind has come after a careful examination of this case.

The complainant has exhibited a patent dated 25th April, 1865. This is *prima facie* evidence of a good title, and puts on the respondents the burthen of proof that the patent is void or worthless.

I need not repeat my remarks in the case of Goodyear *vs.* Day (2 Wall, C. C. Rep. 299), but now adopt them as affording a rule of decision which applies clearly to the present case.

As the infringement of the patent is admitted, the only question will be as to the validity of complainant's patent of April 25, 1865.

"It was after speculation had been reduced to practice," and after repeated experiments, that the complainant succeeded in overcoming the prejudice and ignorance of the people on the subject, and persuading the public that his invention was useful; after he had established its great utility and value; and "when his genius and patient perseverance, in spite of sneers and scoffs," were completely successful, that Reed, who had before made experiments on the same subject, and was wholly unsuccessful, imagined that he had the best right to the invention, and after purchasing one or more of complainant's torpedoes, he applied on the 1st of November, 1867, for a patent for substantially the same combination of devices or machines contained in complainant's patent. On the 15th of the same month the respondents formed themselves into a company or corporation called "The Reed Torpedo Company," for the purpose of pirating the complainant's invention and supporting the expense of litigation, and thus defraud him of its fruits. They have persevered, even after the preliminary injunction very properly granted by the District Judge.

Let a decree be entered for complainant for a perpetual injunction, and a master appointed to take an account according to the prayer of the bill.

R. C. GRIER, Circuit Judge.

NOTE.—The passage referred to by Judge Grier in his former decision, 2 Wallace, p. 299, adopted as applicable to this case, was as follows:

"It is usually the case, when any valuable discovery is made, or any new machine of great utility has been invented, that the attention of the public has been turned to that subject previously, and that many persons have been making researches and experiments. Philosophers and mechanicians may have in some measure anticipated in their speculations the possibility or probability of such discovery or invention; many experiments may have been unsuccessfully tried coming very near, yet falling short of the desired result. They have produced nothing beneficial. The invention, when perfected, may truly be said to be the culminating point of many experiments, not only by the inventor, but by many others. He may have profited indirectly by the unsuccessful experiments and failures of others, but it gives them no right to claim a share of the honor or the profit of the successful inventor. It is when speculation has been reduced to practice, when experiment has resulted in discovery, and when that discovery has been perfected by patient and continued experiments, when some new compound, art, manufacture, or machine has been thus produced which is useful to the public, that the party making it becomes a public benefactor and entitled to a patent.

"And yet when genius and patient perseverance have at length succeeded, in spite of sneers and scoffs, in perfecting some valuable invention or discovery, how seldom is it followed by reward! Envy robs him of the honor, while speculators, swindlers, and pirates rob him of the profits. Every unsuccessful experimenter who did or did not come very near making a discovery now claims it. Every one who who can invent an improvement, or vary its form, claims a right to pirate the original discovery. We need not summon Morse, or Blanchard, or Woodworth to prove that this is the usual history of every great discovery or invention.

"The present case adds another chapter to this long and uniform history."—2 Wallace, C. C. Reports, p. 299.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

BOLT FEEDER.—Oscar Van Tassell, Naperville, Ill.—This invention has for its object to furnish an improved device, by means of which the flour or meal is fed faster or slower to the bolt, as may be desired, and which shall, at the same time, be simple in construction and easily operated.

SPRING BED BOTTOM.—D. M. Bye, Roanoke, Ind.—This invention has for its object to furnish an improved adjustable spring bed bottom, which shall be simple in construction, strong, durable, and elastic in use, which can be readily attached to any bedstead and which can be made and sold for a comparatively small amount.

PLOW.—J. C. McVutt and A. B. Furman, Strattonville, Pa.—This invention has for its object to furnish an improved plow, which shall be so constructed and arranged as to be of lighter draft, and more efficient in operation than the plows constructed in the ordinary manner.

WHEELBARROW.—B. W. Tuthill, Oregon City, Oregon.—The object of this invention is to construct wheelbarrows with metallic frames, metallic boxes, or trays, and also with certain improvements in the construction and arrangement of the hubs of the wheels, all designed to provide cheaper and more durable wheelbarrows than when made of wood in the common way.

FEEDING APPARATUS FOR CARDING MACHINES.—A. A. Dow, Glenham, N. Y.—This invention consists in providing the toothed or spiked feeding strap, on the short side of the said feeding device, with operating devices having "positive" movements; also, in providing the rollers of the traveler, which lays the roping, with means for operating them positively.

