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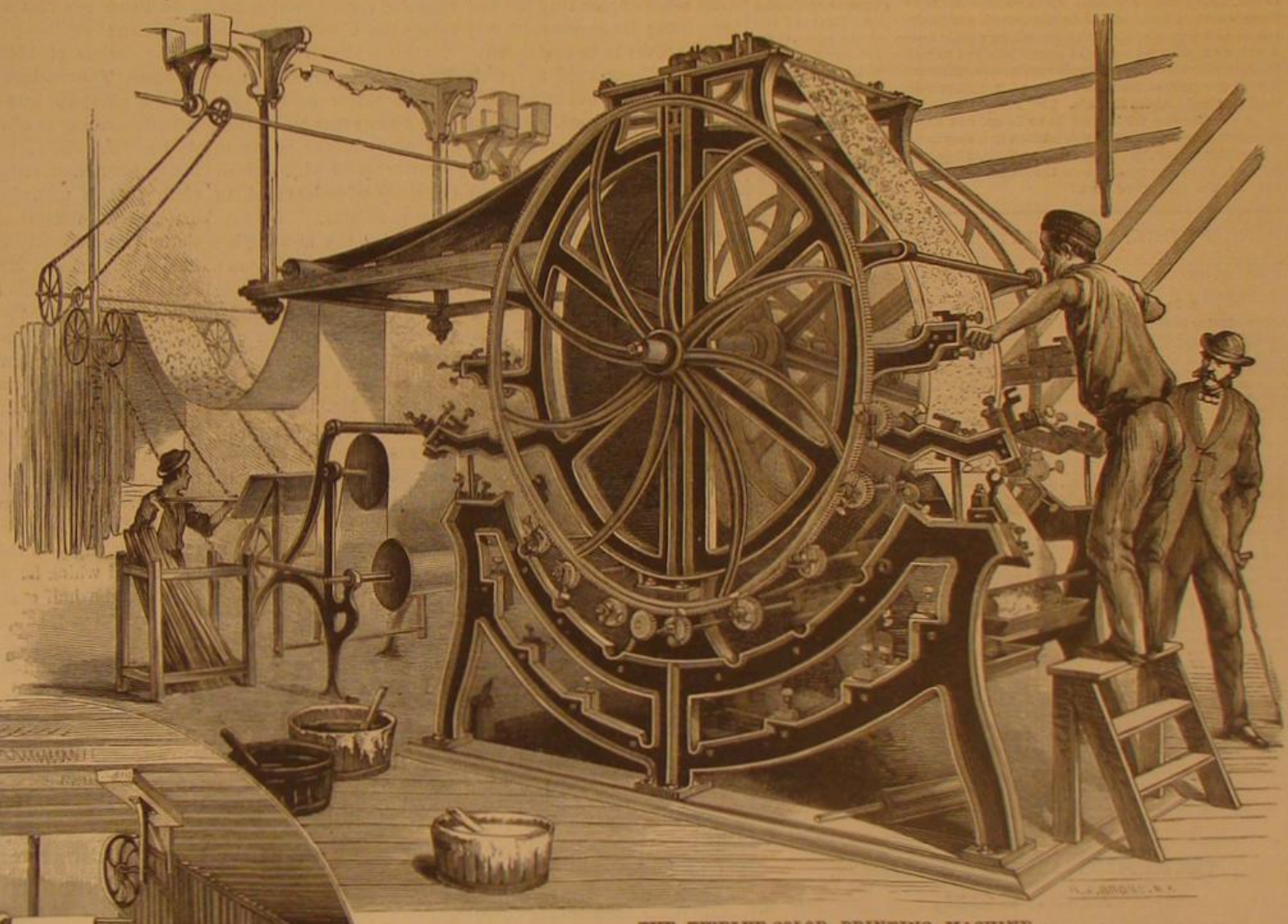
THE MANUFACTURE OF WALL PAPERS.

The white paper comes into the factory from the paper-mill in large rolls. It varies in weight according to the particular use to be made of it; much heavier stock is required, for example, for "leather" paper than for the ordinary wall hangings. The first step in the process of printing is what is called "grounding." This is applying a tint over the whole surface of the paper by a machine made especially for the purpose, in which color is applied evenly over the surface by a series of brushes. Then the paper is caught up in loops and carried by an endless chain over steam pipes, thus becoming dry as it slowly makes its journey of about four hundred feet. It is then reeled up, and is ready for the printing. These grounding machines can carry two widths of paper simultaneously, so that the process is a rapid one. "Mica papers" are grounded in the same way as those in plain colors.

The next step is the printing. This is done on machines such as that represented in the engraving. This machine can print twelve colors at a time. Machines capable of printing in eight colors are quite common and largely used.

The pattern having been designed and the colors chosen, there must be a roller for each separate color, with the corresponding part of the pattern cut on it, and the rest left blank. The rollers consist of a body of wood, with the pattern worked on them in brass and felt. The work on the rollers must be done with great accuracy, for the different parts of the pattern must be adjusted to a nicety.



THE TWELVE-COLOR PRINTING MACHINE.

paper placed upon a movable rack, ready to be reeled into rolls for the market.

After the printing and gilding, they are run through a sim-

[Continued on page 339.]

READY FOR REELING UP.

Everything being ready, the rollers and their troughs of color are adjusted, the reel of grounded paper begins to pass over the great cylinder. Here it gets a spot of crimson, the blushing center of a rose perhaps, while the next roller imprints the dark green of a leaf. And so it touches roller after roller until the whole pattern is produced in completeness and beauty. As it emerges from the machine it is caught on sticks that rest in notches on an endless chain, and so in graceful festoons is slowly carried over steam pipes, which rapidly dry it. If there is any gold in the pattern, at one point in its progress over the drying coils the paper passes through an auxiliary machine, which deposits gold dust on the proper parts, which have been printed in varnish instead of color; the gold adheres to the varnish, while the colors have become sufficiently dry not to hold it. In some of the papers the gold, or bronze, or other metal is applied by hand. The portion to be bronzed is printed in varnish, then it is liberally dusted over with the metal powder. When the superfluous powder is brushed off, the masses of gold, or silver, or bronze shine out, with the result of enhancing the beauty and effectiveness of the whole.

Following the paper along, we reach the end of the moving railway which carries it. Here the sticks which have supported it in its long festoons are thrown out, and the

Some papers are hand-printed. This is done in working off specimens, that effects may be determined and patterns fixed upon. It is done also in the production of special patterns made to order, or in cases where the quantity to be printed would not warrant the expense of preparing the rollers for the machine. It is done also in those cases where the pattern is, as it were, built up by layer after layer of "flock," resulting in very rich effects. Some of the "leather" papers have raised figures upon them. These papers, which are very thick and heavy, are stamped in a machine similar to other machines for the same general purpose.

Some of the most gracefully elegant papers are embossed.

"FLOCKING."

THE MANUFACTURE OF FINE WALL PAPERS.

Scientific American.

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NEW YORK, SATURDAY, NOVEMBER 26, 1881.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT.
No. 308,
For the Week ending November 26, 1881.

Price 10 cents. For sale by all newsdealers.

THE FONTAINE LOCOMOTIVE.

A short time since there appeared in the SCIENTIFIC AMERICAN SUPPLEMENT (No. 305, November 5) several illustrations of the new type of locomotive engine devised by Mr. Eugene Fontaine, accompanied by a letter from Mr. John Ortton, Mechanical Superintendent of the Canada Southern Railway, describing the construction of the engine and the behavior of engine No. 1, in regular service on that road.

Referring to Mr. Ortton's communication and the testimony of the engineer in whose charge that engine and engine No. 3 had been run, we said: "From the evidence thus furnished it seems to be abundantly established that the Fontaine locomotive marks a long stride forward in the direction of speed and economy in railway service."

This recognition of the apparent importance of the changes in locomotive construction introduced by Mr. Fontaine has greatly displeased the *Railroad Gazette;* and in a long article on "The Fontaine Fallacy" it seeks to demonstrate the incapacity of the Fontaine locomotive to do the work and attain the speed accredited it by those who have witnessed its operation, and at the same time the incapacity of the SCIENTIFIC AMERICAN to correctly estimate the value of the evidence furnished as to the practical utility of the improvements it embodies. This would-be demonstration is fortified by a column of diagrams which lack only pertinence to the questions at issue to be very convincing. Admitting the correctness of the *Gazette's* argument, but one inference is possible, namely, that our worthy contemporary is talking about some other engine than the real Fontaine engine, which has been doing for months the very things the *Gazette* so elaborately proves to be impossible.

We are concerned not with Mr. Ortton's or any other man's theories, but with the actual behavior of the new engines on the road. The inventor claims that by a better plan of construction and method of applying the power to the drivers he is able to secure greater speed with a given consumption of fuel, or equal efficiency with less fuel, in comparison with other engines of the same size.

Mr. Ortton says that in practical service the new engine amply sustains the claims of the inventor; and Mr. Ortton's testimony is confirmed by that of Mr. W. P. Taylor, General Manager of the Canada Southern Railway, as will be seen in Mr. Taylor's letter printed at length in another column. On the basis of the actual performance of engine No. 1, Mr. Taylor pronounces it a perfect success in saving fuel as well as in developed power and speed. Mr. Taylor continues: "The engine has been running for several months on our road in freight and passenger service. A test was made with her against one of our best Baldwin engines, with the same sized cylinders, running on regular passenger trains. An accurate record was kept of the fuel consumed, which shows that the Fontaine made an average of fifteen miles more to a ton of coal than the Baldwin engine doing the same amount of work."

Touching the capacity of the engine for speed, Mr. Taylor specifies time and circumstance and witnesses (including railway officers of national reputation), proving the ability of the engine to haul a "good sized train a mile a minute without difficulty." Using from 25 to 40 per cent less fuel than other engines of the same size, the Fontaine, Mr. Taylor says, "can perform the same service and has greater speed," either for passenger or freight service.

Until the *Gazette* has successfully impeached the testimony of Mr. Taylor, Mr. Ortton, and others, touching the actual behavior of this engine, it is obviously a little unfair, not to say injudicious and beside the question, to declare offhand (and evidently without taking the trouble to go across the river and look at the machine) that the inventor "seems to sincerely believe that he is able to get what in the West they call a 'twist' on the action of mechanical forces, and that he gets more power out of the cylinders of his engine than ever goes into them." It is worse than injudicious to add, as the *Gazette* does: "Under this mistake he [the inventor] is spending his own money, which is unwise; but what is worse is that the oldest and most widely circulated scientific paper in this country, by corroborating the erroneous theories which have been advanced concerning the engine, may induce other people to spend money on a device which the first and fundamental principles of mechanics should show to be irrational."

Repeating that we are concerned not with Mr. Fontaine's theories, actual or hypothetical, but with the practical performance of his engine, the SCIENTIFC AMERICAN persists in having a higher respect for the results of Mr. Fontaine's alleged irrationality and unwisdom than for the critical acumen of the *Gazette*. The question is not as to the possible performance of a theoretical engine, but what a real engine does.

After the "impossible" has been accomplished it usually turns out that the argument which established the supposed impossibility is found to be somewhere defective. Usually, too, the error is found to lie not in the logic of the argument, but in its inapplicability to the case in hand. That the flaw in the argument of the *Gazette* is of this nature is evident from its comparison of the Fontaine locomotive to the Keely motor, and its assertion that those who accept the performance of that locomotive as evidence of its value "are inclined to believe that Mr. Fontaine has made a 'corner' on the law of gravitation and the conservation of energy."