PRESS.—W. J. McDermott, Covington, Tenn.—This invention relates to improvements in presses for hay, cotton, and the like, and has for its object to provide a simple and convenient arrangement for changing the application of the power when the resistance increases to give a greater force the speed being decreased.

STOP VALVE.—John Paterson, Troy, N. Y.—This invention comprises a pair of sliding valves, suspended from a screwed stem working up and down in a chamber at the ends of two pipe connections, and a cam arrangement between the saw valves, by which, when they have arrived at their seats on the ends of the said pipes, they are pressed down tightly thereon, and which releases the said pressure as soon as the valve stem is raised a small amount in the direction for opening the valves.

CORN HUSKER.—Elihu Field, Geneseo, Ill.—This invention consists in the arrangement of the shank of a bent pointed metallic instrument, to be held in the hand so as to pass in a straight line across the inside of the fingers and terminate in a bow for taking in the three fingers, beginning with the little finger, leaving the fore finger free for independent action with the thumb.

HEATING FURNACE.—A. L. Otis, Normal, Ill.—This invention consists in certain improved arrangements of the covers of horizontal furnaces, calculated to secure the heating of the air as much as possible before passing off through the conducting pipes; also, certain improvements in the construction of the valves of the furnace, calculated to give out more heat by radiation and by convection; also, certain improvements in the arrangements of the grates, and, also, certain impovements in means for heating the air previous to supplying the fire.

SHAFT COUPLING.—Edward G. Shortt, Carthage, N. Y.—The object of this invention is to provide an improved mode of coupling shafts together, and comprises a pair of curved wedges, a sleeve, a pair of set screws, and radial pieces in the shafts, which are used by placing the wedges, which have semicircular grooves propelling the shafts, on the two sections to be joined together, and placing the sleeve over them, to which they are fitted, and then screwing the set screws through the side of the sleeve into conical recesses in the said wedges, to clamp them tightly between the shafts and the interior wall of the sleeve.

RAT TRAP.—J. Ward Fifield, Franklin, N. H.—This invention consists of a double walled vessel, which may be either square or round, with inclined passages between the walls leading from openings in the exterior wall near near the bottom of the interior chamber, through other openings in the inner walls, the interior openings being provided with doors which open readily inward to the animals seeking ingress, but close effectually against their efforts to get out.

LOCKING WHIP SOCKET.—W. S. Hill, Manchester, N. H.—The object of this invention is to combine with a whip socket, for carriages, a lock with a swinging hasp, similar to padlocks, in such a way that the hasp may be locked around the whip above the buttons, or enlargements at the ends, when not using it, to prevent it from being wrongfully taken away, and so that when driving and requiring it for use, the hasp being unlocked may be opened for readily inserting the whip in the socket or removing it. The invention also comprises an arrangement of leather, or other flexible substance, with the hasp and the lock to prevent chafing the whip.

HEATER.—Edmund Schwiedter, Hoboken, N. J.—The object of this invention is to construct a heating apparatus, in which the smoke will be to a very large degree consumed, so that with a comparatively small quantity of fuel a greater degree of heat can be obtained.

MULTIPLE EMBROIDERING MACHINE.—Hermann Berger, Marthalen, Switzerland.—The object of this invention is to construct an embroidering machine, which can be used on gauze, or other fabric, in such manner that one or more pairs of curtains, or other articles, can at once be embroidered thereon with the design in reverse. Thereby a very large amount of labor is saved, as in the machinery heretofore in use but one single piece could be treated, and as for the reverse position required on every pair of curtains new designs had to be gotten up.

CLOTH AND HAT BRUSH.—Joseph Marshall, New York, city.—This invention relates to a new brush, which, when used on broadcloth, silk, felt, and other fabrics, will very thoroughly free the same of all dust and other impurities, and impart a polish to the surface to which it is applied. The invention consists in arranging a velvet, plush, or other cushion within the bristles, which form the outer part of the bush. This cushion will aid in removing impurities, and will, at the same time, polish and lay the fibers on the brushed surface.

CANE STUBBLE SHAVER.—P. G. Kleinpeter, Plaquemine, Iberville Parish, La.—This invention consists in the use of a horizontal knife, which is attached to the landside of an ordinary plow to cut the stubbles while the plow is forced through the ground. The invention also consists in attaching a rake to the outer end of the knife for raking the cut stubble into the furrow.

HOISTING AND DUMPING MACHINE FOR MINES.—Geo. Martz, Pottsville, Pa.—This invention relates to hoisting water and coal from mines, and dumping the same into chutes.

TIRE BENDER.—Wm. Willhide, Fetterman, West Va.—The object of this invention is to provide a simple, convenient, and effective apparatus for the purpose of bending tires and other metallic bars.

GRAIN SWEATER, DRYER, AND CLEANER.—Wm. Hull and C. W. Hammond, Baltimore, Md.—This invention relates to that class of machines for cleaning grain, etc., in which a hollow rotating cylinder is employed, provided with oblique or "worm" flanges, partitions, or deflections for moving the grain longitudinally with the cylinder as the latter rotates.

LOW-WATER DETECTOR.—G. B. Massey, New York city.—This invention relates to a new safety attachment to steam boilers whereby an alarm will be instantly given as soon as the water sinks below a certain desired level, and it has for its object to construct an apparatus which will operate with with certainty at low as well as high pressure.

RAILROAD-CAR JOURNAL BOX.—J. B. Collin, Altoona, Pa.—This invention relates to a new journal box for railroad cars, which is so arranged that it can be conveniently opened or closed, but not spontaneously drop open during the motion of the car, and so that the oil, flowing over at the back of the box, cannot reach the wheel, and so that the packing within the box cannot be thrown forward against the lid to force the same open.

COTTON AND HAY PRESS.—Joseph K. Davis, Menticello, S. C.—This invention relates to that class of cotton and hay presses in which the bale is formed at the top of the press, the platen being worked upward by means of two vertical screw rods. Such presses must of necessity have doors through which to get into the upper end of the press box, as well as a cover which can be removed when occasion requires.

WAGON BRAKE.—Milton Satterlee, Foreston, Ill.—This invention relates to that class of wagon brakes in which a lever is employed to throw a shoe or drag under one or both of the hind wheels, or remove it therefrom: and this improvement consists in a peculiar construction of such shoe, whereby it not only better adapts itself to the inequalities of the ground, but, also, prevents the sliding or sluing of the wagon on ice, or other smooth surface.

ICE MACHINE.—D. L. Holden, New Orleans, La.—This invention relates to that class of ice machines in which chimogene gasoline, rigoline, and other kindred substances are sprayed into a freezing chamber, or into freezing pipes, and consists in a new and improved construction of the spraying apparatus, whereby the cleaning and repairing are greatly facilitated, together with a new apparatus for purifying the gasoline, and during the process. and a new and improved arrangement and combination of all the parts, whereby the whole is greatly simplified, and its cost and expense of running reduced, while its effectiveness is increased.

CONSTRUCTION OF VESSELS.—W. A. Farley, St. Andrew's Bay, Fla.—This invention consists in producing patterns of two different curves taken from two radii; the one obtained by taking two thirds the measurement of the beam of the required vessel, and the other from a radius of one half the said measurement. Also, in the use of the said pattern, in a manner to obtain the required curves for any part of the sides and bottom of the vessel, by one pattern.

HAT POUNCING MACHINE.—John Rosencranz, Boston, Mass.—This invention consists of one or more pairs of conical rollers, and a vibrating brushing or rubbing device, arranged and adapted for imparting a rotary motion to the hat, by passing the brim through the rollers, which press it and move it against the brushing apparatus for brushing and finishing the brim.

TRACK SIGHTER.—Geo. W. Plumb, Milford, Conn.—The object of this invention is to provide a simple and efficient instrument whereby the rails of railroads may be sighted for adjusting and trueing without the labor and delay of placing the head down upon the rail, which is not only tedious but injurious to the physical condition of the sighter, when the rails are hot in warm weather.

PUMP.—Chalkley Griscom, Lewis Griscom, and J. P. Griscom, Mahanoy Plain, Pa.—This invention relates to a new pump, to be used for mining and other purposes, and its object is to throw a continuous stream and to keep the water at an uninterrupted flow, so that when the column of water is once started, it will continue to move as long as the pump is in motion.

FEED ATTACHMENT TO CARDING MACHINES.—James Lawton, Glenham, N. Y.—This invention relates to a new attachment to carding machines, which is to be a substitute for the ordinary strap heretofore in use.