The *Gazette's* mistaken idea of the Fontaine locomotive may rightly be comparable with Mr. Keely's mythical invention; but the real engine, which has proved its capacity to haul a seven car train at a rate exceeding a mile a minute, and to handle freight trains as satisfactorily as much larger engines of the old type, is manifestly quite another thing.

It is easily possible that under the varying conditions of railway service, particularly as roads are now made, the Fontaine locomotive may not in all respects come up to the expectation of the inventor and his friends; it may not, for instance, accomplish a speed of ninety miles. Nevertheless, what it has already done, if human testimony is worth anything, justifies the position taken by this paper, that it marks a notable advance in locomotive construction, and that—to repeat our own words—"if experience shall confirm the promise held out by the performance of the engine now on trial," the new locomotive "must materially increase the economy of railway service." As yet we have seen no adequate reason for doubting the probability that the future behavior of the engine will confirm the record it has already made.

THE POSSIBILITIES OF THE COTTON INDUSTRY.

At this time less than one-tenth of the superficial area of the Southern States is under cultivation. The late census report shows that less than a third of the cultivated area is devoted to cotton. Under more skillful cultivation it is not improbable that one third of the land now devoted to cotton would produce the entire crop of the present day. The possibilities of increasing the yield of cotton in the South are, therefore, practically unlimited.

Is there any risk of raising more cotton than can be marketed?

The census of 1880 shows that we had then 10,700,000 spindles. The product of only 700,000 spindles was exported, the rest going for home wear. The State Department has at Atlanta specimens of fabrics, prices, etc., from all parts of Asia and Africa. Ninety per cent of the Chinese, the largest body of cotton-wearing people in the world, are clothed with cloth that is manufactured in the primitive way, without machinery. Almost all Asia is clothed in the same way. Cotton manufacturing machinery has hardly touched this immense demand. Mr. Atkinson is authority for the statement that when drills can be sold in New York or Boston at seven cents a yard, they can be sold cheaper in Asia than the native hand-made goods. When middling cotton is nine cents a pound in New York, drills can be made and sold profitably at seven cents a yard.

The question of unlimited extension of cotton manufacture thus obviously hinges on the possibility of producing cotton at an average price of nine cents at the mill. It is believed that much more than the difference between nine cents and the market price for cotton is habitually lost by Southern planters through careless handling. It is reported that a farmer recently brought to the cotton fair at Atlanta a lot of cotton in the seed which he would willingly have sold to a factor for ten and a half cents a pound (lint), the market price on that day. The manufacturer examined it and gave him sixteen cents a pound. In other words, the intermediate steps between planter and manufacturer cost the planter five and a half cents a pound. The greater part of this five and a half cents loss is caused not by commissions, insurance, storing, and shipping—all these are comparatively small, and will compare favorably with similar costs in handling other produce—but by the universally careless method of handling the cotton. Careful picking from the field, careful ginning, secure baling so as to prevent soiling and to keep out sand, and a careful assortment of the different grades saved five and a half cents a pound.

It is not to be supposed that the extra care in this case cost the farmer anything like five cents a pound, or roughly, half the entire cost of his cotton. The desired price, nine cents a pound, mentioned above, is for cotton as it usually reaches the mill. It would be worth several cents more if in proper condition, increasing correspondingly the farmer's profit without enhancing at all the cost of the cloth.

From these figures it would seem easy for our cotton planters to increase their profits and at the same time furnish our manufacturers with cotton at such a price—improved condition being considered—as would enable them to command the markets of the world, even in competition with the hand work of savages. Of course with possible improvements in processes and appliances the margin of profit to the cotton planters of the South may be still further widened.

THE CAUSE OF FAILURE OF STEEL BOILER PLATES.

Steam Boiler Notes in the SCIENTIFIC AMERICAN of August 20, contain an account of the failure of Russian war yacht's steel boiler shells, and an abstract of a report on their behavior by Mr. W. Parker, chief engineer of Lloyds' Register, which was read before the Institute of Naval Architects of England. These plates, after having passed through the various tests required by the English authorities, gave way in a most astonishing manner under the official hydrostatic test after the boilers were completed. The analysis of the metal given by Mr. Parker showed a want of uniformity in their chemical composition. The papers lately read before the British Iron and Steel Institute shed more light on this important subject.

The paper of Mr. W. D. Allen, on the use of a mechanical agitator in the manufacture of Bessemer steel, shows that, in addition to the bubbly conditions of the ingots arising from confined gas generated by the admixture of the spiegeleisen or ferro-manganese to the decarbonized iron, there are veins or streaks of metal of different qualities and composition running in all directions through the mass, which are invisi-

ble to the eye, but manifest themselves in the physical properties of the finished products.

This is illustrated by an imperfect piece of glass, which shows veins and striæ arising from different densities of the composition; also by mixing painter's colors of different hues and densities. Lampblack and white lead, as an exaggerated example will not form a uniform resultant gray without much stirring. It is alleged that such is the case with spiegeleisen and decarbonized iron unless it is agitated and thoroughly mixed before being poured into the ingot mould.

In support of the theory that there is a difference in the chemical composition of the ingot before rolling into the finished form, we abstract from a paper read by Mr. G. J Snelus at the same meeting, the entire proceedings of which we find in the *Ironmonger*. Mr. Snelus says: "At the last meeting of this Institute, in the discussion of Mr. Parry's paper, Mr. Stubbs announced the remarkable fact that he had discovered that the 'cast steel ingots' could not be strictly said to be homogeneous, and that a 'redistribution of the elements took place during solidification, the carbon, sulphur and phosphorus going to the part of the ingot which remained fluid the longest, so that the center of the ingot became the most impure.' Some years ago Dr. Percy suggested to me the desirability of ascertaining whether the spiegeleisen became thoroughly diffused in an ordinary Bessemer charge, and, to test the question, I analyzed the first and last ingots from a charge, and also the top and bottom of an ingot."

At the first series of experiments, which were upon small ingots, Mr. Stubbs' theory could not be established, but on repeating them upon large ingots, different results appeared.

After the spiegeleisen had been added the blast was sent through for nearly a minute to assure a thorough admixture. Slices were taken from this ingot twenty-one inches from the top and four inches from the bottom. The samples were exhibited at the meeting, the bottom one said to be sound, while the top one was spongy, which is in accordance with every foundryman's experience. But the important feature is the difference in the chemical composition. There was more than double as much combined carbon, and more than four times as much sulphur and phosphorus, in the upper section as there was found in the lower section, while nearly the same difference existed between the center or axis of the ingot and the corners, as shown by analysis of successive drillings made on a diagonal line across the slip which had been cut horizontally from the prismatic ingot.

"These results," says the paper, "confirm the molecular interchange discovered by Mr. Stubbs in large ingots, and show that carbon, sulphur, and silicon become concentrated in those portions of the ingot that remain fluid the longest, leaving iron and manganese in excess in the portions from which they have liquidated."

The paper also says "the difference in hardness was most marked, rendering it difficult to cut the top slices near the center, while the bottom cut quite easily."

Now, it seems strange that Mr. Snelus should argue "that the singular molecular change does not afford an explanation of the peculiar behavior of the Livadia's plates." What, then, is the explanation? It is certain the plates were not homogeneous, if we are told the truth about their behavior, and the extreme care that was taken by the firm who made the boilers in annealing and reannealing them after punching the rivet holes. An engineer who has had experience with vicious workmen might fairly suspect that there is "a nigger in the fence."

It is hoped that our English neighbors will ferret him out, or else we cannot feel quite safe in the use of plates made from large ingots of soft steel. Our own steel makers have been more fortunate, but as the size of ingots increases there is danger that they also may get caught.

STEAM BOILER NOTES.

A boiler in Davis & Jones' portable steam sawmill, near Coalton, Jackson County, Ohio, exploded November 2. John Davis, one of the proprietors, was fatally injured, and David Griffiths was seriously injured.

It is a significant fact that in this country more boilers explode in establishments that use light fuel than in any other class of manufactories. In the year 1879 one-third of all the disastrous explosions that were published were in sawing and other woodworking mills that use their light refuse for fuel, and in 1880, 28 percentum of the unusually large total of explosions for that year were in this class of mills. It is probable that this results mainly from neglect of the safety va ves, coupled with the great, sudden, and oft repeated changes of the temperature of the boiler shell, the result of careless, excessive, and irregular firing, and perhaps the use of ice-cold feed water. The effect is violent contractions alternating with expansions of the parts of the boiler that are exposed to cold currents of inflowing air when the fire doors are opened, which occurs in this class of boilers perhaps ten times as often as in those that burn hard anthracite. The same parts of the boiler are, when the fire doors are closed, exposed to the greatest heat of the brisk fire, and a sudden explosion follows.

The great number of thrashing engine explosions that occur every autumn tends to confirm this theory of the cause of deterioration, from which no doubt many disasters arise.

It is also a fact that portable sawmills and thrashing machines are generally in the hands of log drivers or farmers, who do not think it worth while to have their boilers inspected or to employ an engineer, even when adjustments of the engine are needed, believing that they can "fix her up," and that "she" will safely wear out as their boots or their carts and draught chains do.

Builders of portable engines sometimes, nay often, sell their machines to inexperienced persons as absolutely safe from explosion, citing some feature new to the buyer or disguised by some change of outward form of the boiler, which render it entirely unnecessary to know anything about steam or the steam engine in order to use them with perfect safety.

"Build your fire, give her plenty of water, and carry all the steam you need, she's fixed to take care of herself," is the parting instruction to the enterprising huckster as he drives away with his new purchase, the *Excelsior* or the *Gamecock*, from the works of the equally enterprising builder of non-explosive portable engines. Those who know that there are twenty ways for that machine to get out of fix, a dozen of which relate to the safety valve and the steam gauge, do not care to read the details of the inevitable sequel of such an adventure.

A RAIN OF SPIDER WEBS.

In the latter part of October the good people of Milwaukee (Wis.) and the neighboring towns were astonished by a general fall of spider webs. The webs seemed to come from "over the lake," and appeared to fall from a great height. The strands were from two feet to several rods in length. At Green Bay the fall was the same, coming from the direction of the bay, only the webs varied from sixty feet in length to mere specks, and were seen as far up in the air as the power of the eye could reach. At Vesburg and Fort Howard, Sheboygan, and Ozaukee, the fall was similarly observed, in some places being so thick as to annoy the eye. In all instances the webs were strong in texture and very white.

Curiously there is no mention, in any of the reports that we have seen, of the presence of spiders in this general shower of webs. It is to be hoped that some competent observer—that is, some one who has made a study of spiders and their habits—was at hand and will report more specifically the conditions of this interesting phenomenon.

Quite a number of notable gossamer showers have been reported in different parts of the world. White describes several in his history of Selborne. In one of them the fall continued nearly a whole day, the webs coming from such a height that from the top of the highest hill near by they were seen descending from a region still above the range of distinct vision.

Darwin describes a similar shower observed by him from the deck of the Beagle, off the mouth of La Plata River, when the vessel was sixty miles from land. He was probably the first to notice that each web of the gossamer carried a Lilliputian aeronaut. He watched the spiders on their arrival and saw many of them put forth a new web and float away.