HOD ELEVATOR.—Thomas M. Pelham, New York city.—This invention relates to improvements in hod-elevating platforms, such as are used by builders for elevating and returning the hods containing bricks, mortar, and other substances, and has for its object to provide an arrangement whereby the persons who take the hods from the platform after being elevated may do so without requiring to step on the platform in shouldering the hods, as they must now do, as the elevators are at present constructed, by which serious accidents occur by the falling of the platforms owing to the slipping of the hoisting gear, breaking of the ropes, and other causes. The invention also has for its object to provide an arrangement whereby a greater number of hods may be carried up in the same space or on platforms of equal size to others now in use.

WATER DOORS FOR FURNACES.—Joseph Philips and Davis Keeley, Phœnixville, Pa.—This invention relates to a new and useful improvement in doors for puddling, blast, and other furnaces, and consists in producing a circulation of water in a serpentine channel through the door by means of partitions.

MITER VISE.—Charles W. Wilson, Norfolk, Va.—This invention relates to an improvement in means for fastening miter joints, more especially designed for use in making picture frames, but applicable to other purposes.

MACHINE FOR CUTTING SHEET METAL.—John A. Wells, Holly Springs, Miss.—This invention relates to a new and improved machine for cutting circles from tin and other sheet metal.

HYDRAULIC DREDGING MACHINE.—R. S. Elliott, St. Louis, Mo.—This invention relates to improvements in machinery for dredging river bottoms and the bottoms of other water ways used for navigation, and is intended for removing bars of sand and other similar matter from navigable channels.

BURIAL CASE.—J. A. Dandridge, Buffalo, N. Y.—In carrying out this invention the cases are constructed preferably of wood, and are covered with a metallic covering, formed by electro-plating upon wax or any other substance that can be easily molded into ornamental designs of raised figures, and to connect the said ornamental covering the back is filled with a cement impervious to wet, which will adhere to both wood and metal, and when so filled apply them to the exterior, thus uniting them together and protecting the cases from penetration by moisture, or the same may be applied to metallic cases as commonly constructed by the ordinary process of electro-plating or to cases of other substances capable of electro-plating.

MACHINE FOR FASTENING THE BOTTOMS TO POLYGONAL SHEET-METAL CANS.—Reuben Brady, New York city.—This invention relates to a new machine for crimping the turned-up edges of sheet-metal plates to the sides of polygonal sheet-metal vessels so as to thereby securely fasten such plates or bottoms to the vessels.

STEERING APPARATUS.—Henry Edward Skinner, London, England.—This invention relates to a new steering apparatus, which, while it is of very simple construction, will develop much power, and give full control of the rudder. The invention consists in the application of two screws working one within the other.

HIGH AND LOW-WATER INDICATOR.—G. B. Massey, New York city.—This invention relates to a new alarm attachment to steam boilers, which will be operated when the water is a certain distance above as well as when it is below the proper hight, and which will also, when it is operated, indicate whether it is put in action by high or low water.

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FOR THE WEEK ENDING SEPT. 28, 1869.