The behavior of the spiders when setting out upon their aerial voyage has been minutely described by a recent English observer. The shower observed by him occurred in September, 1875, after a thunderstorm without rain. He says:

"About ten A.M. I noticed small spiders running over my coat-sleeves, and had to brush off several trails of gossamer web. Looking round I found that brick walls, houses, branches of trees, etc., had these webs dangling from them, and that other gossamer webs were continually falling from above and adding to the accumulation. By mid-day a long fence was festooned from point to point of its triangular rail-tops with a ribbon-like ladder of gossamer; and this was growing broader and broader as the tiny creatures kept running along this ladder, each increasing the breadth by adding its own contribution of another silken thread.

"On examining next an iron palisading near, I found it in a similar condition, with the tops of the iron spikes connected by a vibrating silken ladder of gossamer, in some places nearly an inch broad. All along this ladder the little strangers were running in an excited and hurried manner, as if they had lost their way and had got into a strange country. Some, in traveling over their improvised road, made mistakes, and got into bordering webs of the garden spider, where they were speedily devoured. About 1 P.M. the clouds cleared off, the sun shone out, and I noticed that some of the spiders had begun to reascend into the atmosphere. They might have commenced this reascension earlier; but on observing that some *were* reascending all my attention was devoted to single spiders, and this is what I saw: Fixing my eyes upon one of them, I observed that as it left the gossamer pathway it selected a clean spot on the iron railing, and gathering its limbs closely together it projected from its spinnerets several threads, which expanded outward and stretched upward from nine to twelve inches. Then this parachute seemed to show a buoyant tendency, and suddenly the tiny creature left hold of the iron rail, or was lifted off it, and quickly 'vanished into thin air.' One after another I closely watched, with the same general result; though once or twice when the spider left the rail it floated for a few seconds in an almost horizontal direction, prior to changing it for an approximately vertical one. They, however, disappeared from sight so quickly that the angle of ascent could only be guessed at. This, however, may be set down, as the rule, at from ninety to one hundred and twenty degrees."

The object of these spider migrations, if they are migrations, and the reasons for the fall of the webs at a time when the spiders are able to ascend at will, are mysteries which are as hard to explain to-day as they were in Chaucer's time, or in that mythical period from which comes the ancient nursery rhyme:

"'Old woman, old woman, old woman,' quoth I,
'O whither, O whither, O whither so high?'
'To sweep the cobwebs out of the sky!'"

From the strength of the webs reported in the recent Western showers there would appear to be a doubt as to the spider which produced them. They seem to have been too strong for gossamers. Perhaps the shower may have been due to an unusual excursion of the more familiar geometric spider, this species having the same power of shooting out webs which float upon the air and sometimes serve as an air-raft for the producer. The natural history of spiders is comparatively an unexplored field for observation; and it is possible that many species emulate the wandering gossamer spider, and betake themselves to the air when occasion serves.

EXPERIMENTS WITH THE GOVERNMENT TESTING MACHINE.

A pamphlet lately published by Colonel T. T. S. Laidley, U. S A., contains an interesting account of experiments made with the great United States testing machine at the Arsenal, Watertown, Mass. The experiments were made upon thick, hollow, cast iron cylinders similar to cannon, some of them lined with coiled wrought iron, and some with bronze tubes, and in competition with them others lined with thin copper tubes. It was held by the author of the paper, as an officer of the Ordnance Board, that the simple hollow cylinder of American cast iron is stronger to resist internal pressure than composite cylinders made upon the plan proposed for the conversion of old 10-inch smooth borers into 8-inch rifled guns. The object of the thin copper lining used by Colonel Laidley is, in practice, to prevent the gases resulting from the burning of the charge from penetrating the incipient cracks in the bore that are developed by continued firing. These gases have thus "an enlarged surface to act upon to burst the gun."

The cylinders experimented on had a uniform diameter of 11 inches and a bore inside of the tubing of 3·3 inches. Of the cylinders made upon the composite plan, those having the iron lining had had a section of about 3 inches of cast iron and 0·9 inch of coiled wrought iron, in thickness on coil side of the bore. Those having the bronze lining had about 3·4 inches of cast iron and 0·5 inch of bronze, while those lined with thin copper had all but 0·1 inch of thin section of cast iron, and, as regards strength to resist internal pressure, they might be considered as cast iron with loose copper veneers. These cylinders, having a length of bore of 16½ to 17⅛ inches, were tested by pressure upon a filling of cold beeswax by means of a nicely fitting copper follower and a loosely fitting steel piston, which, having been put into the cylinder in the order in which they are here named, the whole was placed in the immense testing machine and the piston forced in. The wax was compressed 11·6 per cent under a pressure of 60,000 pounds per square inch, but the yielding of the cylinders before bursting allowed a shortening of the column of wax something more than that fraction of its length.

The veneered or copper lined cylinders burst at an average pressure of 93,400, the bronze lined cylinders at 84,500, and the coiled iron lined cylinders at 78,000 pounds per square inch. They burst at the above roughly stated averages with loud reports which were heard at considerable distance, and the fragments, not exceeding three or four in any one case, were thrown with such force as to crack a five-eighths inch wrought iron casing that surrounded them.

Colonel Laidley in his report says: "The strength of the different kinds of cylinders is in direct proportion to the area of cast iron in the longitudinal section through the axis of the cylinder." And his conclusion is: "That any system of gun construction based on this plan of conversion will be found to be defective in principle and in the end expensive."

It seems to be expensive in the beginning, as the report shows that about $1,700 will pay for an 8-inch rifled cast iron gun of the exterior pattern of the 10 inch Rodman smooth bore, while the weaker converted 8-inch guns recently made cost $2,050 each.

The other officers of the U. S. Ordnance Board seem to reject the conclusions based on these experiments, the board deciding "that any favorable consideration of the question of the use of cast iron (pure and simple) in gun construction would be a step backwards."

To an outsider it will not appear, from the report, that "pure and simple" cast iron is indicated by these experiments, but new cast iron guns lined with thin tubes "sufficient to act as gas checks and exclude the gas from all cracks that may be formed in the course of the firing."

Moreover, it is by no means certain that a sound cast iron surface of the bore is not penetrated by the gases, and that a proper gas check lining would not prevent the inception as well as the subsequent enlargement of cracks. The members of the board, however, having probably committed themselves, upon such information as they previously had, to the composite plan, do not approve of experiments with gunpowder upon *small* cylinders, as is now recommended by Colonel Laidley.

The pamphlet contains photographs of the broken cylinders and a reply to the remarks made by the Ordnance Board. We commend it for perusal to all who are interested in progress in gunnery.

THE PHANTASMOSCOPE, OR MAGIC WHEEL.

In an illustrated article upon the "Horse's Motion Scientifically Considered," which appeared in the SCIENTIFIC AMERICAN SUPPLEMENT, No. 158, January 11, 1879, the use of the zoetrope was suggested for showing the appearance of a horse in motion.

A zoetrope, although not complicated, requires considerable care and mathematical precision in its construction; but the phantasmoscope, or magic wheel, is comparatively simple, consisting, as may be seen by the accompanying illustration, of a disk of any diameter revolving upon a pin in the center. Figures in different poses of arrested action are painted or pasted upon the one side; under each figure is an oblong opening or slot. Much amusement can be derived from this old and simple toy. We herewith give one with the correct positions of a horse trotting a 2:40 gait, drawn in silhouette upon the outer margin of the wheel.

Cut the phantasmoscope, or magic disk out, following the outer circle with the scissors; this done, paste the disk upon a circular piece of cardboard. Under each figure, at the oblong places, cut a corresponding opening through the pasteboard. Fasten the wheel to a stick or handle by means of a pin at its center on which it can freely turn. To use the toy, stand in front of a mirror, as shown in the small illustration; hold the disk before the eyes, and look through the slots under the figures, and turn the wheel rapidly. The horses' legs will commence to move as in life, and as each successive position drawn upon the phantasmoscope is the exact one taken by a trotting horse, the horses in the mirror will all appear to be in actual motion on a fast trot. If the eye is directed over the margin of the pasteboard disk, an indistinct blur is all that is seen. The principle is generally well known and easily explained. It pertains to the phenomenon known as the persistence of vision. When the eye is directed through the slot the figure of a horse is seen for an instant as the opening passes the eye, and the impression is retained after the object is shut off by the intervening portion of the board between the slots until another horse

THE MAGIC WHEEL.

appears through the succeeding opening, when an additional impression is made, the same as the preceding impression, except a slight change in the position of the legs. These impressions follow each other so rapidly that they produce upon the retina of the eye the effect of a continuous image of the horse, in which the limbs, replaced by a succession of positions, present the appearance of a file of horses in actual motion.

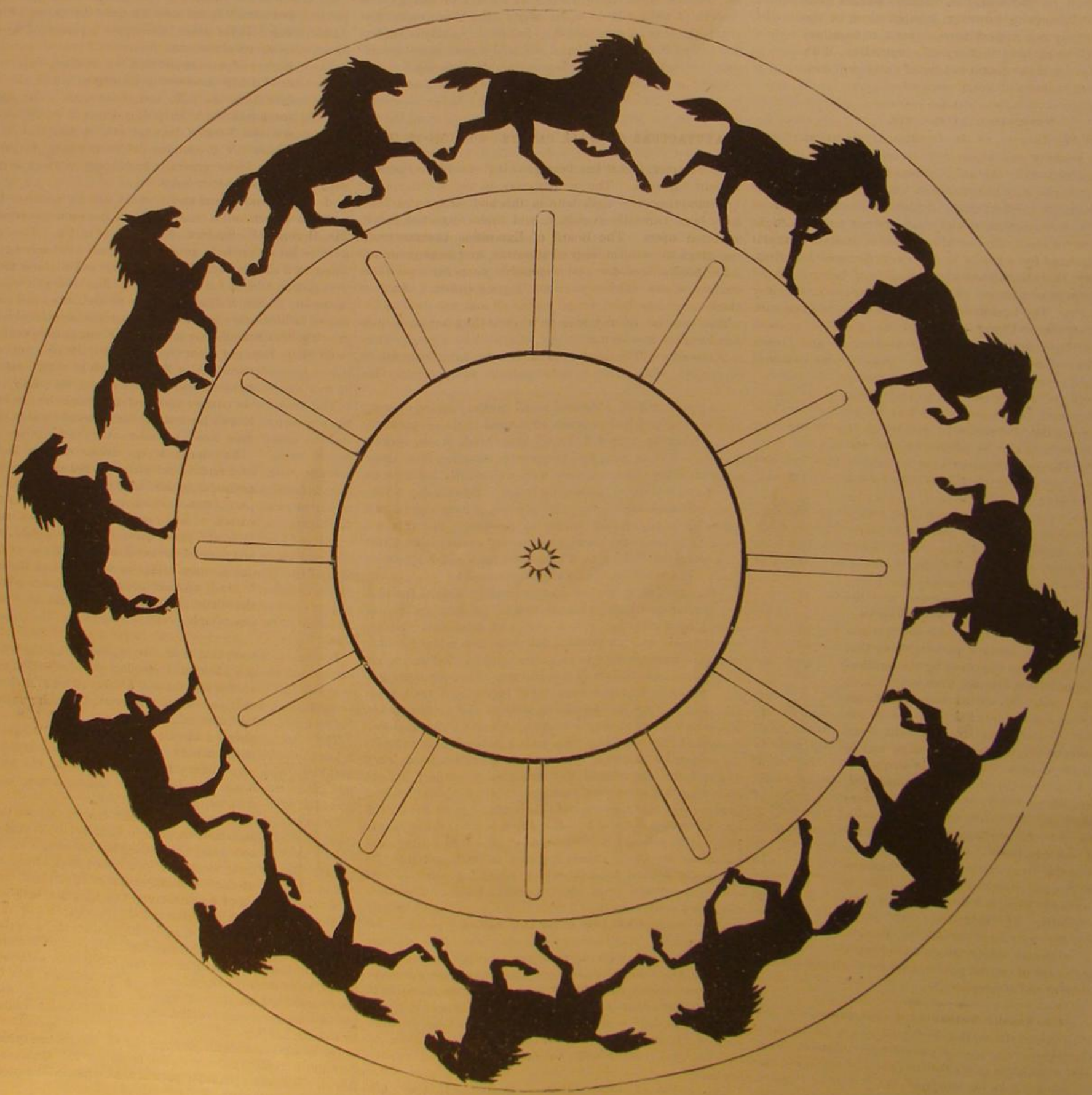
For young scientists this beautiful experiment will be found very entertaining.