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95,179.—PRESERVING FISH.—Reuben A. Adams, Cambridge, Mass.
95,180.—SASH BALANCE.—Orson Armstrong, Oshkosh, Wis.
95,181.—PERMUTATION LOCK.—Theophilus A. Auberlin, Detroit, Mich.
95,182.—BASE-BURNING STOVE.—Rodman Backus, Albany, N. Y.
95,183.—BABY JUMPER AND ROCKER.—Burroughs Beach (assignor to J. R. Pease), Meriden, Conn.
95,184.—MINERS' SAFETY LANTERNS.—N. L. Beaufils and Jacques Rexroth, Paris, France.
95,185.—BASKET.—L. W. Beecher, Westville, Conn.
95,186.—EMBROIDERING MACHINE.—Hermann Berger, Marthalen, Switzerland.
95,187.—HARVESTER GUARDS.—James Birch, Corry, Pa.
95,188.—HARVESTER.—Olpha Bonney, Jr., San Francisco, Cal.
95,189.—LIQUID METER.—J. A. Bradshaw and W. H. Brown (assignors to themselves and Darius Whithead), Lowell, Mass.
95,190.—MACHINE FOR FASTENING BOTTOMS TO CANS.—Reuben Brady, New York city.
95,191.—HARVESTER RAKE.—Thomas S. Brown, Poughkeepsie, N. Y.
95,192.—BED BOTTOM.—D. M. Bye (assignor to himself and H. Bash), Roanoke, Ind.
95,193.—MACHINE FOR MITERING PRINTERS' RULES.—W. E. Cameron and A. A. Dettlaff, Green Island, N. Y.; said Cameron assignor to said Dettlaff.
95,194.—PLOW WHEEL.—E. A. Chubb, Ionia, Mich.
95,195.—VISE.—C. A. Cole, St. Louis, Mich., assignor to himself and J. L. Evans.
95,196.—RAILWAY-CAR JOURNAL BOX.—J. B. Collin, Altoona, Pa.
95,197.—LET-OFF MECHANISM FOR LOOMS.—D. M. Collins, Lowell, Mass.
95,198.—LOOM HARNESS.—A. B. Corey, Providence, R. I.
95,199.—METHOD OF CONSTRUCTING PILES FOR RAILROAD RAILS.—W. E. C. Cox, Reading, Pa.
95,200.—YARN-TENSION DEVICE FOR KNITTING MACHINES.—John Crandell, Chicopee Falls, Mass.
95,201.—MANUFACTURE OF WHITE LEAD.—Jas. Cuddy, Pittsburgh, Pa.
95,202.—BURIAL CASE.—J. A. Dandridge, Buffalo, N. Y.
95,203.—HOOP-SKIRT FASTENING.—F. E. Day, New York city, assignor to himself and L. H. Day, same place, assignors to J. B. Loomis for one half their right.
95,204.—SEAL LOCK FOR BAGS.—John Dewe, Toronto, Canada.
95,205.—CAN OPENER.—E. F. Dewey, San Francisco, Cal.
95,206.—COAL STOVE.—R. S. Dillon, Detroit, Mich.
95,207.—LATH MACHINE.—Jacob Dobbins, Litchfield, Mich.
95,208.—FEEDING MECHANISM FOR CARDING ENGINES.—A. A. Dow, Glenham, N. Y.
95,209.—MEDICAL EXTRACT.—H. S. Draper, Rochester, N. Y. Antedated Sept. 13, 1869.
95,210.—BOOT AND SHOE.—Charles S. Dunbrack, Swampscott, Mass.
95,211.—MANUFACTURE OF SHOES.—C. S. Dunbrack, Swampscott, Mass.
95,212.—CHURN.—R. Elarton and W. J. Elarton, Hillsborough, Iowa. Antedated Sept. 16, 1869.
95,213.—HYDRAULIC DREDGING MACHINE.—R. S. Elliott, St. Louis, Mo.
95,214.—CORN HARVESTER.—E. I. Eno, Springfield, Ill.
95,215.—CONSTRUCTION OF VESSELS.—Wm. A. Farley, St. Andrew's Bay, Fla.
95,216.—RAT TRAP.—J. W. Fifield, Franklin, N. H.
95,217.—STUMP EXTRACTOR.—Ira Flanders, Paw Paw, Mich.
95,218.—CURTAIN FIXTURE.—G. P. Fuller, Philadelphia, Pa.
95,219.—MODE OF HANGING WINDOW SHADES.—G. P. Fuller, Philadelphia, Pa.
95,220.—AUGER HANDLE.—D. W. George, Minnesota City, town of Rollingstone, Minn. Antedated Sept. 18, 1869.
95,221.—HARNESS MECHANISM FOR LOOMS.—A. F. Gibboney, Bellville, Pa.
95,222.—PUMP.—Chalkley Griscom, Lewis Griscom, and J. P. Griscom, Mahanoy Plane, Pa.
95,223.—BEDSTEAD.—Jones Harding, Detroit, Mich.
95,224.—HEADBLOCK FOR SAW MILLS.—J. F. Hartmann, Richmond, Ind., assignor to himself, Heinrich W. Morningstar and Eugene Movel.
95,225.—DIRECT-ACTING STEAM ENGINE.—W. B. Hayden, Columbus, Ohio.
95,226.—COMPOUND FOR BUILDING PURPOSES.—Geo. Heim, Naperville, Ill.
95,227.—RAILWAY-RAIL CHAIR.—G. A. H. Hertzer, Waterford, Mich.
95,228.—WHIP SOCKET.—W. S. Hill, Manchester, N. H.
95,229.—GANG PLOW.—H. R. Huie, Haywards, assignor to L. L. Treadwell and G. R. Carter, San Francisco, Cal.
95,230.—Suspended.
95,231.—DOOR FASTENER.—Henry M. Jones, West Meriden, Conn.
95,232.—SPRING CURTAIN ROLLER.—E. M. Judd, Wolcottville, Conn. Antedated Sept. 11, 1869.
95,233.—RUFFLE.—Austin Kelley, Brooklyn, N. Y. Antedated Sept. 16, 1869.
95,234.—HAY TEDDER.—J. B. Kelley, Brandon, Vt.
95,235.—SHOULDER BRACE.—J. E. Kent (assignor to W. J. Everett), Philadelphia, Pa.
95,236.—PEDDLERS' WAGON.—S. T. Lamb and G. A. Rankin, New Albany, Ind.
95,237.—FEEDING ATTACHMENT FOR CARDING ENGINE.—James Lawton, Glenham, N. Y.
95,238.—MACHINE FOR DRESSING STONE.—T. H. Leavitt, Boston, Mass.