Bridging Lake Pontchartrain.

The contract has been signed for building a six-mile trestle across Lake Pontchartrain. The Alabama and Great Southern Railroad ends at Meridian, where the New Orleans and Northwestern road begins leading to Lake Pontchartrain. Opposite the terminus of the New Orleans and Northeastern road, at Lake Pontchartrain, is the northern terminus of what is known as the "Old Fork Road," which begins at Canal street, New Orleans. The last-named road has been used principally for carrying pleasure seekers from New Orleans to Lake Pontchartrain. It has recently been purchased by the Erlanger Syndicate, and, in order to connect this road with the New Orleans and Northeastern, the construction of the trestle across the lake was found necessary.

External Use of Castor Oil.

The London *Medical Journal* gives reports from various practitioners who have found purgative results follow the inunction of castor oil. One writer states that he has frequently applied this oil to the abdomen, under spongiopiline or other waterproof material, in cases where the usual way of administering by the mouth seemed undesirable, and with the most satisfactory consequences. In a case of typhoid fever, also, half an ounce of castor oil was applied in this manner, under a hot water fomentation, the effect of this being as represented, to relieve the constipation and tympanitic distention that had been present, without undue purging or irritation of the bowels.



THE MAGIC WHEEL.

THE MANUFACTURE OF WALL PAPERS.

[*Continued from first page.*]

ple machine, the essential parts of which are two rollers, an upper one of steel, engraved with the pattern desired—ribs, wavy lines, or reticulations of any kind—and a lower one of hard manila paper. With many patterns this embossing adds very materially to the effect. The making of velvet or "flock" papers, as they are sometimes called, is an interesting process in the manufacture. The illustration shows the application of "flock" to portions of a pattern. These portions are hand-printed with varnish. Then the paper is laid in a tray which has an elastic bottom, and the "flock"—carefully ground and colored shoddy, imported for the purpose—is sifted over it. A boy then skillfully beats a rat-a-tat on the elastic bottom of the tray, which insures the even distribution of the "flock" over the varnished parts to which it is to adhere. "Plain flocks" are made by evenly coating the paper with varnish by drawing it through a machine constructed for the purpose, after which it is laid in a tray. The flock is sifted over it, and it is beaten by a series of long fingers moved by steam. These papers have the appearance and richness of fine cloth, and are much in demand for many purposes of decoration.

The designing department of such an establishment as the one we are visiting is, of course, a center of interest. Here artists are at work, getting their hints from foreign patterns, from tapestries, from stuffs of various kinds, from pottery, from objects of nature, from every possible source, for new designs. It cannot always be told in advance what pattern will strike the public eye and prove fashionable. Nor does it always follow that the most really artistic design will be the most popular. The only thing for the designer to do is to create a wide variety, and so suit all tastes. In this first-class establishment, however, though some of the patterns may not appeal to your taste or to mine, there will be nothing that is really inartistic. Both the designs and the combinations of color will conform to the canons of good taste.

THE MANUFACTURE OF WALL PAPERS.—WINDING IT INTO ROLLS.

Navigation of the Air.

Mr. F. W. Brearey, of the London Aeronautical Society, recently read a paper on aerial navigation, and explained, with the aid of models, the principles upon which attempts had hitherto been made and should in the future be made to effect artificial flight. The conclusion at which the Aeronautical Society had arrived was that flight was merely a mechanical action capable of imitation, that it was unassisted by air cells or other contrivances for effecting levity, that the balloon was incapable of being rendered useful to man as a means of locomotion except in the way of waftage. The tenants of the air, great as was the variety in their size and form, resembled one another in possessing three important capacities, the association and proper adjustment of which constituted the property and power of flight, namely, weight, surface, and force. The weight of a body was due to the action of gravity, and the problem was how so to retard or regulate the action of gravity as to cause its influence to be infinitesimally distributed. Having explained what he wished to show by projecting some peculiarly folded pieces of paper across the theater, he then let fall from a height a bat-shaped model, which soon, taking a curve, shot out in a nearly horizontal direction for a time. Had force, the third great principle of flight, been employed, it would have neutralized the action of gravity so long as it continued, and the flight of the models would have been prolonged. In endeavoring to estimate the proportion of plane surface to weight, so that the one might carry the other by the application of impulsive force, we were not without significant data. So varied were the forms of flight and so widely different the conditions—in some cases a heavy weight being supported by small planes or wings, and in others little weights by extensive surfaces—that, if ever the subject should be mastered, flight would probably be effected in more ways than one. Great weight and small surface, as the observations of M. De Lucy showed, must be accompanied by great velocity, as in the flight of the common sparrow, while with small weight and great surface, as in the butterfly tribe, a reduced velocity only was requisite. If, therefore, man could construct the necessary surface of strength sufficient to insure safety, he could certainly add, by the aid of engine power, sufficient velocity to obtain support from the atmosphere.

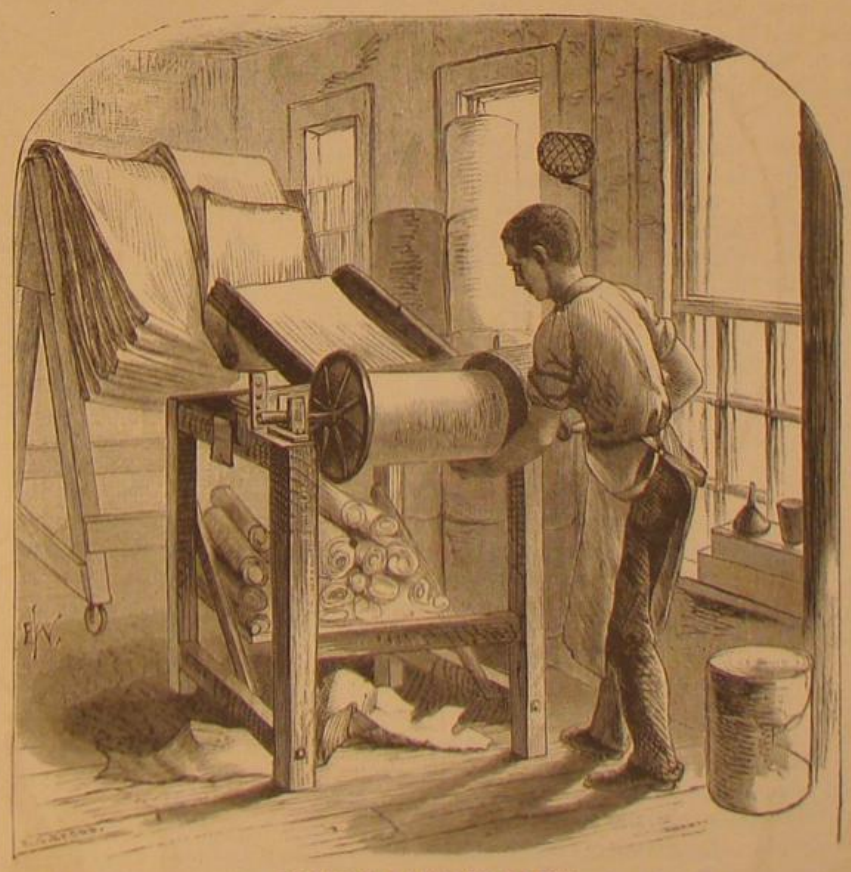
The Smoke Nuisance in Cincinnati.

The Cincinnati (Ohio) Board of Aldermen have passed an ordnance making the use of an effective smoke-consumer compulsory upon the part of all manufacturers and others whose business requires the use of a chimney that has become a nuisance to the neighborhood. The matter of selecting a consumer is left entirely with the user, the only requirement of the ordnance being that it shall be effective. Failure to comply with the provisions of the ordnance renders the one thus offending liable to a fine or imprisonment, or both.

It is expected that difficulties will be encountered in the enforcement of the ordnance, and there is a fear that many manufacturers will be driven into buying worthless devices, but there can be no doubt that the city will be ultimately benefited. It is also well established that there will be a gain to those employing effective devices, because of a more economical use of fuel.

The smoke nuisance in Cincinnati has long been of a grievous character, and it has been growing steadily worse with the city's growth. The contrivances in use in cities where bituminous coal is used, both in this and foreign countries, have been carefully examined, and their respective merits reported upon. The Board of Exposition Commissioners has given the subject especial attention, and large premiums have been offered for two successive years for smoke-consumers whose efficiency could be established. None of those tested has been found to be all that was desired, but almost any of them would be a great improvement upon the furnaces now in use

Alderman Oliver mentioned, at a meeting of the board, that while in London the past summer he observed that, though fifty times as much soft coal was being consumed as in Cincinnati, there was more smoke to be seen in one ward of Cincinnati than in the whole city of London. Here is a good subject for study by inventors.



REELING UP WALL PAPER.

RECENT INVENTIONS.

Mr. Robert Seeger, of St. Paul, Minn., has patented an improved vapor burner. The invention consists in a combination with the inlet or retort tube of a burner provided not only with an ordinary jet hole, but with an auxiliary jet hole which admits of a flame impinging upon the inlet tube to heat the latter and vaporize the liquid passing through it. Shields are formed on the inlet tube, and the tip tube is provided with an overhanging disk to retain the heat derived from the auxiliary flame; also the tip tube, which is vertically adjustable, both controls the air inlet and has holes in its side which communicate with an interior chamber in the burner, whereby a return current of gas to the jet hole is formed.

An improvement in wire fences has been patented by Mr. Lorenzo Dow, of Denver, Col. The invention consists in combining sheet metal posts open longitudinally to give elasticity, and provided with tongues, with wire rails, of which one is wrapped around each post, whereb they wires are kept taut.

Mr. George T. Finagin, of Pioche, Nev., has patented an improved monkey wrench. The handle of the wrench, which carries the fixed jaw, is serrated on its front edge, and the sliding jaw also formed with serrations to correspond. Surrounding this movable jaw and the handle is a broad yoke, which is recessed on its side opposite said jaw, to receive within it the fulcrum and pivoted end of a lever. This lever is provided at its forward end with teeth which engage with cogs on a wedge within the yoke and bearing on the handle, so that when the lever is down, in which position it is maintained by a spring, the wedge locks the serrated jaw on the serrated handle, but when the lever is raised the wedge is released, and said jaw left free to move. This forms a very simple and strong construction, and provides for an extended grasp by the wrench.

Mr. Edward A. Smith, of St. Albans, Vt., has patented an improved smoking tube. The invention consists in a smoking tube, preferably of cigar shape, provided internally with a spool having end flanges and draught slots. This spool is placed in the tube to leave a chamber in the rear of it next to the mouthpiece, and a space in front for the charge of tobacco or cartridge containing the same. This smoking tube is clean, safe, and convenient. The smoke, passing through the spool and rear chamber in broad and thin streams, becomes cooled and deposits the oily matter it contains before reaching the mouthpiece, and the device generally seems to meet every requirement that the smoker can desire.

A very ingenious and useful check file, suitable for stores and other mercantile establishments, has been patented by Mr. Herschel V. Sanford, of Milledgeville, Ga. The object of this invention is to promote accuracy in receiving and filing cash checks and other memoranda. The check file has a supporting frame for attaching it to the cashier's desk. In using the device, the salesman passes his money and check to the cashier, and then forces down one of a series of levers bearing his distinguishing mark. This causes a file-covering lever to be removed from one particular file of a series of wire files, so that the cashier cannot err and put the check upon a wrong file. As soon as the cashier has filed the check, he touches a lever which causes the removed lever to again drop into place on or over the file it controls.

An improved tag, which combines facility of manufacture with reduced cost, has been patented by Mr. John Chantrell, of Bridgeport, Conn. The device consists in a combination, with the cord and tag body, of a metallic clip passed through a slot in said body and formed with end tongues which are bent down, upon either or both sides of the clip, to firmly connect the cord with the tag body, the whole forming a very secure as well as cheap tag.

An improved apparatus for facilitating sketching from nature, has been patented by Mr. Richard D. Gallagher, of Omaha, Neb. In this apparatus, a folding canopy, having a curtain to receive the head and upper part of the body of the artist, and provided with a mirror and lens in its top, is used in connection with an adjustable drawing board in the bottom of the canopy frame, the whole being arranged so that the picture of the country back of the artist will be visible upon a sheet on the board, and may be sketched thereon. The mirror is adjustable, and the adjustment of the board to bring it into proper focus with the lens is effected by employing a circular board capable of being turned, and having a screw-like fit in the bottom of the canopy frame. The top of said frame is supported by folding braces, and the entire frame is sustained by folding legs, to certain of which is attached a folding seat, the whole admitting of being packed into a small compass and very convenient of carriage.

An improved gong bell has been patented by Mr. Patrick McMahon, of New York city. The object of this invention is to obtain in gongs a heavy blow of the hammer with a comparative short movement of the operating lever, and also to provide a gong that can be used right or left hand without change of the mechanism.

Heretofore sketching blocks have been made of a series of detached sheets united at the edges by a strip of paper or muslin, which sheets are successively cut from the block and loosened after the completion of the sketch for the purpose of laying bare the next sheet; but these detached sketches are easily lost and mislaid, and are very apt to become soiled and damaged. Mr. Charles R. Lamb, of New York city, has patented a sketch-block in which the completed sketches need not be entirely detachable to lay bare the next lower sheet.

Messrs. Louis R. Sassinot and Max L. C. Huet, of New Orleans, La., heve patented an improved portable furnace, which is light, strong, and durable. The improvement consists in a portable furnace formed of a cylindrical or square metal box containing a basket for the burning fuel, which basket is provided with a series of hooks, which are hooked on the edge of the exterior vessel.

Mr. Henry F. Childers, of Elsberry, Mo., has patented an improvement in newspaper files, in which bars or rods and locking and pointed holding screws are used to hold the papers in place, one of the locking screws being provided with a nut and forming a pivot for the one bar to turn upon when entering or removing a paper. By this improvement a paper can be filed with little trouble. The loosening of a nut and moving aside of a bar prepare the file for the reception of a paper, which, when placed on the file, is secured by the reverse movements of the nut and bar. The bar or rod also protects the points that secure the paper in its place, so that the points cannot possibly tear holes in or mutilate a paper when it is desired to turn from one paper to another.

Mr. Charles D. Jaques, of Curtisville, Mass., has patented a horse-tail tie. The object of the invention is to provide a device by means of which horses' tails, after they have been braided or twisted and folded, may be easily and quickly secured for holding and protecting them from mud. The invention consists of a divided ring or clasp, which, after the tail of the horse has been braided and folded or twisted and folded, is opened and placed around the tail. This clasp is formed with a slot in its back to receive a binding cord that not only serves to bind the tail securely, but also, by engaging with projections on the face of the clasp, to prevent loss of the clasp, which may if desired be provided with a button catch.

Mr. Henry S. Northrop, of Pittsburg, Pa., has patented an improved metallic roofing shingle. This invention relates to sheet metal shingles which are to be secured to the roofs of buildings with nails or similar fastenings. The shingles are of such form that in laying them the edges may be united to form a water-tight joint without the labor of seaming, and the shingles fastened to the roof in such manner that the nail heads will not be exposed to the weather.

An improved steam cooker has been patented by Mr. Thomas F. Dean, of Boston, Mass. The invention consists in a suitable vessel of cylindrical or other form, provided near its mouth with a V-shaped water ring, one edge of which is united with the upper edge of the vessel, the bottom of this V-shaped ring resting upon a bead projecting from the vessel. This vessel is provided with a conical cover, a sieve, or perforated disk for receiving the articles to be cooked, with a water filling tube, with an exhaust tube for carrying off the odor of the articles being cooked, and with a small pane of glass or mica, that is inserted in the side of the boiler to show the condition of the contents or height of the water.

A new and improved waist of waterproof material, for the purpose of protecting the dress from being soiled or discolored by perspiration, has been patented by Emma R. Turner, of Watseka, Ill.

Messrs. Olof Johnson and Johan J. Sandström, of Algona, Iowa, have patented an improved mould for forming the walls of cisterns or wells. In using this apparatus the hole for the cistern or well is made somewhat larger than the required diameter when finished. The mould is then placed in position in the hole and the cement or plaster is poured around it. When said cement or plaster is sufficiently hard and "set" the mould is removed by either separating the sections or by simply releasing the latches, so that the dome and the cylinder may be rolled or folded.

An improved placer worker and concentrator has been patented by Mr. Robert Barber, of Omaha, Neb. This invention relates to that class of apparatus used in placer mining whereby the ores or tailings are disintegrated, sifted, and washed preparatory to an amalgamating process.

The Durability of Redwood.

Mention was made in a recent issue of this paper of the suitability of redwood for wine casks. Messrs. Fulda Brothers, of San Francisco, tell us that redwood casks have been used in California for many years; indeed, two-thirds of the vast wine crop of that State is fermented and stored in casks and tanks made of this timber. The casks simply require to be slightly steamed and well soaked to remove the color; after that the fermentation of the wine does not extract any color or taste.

The trade in redwood is becoming of considerable importance, a great deal being shipped eastward to Denver, Omaha, Kansas City, and the Atlantic coast as far as Rhode Island.

The wood is specially valuable in situations which occasion rapid decay in other timber. Seventy years ago the Russian Fur Company erected a redwood stockade at Fort Ross, Alaska. The posts were cut down level with the ground some years ago, but the buried parts remain perfectly sound, excepting the thin layer of sapwood near the bark, the alternate soaking and drying of seventy years having no injurious effect upon the heart wood. A piece of one of the posts, with a certified statement of its history, was sent to San Francisco a few weeks ago. The sender, Mr. G. W. Coll, of Fort Ross, states that he knows of shoots from old stumps which have grown to be three or four feet in diameter in forty years, indicating a hopeful restorative power in redwood forests under favorable conditions.

The redwood in demand in California for underground uses is what is known by the lumbermen as "black-heart redwood." It shows a dark color when cut with a knife, the outer layer only becoming "seasoned." "Black heart" is exceedingly heavy—too heavy to float. One who has observed schooner-loading at chutes along the coast tells the *Pacific Rural Press* that a post of this wood which plunges overboard never rises, and a board lingers on the surface a moment and then slowly slides down into the depths. This is the sort which is sought for in foundations, and under brick walls is believed to be imperishable.

Self-Propelling Fire Engines.

At the recent convention of the Massachusetts State Firemen's Convention, held in Springfield, Mass., beginning on the 11th of October, a self-propelling fire engine from Hartford, Conn., was exhibited and greatly astonished many people. The *Fireman's Journal* says:

"It steamed around the City Hall Square twice, the last time in fifty seconds, and then the engine was reversed and run backward. Afterward it ran up grade of half a mile or more at a fast rate, belching smoke and sparks high in the air. . . . The plaudits of the crowd were more than ever called forth when the engine, while coming rapidly down the steepest grade, was stopped suddenly, backed a trifle, and then sent down the hill again."

A Hartford letter to the *Journal*, speaking of this exhibition, is more explicit. It says:

"Her first exhibition of ascension was at Armory Hill, where her performances completely annihilated the doubting Thomases. She carried 110 pounds of steam, and blew off when she topped the hill. The parade lasted a couple of hours, and in the afternoon thousands of people turned out to see her go around Court Square. At a given signal, and with 110 pounds of steam, she went away and made the circuit in handsome style. A horse car impeded her travel slightly at one corner, so she 'continued the march' and made the second circuit in forty-eight seconds—a quarter mile trip with four corners to turn. Then she went up and down a straight stretch in front of City Hall, forward and reversed, and was loudly applauded. Next she went to Harrison avenue, where there is a hill with a grade of seventeen feet to the hundred. Her new-made friends lacked confidence there, but only for a moment. At the word of command up the hill she went, and had a hundred pounds of steam when she landed. Then, by orders, she rolled down to the center of the hill, stopped, went back a few feet, and then to the foot of the hill. Then she reversed, and backed up the hill, came down, went to the head of the street and turned about, speeded through again, turned about, and was dismissed."

This engine is called first-class, having two 7⅜ inch steam and two 4¼ inch water cylinders; 8 inch stroke of pistons. It is designated as No. 7 Blake, and has been in service since March, 1876, in Hartford, where its practical performances have been greatly admired.

There has been much prejudice among firemen against self-propellers, because they have, it is said, to be carefully watched and handled, requiring trained men to operate them. But the success of this sample, together with that of No. 4, in the same city's service, which has smaller steam cylinders, with the same sized pumps, having the same stroke, and which was put in service in June, 1879, seems to demonstrate the entire practicability of this improved system of fire extinguishers.

Fast Trains to the West and South.

The Pennsylvania Railroad Company began, October 31, the experiment of running a special passenger train from this city to Chicago, stopping only at Harrisburg, Pittsburg, and Fort Wayne. The trip is made in twenty-six hours—ten hours less than the best time heretofore.

Arrangements have been made for a rival train on the New York Central, which began running November 5. It leaves New York at eight o'clock in the morning, and is due in Chicago at five minutes past nine the following morning. The distance by the Pennsylvania route is 913 miles; by the New York Central, Lake Shore and Michigan Southern, 979 miles.

The saving of time by the fast trains makes it possible for mails to reach San Francisco thirty-two hours earlier than heretofore, and the intermediate points are correspondingly benefited. Connection with the fast train on the New York Central is made at Albany by a train leaving Boston at 6 P.M., making the time from Boston to Chicago about twenty-seven hours.

A fast mail service has just been established between New York and Jacksonville, Florida. The mail leaves New York at 4:35 A.M., and arrives in Jacksonville the following day at 6:20 P.M. Included in this service is a mail for Atlanta, Ga., which reaches that city at 10:35 A.M. the day after leaving New York.

Correspondence.

Steam Buggies.