95,239.—WASHING MACHINE.—G. A. Leigh, Springfield, assignor to himself and S. E. Leigh, Bloomington, Ill.
95,240.—MUFF.—Bernard Levy (assignor to himself and W. H. Slocum), Boston, Mass.
95,241.—SEED PLANTER.—J. S. Lewis, Elkader, Iowa.
95,242.—POTATO DIGGER.—Daniel Locke, Geneva, Wis.
95,243.—SAIL LATCHET.—John Mair (assignor to himself and H. W. Cranmer), Philadelphia, Pa.
95,244.—CLOTH AND HAT BRUSH.—Joseph Marshall, New York city.
95,245.—LOW-WATER DETECTOR FOR BOILERS.—G. B. Massey, New York city.
95,246.—HIGH AND LOW-WATER INDICATOR.—G. B. Massey, New York city.
95,247.—WASHING MACHINE.—G. J. Matson (assignor to himself and S. F. Judd), Alma, Mich.
95,248.—HEAD LIGHT.—H. S. Maxim and James Radley, New York city.
95,249.—PRESS.—W. J. McDermott, Covington, Tenn.
95,250.—GRATE FOR STOVES AND FURNACES.—J. B. McIntosh, Erie, Pa.
95,251.—PLOW.—J. C. McVutt and A. B. Furman, Strattonville, Pa.
95,252.—MILL PICK.—Chas. Metzer and G. R. Roraback, De Sota, Mo. Antedated Sept. 17, 1869.
95,253.—MODE OF FASTENING BUTTONS ON SHOES, ETC.—C. C. Morgan, New York city.
95,254.—HORSESHOE-NAIL CLINCHER.—A. Morley, Addison Mich.
95,255.—FERNERY.—C. L. Osborn, New York city.
95,256.—HOT-AIR FURNACE.—A. L. Otis, Normal, Ill.
95,257.—INSTRUMENT FOR SETTING BUTTON HOOKS.—J. S. Palmer, Providence, R. I.
95,258.—VISE.—Charles Parker, Meriden, Conn.
95,259.—MOP HEAD.—H. C. Parsons, Dexter, Me.
95,260.—STOP VALVE.—John Paterson, Troy, N. Y.
95,261.—TRAVELER FOR SPINNING RING.—H. L. Peirce, Taunton, Mass.
95,262.—HOD ELEVATOR.—T. M. Pelham, New York city.
95,263.—FURNACE DOOR.—Joseph Philips and Davis Keeley, Phœnixville, Pa.
95,264.—IMPLEMENT FOR SIGHTING RAILROAD TRACKS.—G. W. Plumb, Milford, Conn.
95,265.—POLISHING MACHINE.—P. F. Randolph, Jerseyville Ill.
95,266.—WASH-BOILER TUBE.—T. W. R. Rayner, New York city.
95,267.—WINDOW.—Henry Redlich, Chicago, Ill. Antedated September 22, 1869.
95,268.—HORSE HAY RAKE.—M. C. Remington, Weedsport, N. Y.
95,269.—GRAIN-CLEANING MACHINE.—James Rood, Beaver Dam, Wis.
95,270.—HAT-POUNCING MACHINE.—J. Rosencranz, Boston, Mass.
95,271.—THREAD GUIDE FOR SPOOLS.—T. O. L. Schrader, New York city. Antedated Sept. 15, 1869.
95,272.—"PLUG TOBACCO" CUTTER.—Albert Schuneman and Theodore Schuneman, Detroit, Mich.
95,273.—COAL STOVE.—Edward Schwiedter, Hoboken, N. J.
95,274.—BASE-BURNING FIREPLACE STOVE.—S. B. Sexton, Baltimore, Md.
95,275.—CONDENSER.—Thomas Shaw, Philadelphia, Pa.
95,276.—LAUNDRY STOVE AND HEATING FURNACE.—C. J Shepard, Brooklyn, N. Y.
95,277.—SHAFT COUPLING.—E. G. Shortt, Carthage, N. Y.
95,278.—STEERING APPARATUS.—H. E. Skinner (assignor to Wm. Hopcraft), London, England.
95,279.—AXLE SKEIN.—T. S. Sleeper, Binghamton, N. Y.
95,280.—FEED MEASURE FOR STOCK.—Charles E. Spaulding, Theresa, N. Y.
95,281.—HOT-AIR FURNACE.—B. F. Sturtevant, Jamaica Plains, Mass.
95,282.—NUMBERING MACHINE.—H. Sutcliffe, Brooklyn, N.Y Antedated Sept. 16, 1869.
95,283.—RAILWAY CAR SEAT.—John B. Sutherland, Detroit Mich.
95,284.—ROLL FOR SPLITTING RAILROAD RAILS.—Wm. A Sweet, Syracuse, N. Y.
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95,374.—Clay Tempering Machine.—G. E. Noyes (assignor himself and E. N. Gray), Washington, D. C.
95,375.—Combined Grain Drill and Land Roller.—Henry D. Palmer, Volena township, Mich. Antedated September 22, 1869.
95,376.—Compound for the Cure of Cholera Morbus.—John Pool, Hermon, N. Y.
95,377.—Medicated Soap.—W. P. Pugh, High Point, N. C.
95,378.—Composition for Roofing, Pavements, etc.—Evander W. Ranny, New York city.
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95,387.—Steam Generator.—Noah Shaw, Eau Claire, Wis.
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95,396.—Grinding Mill.—David Weimer, Gettysburg, Ohio.
95,397.—Harvester Dropper.—Wm. N. Whitely, Springfield, Ohio.
95,398.—Tire Bender.—William Willhide, Fetterman, West Va.
95,399.—Coal Stove.—S. H. Williams, Baltimore, Md.
95,400.—Dish-washing Machine.—L. R. Witherell (assignor to himself and Charles F. Calkins), Galesburg, Ill.
95,401.—Churn Dasher.—Travis P. York, Terre Haute, Ind.
95,402.—Bridge.—Edward William Young, New Street, Spring Gardens, Great Britain. Patented in England, February 19, 1868.
95,403.—Paint Compound.—James Gould, Lexington, Mass.
95,404.—Steam Engine Slide Valve.—Thomas Adams, London, England.