To the Editor of the Scientific American:

It seems strange to me that the subject of steam buggies has not received more of the attention of the mechanical public. The advantages of such conveyances would be many and very desirable. It need not or would not cost any more or so much as animal propulsion, when the entire cost of buggy, horse, and harness is considered.

The wear and tear would not exceed the same or equal it when the same entire present rig is considered.

The cost of feed would not be equaled by that of the small quantity of fuel consumed.

The wages of groom or stable boy would be saved, as no attention would be necessary scarcely, except when under way.

The only other requirements would be to keep up the supply of water for the boiler and of liquid fuel and keeping the machinery oiled. The machinery could be painted and nickel-plated, so that nothing more than wiping would be necessary.

The suburban resident, going to or from the city, could run his little steam buggy into his buggy shed, turn off his supply of liquid fuel, and leave it with no dread that his trusted and valuable horse may not be properly fed and cared for, or, when turning down his flame and locking up his engine on making a stop, that on reappearing his horse may have frightened and run away, injuring himself and destroying buggy and harness.

The advantages of a steam buggy over our present horse and buggy are many, and you can no doubt enumerate more of them and clothe them in better language than I have done, as well as point out what inherent disadvantages such a vehicle and mode of propulsion would have or be likely to have.

I (and no doubt many others of your subscribers) would like very much to have you devote an article to this subject, pointing out the essentials or leading points in such a conveyance, and directing the attention of manufacturers of small engines or carriage manufacturers, who could experiment easily and inexpensively in this field to this very promising subject.

It would be necessary for you to discuss the grades and kinds of pavements or roadways that could be overcome by such a vehicle, in what way the power could be most simply generated and efficiently applied to the buggy, etc.

It seems to me that benzine will be found the most suitable fuel, burned in a gas pipe burner pierced with fine holes, as it is now in use for other heating purposes. On turning a cock the benzine burns at all these fine holes and heats the burner, so that the fluid is forced back by the vapor generated, and which, escaping under the consequent pressure, burns like a gas flame and very economically.

Also I think the power should be conveyed to the driving axle or wheels by a suitable chain, to avoid slip and be reliable.

The weight of boiler, engine, and connections, together with the load, should bear on the hind or driving wheels, and one wheel only in front would be necessary to steer or guide the conveyance.

I think an upright tubular boiler, in which steam could be raised and generated quickly, and in large quantity for its size and weight, would be most suitable.

W. C. K.

The mechanical difficulties that have prevented the use of steam on common roads have by this time come to be fully appreciated by practical men, and they do not appear to be formidable or numerous, especially so since liquid fuel, high steam, and small powerful generators have taken practical shape. The adhesion of a pair of driving wheels that sustain a considerable portion of the load has been repeatedly shown to be sufficient for all practicable road grades. The link motion seems to fulfill the requirements of increased power at starting. The noise and smoke tending to frighten horses that are met on the road have been mastered, so that a well trained horse pays little attention to steam carriages, even when seen for the first time.

It seems, therefore, that this field is an inviting one for the inventor, and that our correspondent's points are well made. The weight of the complete steam buggy in the present state of engineering and carriage building arts need not now remain as so great an objection as formerly. Steel, aluminum bronze, and high steam are capable of greatly reducing the avoirdupois of a horse power in the steam engine.

The Fontaine Locomotive.

To the Editor of the Scientific American:

In recent numbers of your paper are drawings of the Fontaine locomotive and detailed descriptions of it. The inventor claims that there is a great gain in the application of the power by the intervention of what is equivalent to gearing between the engine and the rolling wheels. I do not gainsay this; indeed, I think he is right. But what I wish to suggest is this: that if there is a gain in the case of a locomotive there would be an equal advantage in using the same intervention between the engine and the wheels of a sidewheel steamer.

The wheels of a steamer may be regarded as rolling over a plane from two to four feet below the surface of the water. Therefore the conditions between the engine and wheels are

about similar. If there is a gain in the application of power by the Fontaine plan, there would also be a gain by applying it on sidewheel steamers.

It seems to me, however, that if Mr. Fontaine would lower his drivers, if possible, the machine would vibrate less. Place them, if possible, so that their peripheries would be not more than nine inches off the track.

Let some experts give us some information on the above ideas.

SOTOR.

New Orleans, November, 1881.

Fast Locomotion.

To the Editor of the Scientific American:

There seems to be a great desire to have high speed locomotives. It has occurred to the writer that by combining two or more pistons on one rod, or two or more cylinders with one piston rod passing through both cylinders, in this way shorten the stroke of the pistons one half, and make up the loss of travel of piston by having double the amount of piston surface. In this way you would greatly lessen the vibration of the moving parts of the engine, and be able greatly to increase the revolutions of the drivers. As all the working parts are traveling one half the time and distance, but under a double piston pressure, I think the speed of an engine built in this way could be greatly increased without any detriment to the machinery, and accomplish what the Fontaine engine does.

W. B. DUNNING.

Geneva, N. Y., November, 1881.

The Stormy Petrel, or Mother Carey's Chicken.

To the Editor of the Scientific American:

Reading your valuable paper under date of November 27, 1880, in giving the history of the bird stormy petrel, known to us mariners as Mother Carey's chicken, you state it is believed it does not dive. Please allow me to correct that by saying it is one of the greatest diving birds in sea water known, the kingfisher excepted. I have seen fifty to one hundred of them at a time diving six to seven feet after pieces of beef that were thrown overboard to them.

JNO. T. HOLT,
Commanding ship David Stewart.

Ship David Stewart, at sea from Rio de Janeiro, bound to Baltimore, Md., October, 1881.

Note on the Humid Assay for Silver.

To the Editor of the Scientific American:

In making the humid assay for silver a great deal of time is necessarily spent in waiting for the suspended chloride to settle and leave the liquid clear to observe the action of the next drop of the precipitant; this, even when the solution has been previously heated. I have reduced the loss of time and insured greater facility in making an assay, by dividing the solution (containing the silver) into several, say, five equal parts, in separate vessels. I place them in a row, and add, say, 3 c.c. of the solution of salt to the first, 4 c.c. to the next, 5 c.c. to the next, and so on. After the precipitate has subsided I add, say, one-half c.c. of the same solution to each of the several parts of the silver solution, successively. Numbers one, two, and three will perhaps show traces of silver still in solution, but numbers four and five none. The total amount precipitated from number three multiplied by five (as it represents only one-fifth of the original solution of silver) will be the amount of silver contained in the ore or alloy being assayed.

A simple means of settling the precipitated chloride almost instantaneously is to agitate the solution with a few drops of chloroform. Its action seems to be entirely mechanical. The agitation disperses the chloroform in minute globules throughout the silver solution, which in settling to the bottom carries with it every particle of the chloride.

A. P. WHITTELL, M.D.

San Francisco, Cal., October 16, 1881.

Brooks' Periodic Comet.

I have, with much pleasure, just received from Prof. S. C. Chandler, Jr., of Harvard Observatory, the following interesting announcement concerning the comet discovered by me on October 4, 1881:

HARVARD COLLEGE OBSERVATORY,
CAMBRIDGE, Nov. 2, 1881.

William R. Brooks, Esq.:

SIR: You will be interested to know that we have been busy investigating your comet, and I have demonstrated it to be periodic; revolution about 8½ years. Of course the numerical value of the perihelion is a little uncertain yet, but the fact that the comet is a short term periodical is beyond doubt. These are the new elements:

Perihelion Passage, 1881, September 12.82437. Wash. M. T.

Long. Perihelion	18°	10′	5″
Long. Node	66	9	2
Inclination	6	53	26
Log. Perihelion Distance	9.8356448.		
Period	3047.34 days.		

S. C. CHANDLER, Jr.

From the foregoing it will be seen that another addition has been made to the rather limited list of known comets of short period. Swift's comet of 1880 was the latest addition previous to this one.

WILLIAM R. BROOKS.

Red House Observatory, Phelps, N. Y.,
November 3, 1881.

MECHANICAL INVENTIONS.

Mr. Andrew J. Miller, of Patterson, Ga., has patented an adjustable box for cotton gins, intended specially for application to the McCarthy cotton gin, but capable of being applied to any gin or other machine wherein a striking or shaking motion is used. The improvement relates to the connections between the vibrating stick or rod and its operating shaft. The invention consists in an adjustable box constructed to hold the stick securely, prevent any down or sidewise movement, and to allow compensation for wear.

An improvement in rotary pumps has been patented by Mr. Abijah S. Clark, of Turner's Falls, Mass. The invention consists in connecting the piston case with the base by screw dowel pins and screw bolts, so that the case can be adjusted to keep the inner surface of its upper part in contact with the wings of the pistons as the piston shafts wear down in their bearings; also, in providing the piston shafts with supplementary bearings to prevent the said shafts from springing out of line; and also in connecting the piston shaft stuffing boxes with the piston case heads by slotted flanges formed upon the said stuffing boxes and screw bolts screwed into the heads.

Mr. James M. Trackwell, of Skookumchuck, W. T., has patented an improved wood boring machine, which is more particularly intended for boring in the trunks of trees, either while standing or when fallen, but is applicable to various kinds of wood boring. The invention consists in a novel construction and combination, with an auger stock and its carrying frame, of a frame and devices connected therewith for holding the auger in place while at work.

An improved machine for combing cotton has been patented by Messrs. John M. Hetherington, of Manchester, County of Lancaster, England, and Edouard J. J. Lecœur, of Rouen, France. The invention consists, first, in a particular construction of the rotating clamps; second, in a comb situated on or near the feed plate, operating in connection with the clamps; third, in a comb fastened on a lever and having a reciprocal and oblique movement; fourth, in a pusher having a forward and downward movement and a holder having a vertical movement, in combination with a table for receiving and piecing together in slivers the tufts of fibrous material.

Messrs. Frederick Crich, of Pittsburg, Pa., and John A. Crich, of Naugatuck, Conn., have patented an improvement in that class of devices that are designed to remove the surplus coating metal from wire as it is drawn through the galvanizing or tinning bath. The invention consists of two metallic plates, having opposite edges longitudinally grooved for holding the wiping material and vertically slotted for the guidance and passage of the wires, one plate being stationary, with its grooved edge upward, and the other being pivoted, with its grooved edge downward, and provided with a lever and weight for regulating the pressure upon the wires, the two plates being arranged in such a manner that the wires, as they are drawn from the metal bath, are brought in contact with the wiping material, first of one plate and then of the other.

An improved take-up and let-off mechanism for looms has been patented by Messrs. William A. Bramall and Charles R. Innes, of Chester, Pa. The object of this invention is to operate the yarn beam in looms by connections from the take up mechanism, in order to provide for letting off the yarn uniformly. The invention consists in a sliding stand fitted for movement to and from the yarn beam and carrying friction rollers that are geared to the take up mechanism. The stand rises as the yarn beam diminishes in size, so that the friction rollers bear constantly on the yarn.

Mr. Terrence H. Hughes, of New York city, has patented an improved machine for printing or coloring the yarn used in weaving carpets. As usually constructed, such machines consist of a drum, on which the yarn is wound, and a traversing carriage carrying the paint box and rollers by which the color is applied. It is essential that the color be scraped into the yarn after application by the roller. The object of this invention is to work in the color by pressure, and also to effect the winding of the yarn on the drum by automatic mechanism.

An improved machine for making split keys has been patented by Mr. Robert T. King, of Columbus, Ohio. This invention consists, principally, of two recessed jaws pivoted upon a table contiguous to a stud or pin, the jaws being operated by a pivoted lever connected with the lateral ends of said jaws by means of links; also, of lever mechanism whereby the completed key is caused to drop out of the way of the next blank.

An efficient carpet sweeper that is simple and cheap of construction and noiseless in operation, has been patented by Mr. Myron G. Stolp, of Aurora, Ill. The casing is of such a form as to admit of using one sheet of material for the covering, and having the end boards of wood, to the edges of which the sheet is fastened. By this manner of construction the work of making the casing is greatly simplified.

An improved stuff regulator for paper machines has been patented by Mr. Charles W. Mace, of Westbrook, Me. The object of this invention is to accurately gauge the flow of stuff to paper machines, so as to secure uniformity in the thickness and weight of the sheets of paper. Heretofore a movable gate has been used to regulate the flow, and the paper weighed at intervals to determine the adjustment of the gate; but between these intervals the paper is liable to vary on account of the constant variations in the density of the stuff. The improvement consists in the automatic adjustment of the gate to the variations in the weight of the stuff as it is fed to the machine, and in a combined feed box, balance, and gate.

Mr. W. P. Taylor on the Efficiency of the Fontaine Locomotive.

CANADA SOUTHERN RAILWAY CO.,
BUFFALO, N. Y., July 4, 1881.

WM. H. VANDERBILT, President.
WM. P. TAYLOR, General Manager.

E. Fontaine, Esq., New York City:

Your favor of the 2d instant, asking my opinion of the Fontaine engine, is at hand. I am happy to reply that this engine is surely proving herself a perfect success, both in power and speed, also in a great saving of fuel.

The engine has been running for several months on our road in freight and passenger service. A test was made with her against one of our best Baldwin engines, with the same sized cylinders, running on regular passenger trains. An accurate record was kept of the fuel consumed, which shows that the Fontaine made an *average of fifteen miles more* to a ton of coal than the Baldwin engine doing the same amount of work.

As regards the engine running faster than ordinary engines, that has been fully demonstrated on several different occasions and times by different parties. On Wednesday last, the 1st instant, this engine hauled our regular passenger train from St. Thomas to Amherstburg, and made more than a mile a minute whenever called upon to do so. Our private car was attached, making seven cars in the train. A number of miles were run in fifty-six and a half, fifty-seven, and fifty-eight seconds, as timed by the party on the train, which consisted of Mr. Tillinghast, assistant to President of New York Central; Mr. Cox, Assistant Treasurer of Canada Southern; Mr. W. H. Taylor, Auditor of Canada Southern; Mr. Davis, of Messrs. Brown Bros., Bankers, New York, and several others.

This alone proves that your engine can draw a good sized train a mile a minute, without difficulty. There is no question but what she can perform the same service, has greater speed, and uses from twenty five to forty per cent. less fuel than other engines of the same size. While running on freight, the "Fontaine" handled our heavy freight trains as easily as any of our larger Schenectady engines with seventeen by twenty-four inch cylinder, which are the largest engines we have on the road. This shows, at least, that your engine has as much or more power to draw heavy loads as any engine of the same size. This, in addition to her extra speed and saving in fuel, must necessarily demonstrate her superiority over other engines.

I can only add that I wish we had more of the same pattern on our road.

W. P. TAYLOR, *General Manager.*

Wrangell Land an Island.

The mystery of Wrangell Land has been solved. The unusually open season just past made it possible for Captain Hooker, of the revenue steamer Corwin, to penetrate the pack ice and effect a landing on the morning of August 10. This was, so far as known, the first landing ever made on that remote and desolate shore. The landing place was in latitude 70° 4′ north and longitude 177° 41′ west.

A fortnight later the Arctic search steamer Rodgers effected a landing near the same place, and the day after entered a fine harbor, whence expeditions were sent east and west around the coasts to look for traces of the Jeannette, but failed to find any. A land party, under the command of Captain Berry, climbed a mountain 2,500 feet high, whence they saw open water all around except between the south and southwest, where a high range of mountains seemed to terminate the land. The harbor where the Rodgers last anchored for this land exploration was in longitude 178° 10′ west, latitude 70° 57′ north, south and west of Hooper's landing at Clark's River. The boat's crew made an unbroken tour around the island. After having established Wrangell Land to be an island, the Rodgers steamed 120 odd miles north and northwest in search of further land, but failed to find any.

On September 19 the Rodgers reached latitude 73° 44′ north, the highest point yet attained by an exploring vessel, as far as known.

New Process for Sulphur.

The authors boil out the sulphur from its gangue in a solution of chloride of calcium containing 66 per cent of the solid salt and having its ebullition point at 120°. This solution attacks neither the sulphur nor the gangue. In this manner the sulphur is extracted in a state of great purity, at the cost of five francs per ton, and without the production of any nuisance.—*M.M. de la Tour du Breuil.*

Radiophony Produced by Lampblack.

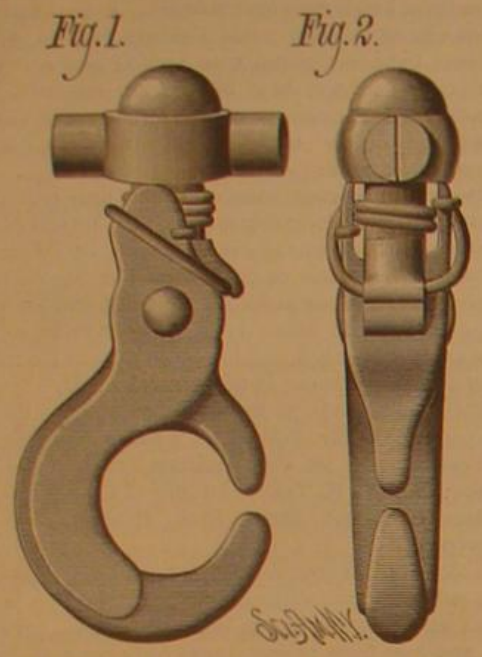
Lampblack is not merely pre-eminently the thermophonic agent, but it may, like selenium, act as an electric photophone. The author, referring to the double coil receivers, which he described (*Comptes Rendus*, xcii., p. 789), states that, instead of selenizing one of their surfaces, it may be blackened by exposure to the smoke of an oil lamp, taking care not to carbonize the parchment paper, which isolates the metallic coils from each other.—*E. Mercadier.*

AUTOMATIC DETACHING AND LOCK HOOK.

The engraving shows an automatic detaching and lock hook lately patented by Mr. George B. Whiting, of Washington, D. C. This hook may be applied to ropes, chains, rings, and shackles, in connection with boat davits and cranes, and has many other useful applications. It can be readily and easily attached, and, if required, locked in position, or as promptly and quickly detached from its connection.

Fig. 1 is a side elevation, and Fig. 2 is a front elevation of the device.

The shank of the hook has a swiveled connection for attaching it to the block or shackle with which it is to be used. A shell, pivoted to the shank of the hook and embracing the back of the hook, has a point projecting toward and nearly touching the point of the hook. The sides of the shell extend upward and are engaged by the ends of a spring wound around the shank. This spring tends to



WHITING'S DETACHING AND LOCK HOOK.

throw the shell forward toward the point of the hook, but is prevented from doing so by a link that is pivoted to the front of the hook shank. When the shell is unlocked by slipping the free end of the link downward, it is forced forward against the rope, ring, or shackle, detaching it from the hook.

IMPROVED COTTON STALK CUTTER AND PULLER.

We give an engraving of an improved machine for cutting and pulling cotton stalks in order to remove them from the land in preparing it for cultivation. The removal of cotton stalks is one of the most perplexing questions the planter has to deal with, it being expensive to remove them altogether and difficult to dispose of them by any other means.

The machine shown in the engraving is designed to cut the stalks into such small pieces that they will not interfere with tillage and to pull the roots.

The machine consists of two inclined rollers, A B, grooved longitudinally and provided with knives capable of cutting the stalks. These rollers receive their motion from the axles of the drive wheels, and are provided with two large toothed wheels, D, at their lower ends. The knives, *b*, of the roller, B, fit into slots, *a*, of the roller, A, as shown in the sectional view, Fig. 2.

The machine is provided with guides, C, which gather in the stalks as the machine is drawn forward. The rear end of the machine is supported on caster wheels, and entire cutting apparatus is capable of being raised from the ground by means of the lever handle near the driver's seat.

As the machine is drawn forward the rollers, A B, in revolving cut off the tops of the stalks to within a short distance of the ground, when the stalks are drawn between the heavy teeth of the wheels, D, and are pulled from the ground. This machine cuts the stalks up so that they do not interfere with the cultivation of the land, and leaves the short pieces of stalk to enrich the soil.

Fig. 2.

Fig. 3.

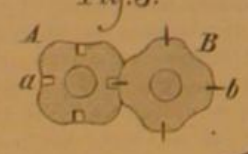


Fig. 1.

RICHARDSON'S COTTON STALK CUTTER AND PULLER.

Further information in regard to this useful invention may be obtained by addressing the inventor, Mr. Wm. B. Richardson, in care of C. and A. Freight Office, Kansas City, Mo.

Chicken Hatching by Electricity.

The chicken hatching machine in the Electrical Exhibition deserves celebration as well as other electrical contrivances. It is an ordinary egg hatching machine, in which the heat is regulated by a thermometer, the surface of the mercury in which, as it rises or falls, acts by electric wires and a magnet upon a ventilator, which opens as soon as the heat rises to 104 degrees, and shuts when it begins to fall too low. It has been observed that machine-hatched chickens suffer from lonesomeness, and do not eat so well as those who hear a mother's constant voice; and so the ingenious proprietor of this machine is now constructing a telephone which will convey to his henless chicks, scattered in different cages about a meadow, the clucking of a central hen. It is a benevolent idea; and if he would go a little further, and discover a way of "laying on" maternal care to the poor featherless chicks that are so often seen abandoned in the stationary machines called perambulators, yet greater would be his boast that he has not lived in vain.—*St. James's Gazette.*

American Shoemaking Machinery at the Frankfort Leather Fair.

A notable feature of the International Shoe and Leather Exhibition at Frankfort-on-the-Main, recently closed, was a complete American shoe factory, organized by C. S. Larrabee & Co., of Mainz. About a hundred machines were shown in operation, exhibiting fully the progress which our inventors are making in shoe machinery and in the manufacture of shoes by machinery. The principal machines exhibited are protected by patents, and included Keats' sole sewers, Larrabee heelers, the Jamieson crimper, Busell trimmer, union edge setter, etc. The official list of awards kindly forwarded to us by Mr. Larrabee shows that he received seven gold medals, six silver medals, and eleven bronze medals for himself and the builders of the various machines shown in the exhibition factory, and for manufacturers using them.

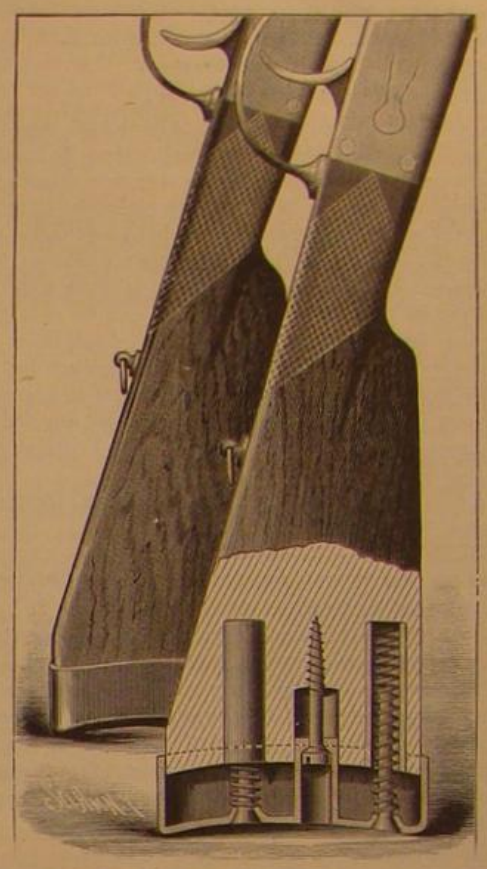
Acorn-Storing Birds.