REISSUES.

83,182.—Printing Certain Textile Fabrics and Yarns.—Dated October 20, 1868; reissue 3,647.—American Print Works, Fall River, Mass., assignees of John Lightfoot.
86,273.—Pump Device for Steam and other Enginery.—Dated January 26, 1869; reissue 3,648.—Charles Edward Blake, San Francisco Cal.
56,525.—Cooking Stove.—Dated July 24, 1866; reissue 3,649.—Esek Bussey, Troy, N. Y.
63,802.—Gas Burner.—Dated April 16, 1867; reissue 3,650.—Benjamin Collins, New York city, assignee, by mesne assignments, of Richard B. Locke and Wm. B. Ulrich.
67,682.—Detachable Saw Teeth.—Dated August 13, 1867; reissue 3,651.—Henry Disston and Hamilton Disston, Philadelphia, Pa., assignees by mesne assignments, of Joseph W. Strange.
74,060.—Washer for Lock Nuts.—Dated February 4, 1868; reissue 3,652.—D. Elliot and E. Seely, New York city.
33,560.—Breech-loading Firearm.—Dated October 22, 1861; reissue 3,653.—Alfred B. Ely, Newton, Mass., assignee of Francis J. Vittum and Edgar M. Stevens.
72,031.—Machine for Refitting Valves.—Dated December 10, 1867; reissue 3,654.—Charles F. Hall, for himself and Charles S. Hall, assignee of Charles F. Hall Brooklyn, N. Y.
38,202.—Bedstead.—Dated April 14, 1863; antedated October 14, 1862; reissue 3,655.—David Manuel, for himself Dedham, and Frederick K. Ballou, assignee, by mesne assignments, of David Manuel Foxborough, Mass.
67,900.—Adjustable Stove-pipe Shelf.—Dated August 20, 1867; reissue 3,656.—O. B. Olmsted, Beloit, Wis.
79,907.—Milk Can.—Dated July 14, 1868; reissue 3,657.—H. W. Shepard, Mannsville, N. Y., assignee of George A. Huggins.

DESIGNS.

3,667.—Bust of Alexander Von Humboldt.—Henry Berger, New York city.
3,668.—Carpet Pattern.—Jonathan Crabtree (assignor to James Bromley & Brothers) Philadelphia, Pa.
3,669.—Stove.—Addis E. Chamberlain and John B. Crowley, Cincinnati, Ohio, assignors to Addis E. Chamberlain, O. N. Bush, and F. V. Chamberlain.
3,670.—Railway Car Ventilator Case or Shell.—M. T. Hitchcock, Springfield, Mass.
3,671.—Cap of a Fruit Can.—Julius I. Livingston, Pittsburgh, Pa.
3,672.—Clock Case.—George B. Owen, Winsted, Conn.
3,673.—Face-plate of a Latch.—Emery Parker, New Britain, Conn.
3,674.—Harness Mounting.—James Patterson Robbins, Philadelphia, Pa.
3,675.—Stove.—Watson Sanford, New York city.
3,676.—Plate of a Stove.—Robert Scorer and Robert Ham, Troy, N. Y.
3,677.—Carpet Pattern.—Isaac Starr, Jr., Philadelphia, Pa.
3,678.—Trade Mark.—Geo. W. Tucker, Manchester, N. H.
3,679.—Fireplace Heater.—Samuel L. Utter, Brooklyn, N. Y.
3,680.—Stove.—Samuel L. Utter, Brooklyn, N. Y.
3,681.—Stove.—Nicholas S. Vedder, Troy, and Thomas S. Heister, Lansingburg, N. Y., assignors to John H. Herron & Co., Pittsburgh, Pa.
3,682 to 3,684.—Floor Oilcloth.—John T. Webster, New York city., assignor to Page, Wilder & Co., Hallowell, Me. Three patents.
3,685.—Felt Border.—John T. Webster, New York city., assignor to "Crossley Company," Bridgeport, Conn.
3,686.—Reflector.—August Wil elm, Philadelphia, Pa.

EXTENSIONS.

Corrugated Beam.—Richard Montgomery, New York city. Letters Patent, No. 13,599, dated September 25, 1855.
Gang Plow.—Thomas J. Ball, Bryan, Texas.—Letters Patent No. 12,791, dated May 1, 1855.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

2,386.—Sewing Machine.—C. Lockman, Hamilton, Canada. August 10, 1869.
2,590.—Railway Chair.—F. Nicklin and R. Willis, Troy, N. Y. September 2, 1869.
2,598.—Steam Boiler.—H. W. Lüders, Philadelphia, Pa. September 3, 1869.
2,600.—Transmitting Power by Means of Air or Fluid.—R. Spear, New Haven, Conn. September 3, 1869.
2,622.—Reaping and Mowing Machine.—William Allen, Auburn, N. Y. September 6, 1869.
2,632.—Means for Utilizing the Force of the Waves.—F. Ellerhausen, Ellerhouse, Nova Scotia. September 7, 1869.
2,634.—Telegraphic Apparatus.—George Little, Rutherford Park, N. J. September 7, 1869.

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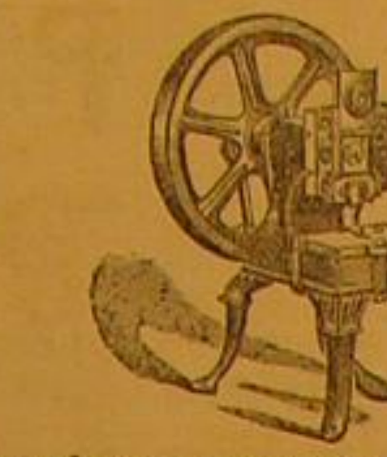

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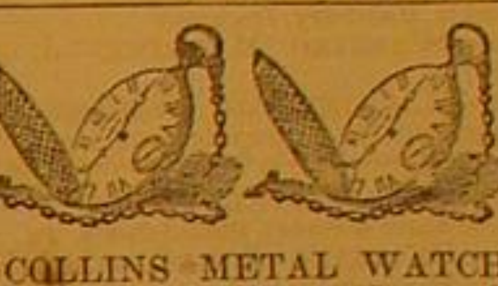
$15.00  **$20.00**

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