At a late meeting of the California Academy of Sciences, a paper was read by Mr. R. E. C. Stearns, on the acorn-storing habits of the California woodpecker. In Napa County he had examined a fallen yellow pine, the bark of which was full of acorn holes. Its length was 175 feet, and the diameter of its butt was five feet ten inches, and at ninety feet three feet eight inches. Above the ninety foot line the woodpecker holes were comparatively few; neither were there any in the first ten feet of the trunk from the ground. A piece of the bark, twelve by twelve inches, showed sixty holes. Taking an average of thirty-six holes to the square foot, it gave 41,040 acorn holes in the bark of this one tree. The holes were drilled to receive acorns of different sizes, for the birds are exact workmen, and each acorn is nicely fitted into its special cavity. Woodpeckers reject the cups and store the acorns without them. In Knight's Valley he observed woodpecker holes in a large spruce tree, and he was informed that they also bore into the bark of certain oaks to a limited extent. The acorns were generally considered as laid up for a winter supply of food; but while in this climate no such provision was necessary, it was also very improbable that woodpeckers would feed on hard nuts or seeds of any kind. The more rational explanation is that they are preserved for the sake of the grubs they so frequently contain, which being very small when the acorn falls, grow until they eat out the whole interior, when they become a welcome delicacy for the bird.

Mr. Lightner, a member of the Academy, had observed woodpeckers engaged in drilling holes in the bark, when a bluejay was seen to fly close up to one and inspect the size of the hole. Some active chippering then ensued, when the bluejay flew away, but soon returned with a green acorn, without the cup, in his beak. This he offered to the woodpecker, who took it with his beak, and set it into the hole, and drove it home with a few taps, where it remained. This process was continually repeated. Mr. Lightner desired to know what were the special benefits derived by this mutual service conducted between a seed-eating and an insect-eating bird. Mr. Stearns said that great numbers of untouched acorns remain in the spring, which have developed no worms suitable as food for the woodpecker, but which supply nutriment to bluejays and squirrels. Thus a community of interest was manifest, explaining their joint labors.

IMPROVED CUSHIONED GUN STOCK.

The engraving represents an adjustable and yielding gun stock lately patented by Mr. Hiram W. White, of Yankton,



WHITE'S CUSHIONED GUN STOCK.

Dakota Territory. The gun stock is made in the usual form, except at the butt, where opposite sides are made parallel for a short distance to receive the yielding butt, which caps over it, and is capable of sliding on or off the butt within prescribed limits.

The butt has an inwardly projecting thimble or socket near the middle for receiving a long screw that extends into the wood of the stock and serves to adjust the butt and to limit its outward movement.

From the butt two parallel guide pins project into guide holes in the stock, and are surrounded by spiral springs, which tend to press the butt outward as far as the adjustment of the screw will permit.

This construction renders the butt of the gun elastic, so that the shock of the recoil will be modified so as to be scarcely noticeable. The degree of elasticity can be adjusted by turning the screw in or out, so as to suit the strength of the gunner or weight of the gun, and the strength of the charges fired from the gun.

The length of the stock may be varied by turning the screw in or out to adapt the length of the stock to the gunner's arm.

Another advantage in this improved stock is that there is no tendency to raise or tilt the muzzle, and thus detract from the accuracy of the aim at the instant of firing.

This invention, while it adds very slightly to the expense of a gun, greatly increases the facility and comfort in using it. The engraving shows a sectional view and also an external view.

Further information in regard to this invention may be obtained by addressing the inventor as above.

Salmon from the Arctic Regions.

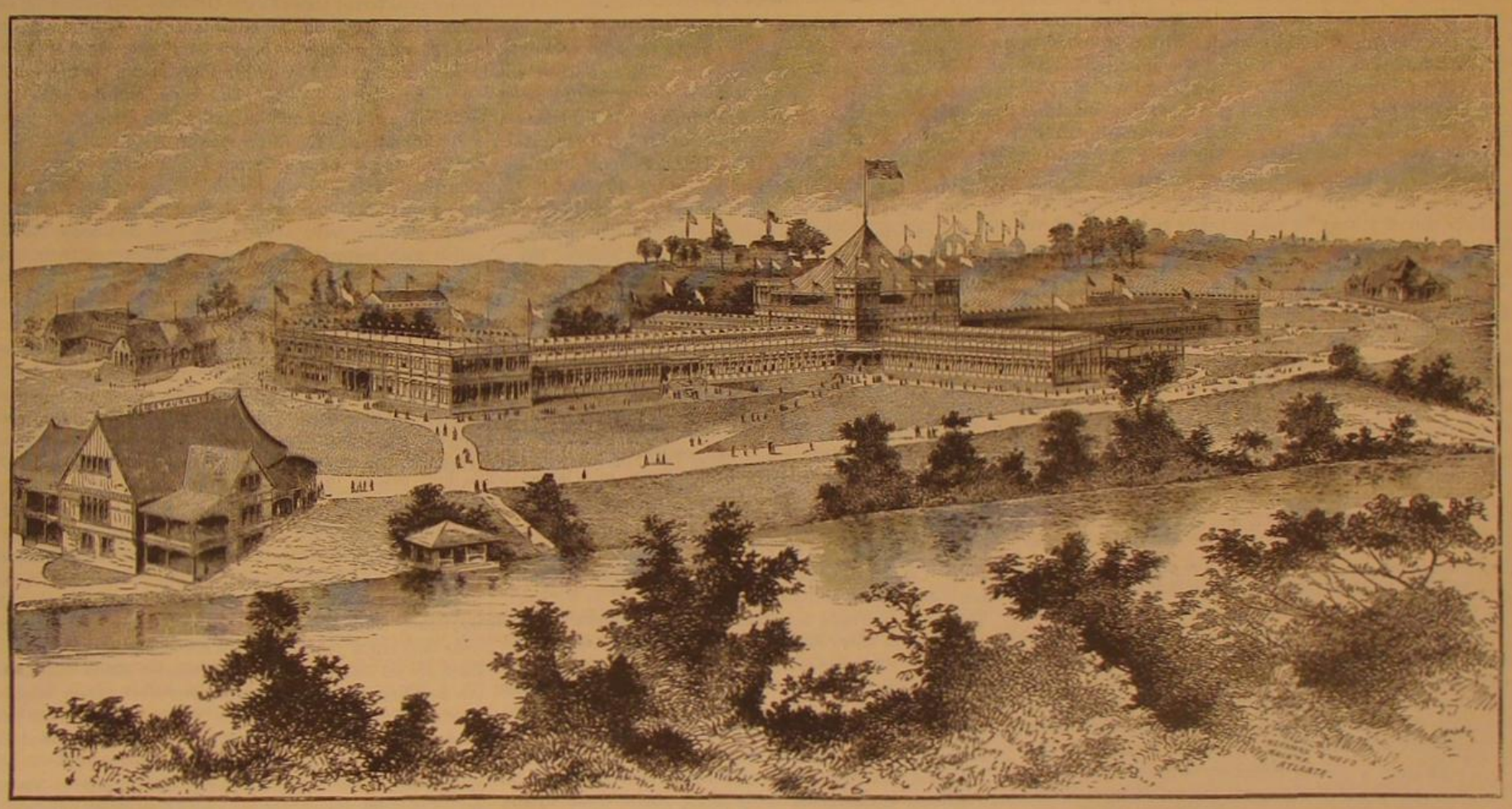
The steam yacht Diana, lately arrived in London, has solved an interesting question with regard to the importation of salmon. The vessel belongs to the Hudson's Bay Company, and has been fitted up by the Bell-Coleman Mechanical Refrigeration Company, of Glasgow, with one of their patent dry air refrigerators, designed by Mr. I. I. Coleman. The hold is made air-tight, is lined with a non-conducting lining, and contains about 35 tons weight of fish, which have been kept at a temperature of about 20° or 22° Fah. throughout

the voyage from the Hudson's Bay Settlements. The fish were caught at the rate of about three tons daily, and placed in the cold air chamber immediately as they arrived alongside the ship. On opening the hold in London the salmon were found in as good condition as when taken out of the water. The flesh is declared quite firm and of excellent color.

THE GREAT EXHIBITION AT ATLANTA GA.

The Atlanta Exhibition opened, as already noted, with hopeful prospects, both as to popular success and national utility. These prospects have improved with each day's developments, and the indications now are that the commercial and industrial results of the fair will as far transcend the anticipations of the projectors of it as the show itself has exceeded in magnitude and variety their original intentions.

The first plan, as proposed by the Hon. Edward Atkinson, of Boston, was to hold a modest cotton fair somewhere in the South, preference being expressed for Atlanta. The energetic proprietors of the *Textile Record* took up the project in earnest, and succeeded in enlisting the good will and active co-operation of the leading citizens of Atlanta. The Exhibition Company was organized about a year ago, and under the energetic direction of Mr. H. I. Kimball, of Atlanta, subscriptions to the amount of $200,000 were promptly secured, of which New York City contributed a fifth part. The construction of the buildings deemed necessary for the exhibition was begun last spring.



THE GREAT EXHIBITION AT ATLANTA GA.

The site selected for the fair was Oglethorpe Park, a space of fifty acres just outside the city. The principal building was designed for a model cotton mill; and the general plan of the exhibition buildings was thought to be, if anything, over-ambitious. But the demands for space came in so rapidly that successive annexes were erected, ultimately quadrupling the exhibition space at first contemplated; and yet the demand has exceeded the twenty acres of exhibition space provided.

The original "Main" Building is a handsome structure almost entirely of glass. It is 720 x 400 feet, well lighted and ventilated. It is supplied with abundant steam power and with eight lines of shafting, arranged for the operation of every description of machinery. Its magnificent aisles afford opportunity for a grand and artistic display.

The Art and Industrial Pavilion (310 x 55 feet), open to the roof, 50 feet high, with capacious galleries, is provided for the display of fine arts and manufactured goods to the very best advantage.

The Department of Minerals and Woods (300 x 100 feet) is an elegant building, provided for the especial display of the collective exhibits of the natural products of mines, fields, and forests, which constitute one of the finest displays of the kind ever presented.

The Judges' Hall (88 x 112 feet) includes, besides the commodious offices, committee rooms, etc., a capacious hall, seating 2,000, for the accommodation of the various assemblies attending the lectures, business meetings, etc., held during the exhibition.

The Department of Public Comfort contains, besides the offices of the department, convenient offices for the telegraph, telephone, and exhibition messengers, stands for fruit, cigars, newspapers, etc.; also barber shop, check room for parcels, ladies' parlors and retiring rooms, gentlemen's parlors and retiring rooms, etc.

The Exhibition Restaurant (100 x 53 feet, two stories) contains saloon, dining room, serving room, and ladies' parlor and retiring room, gentlemen's retiring room, store rooms, kitchen, etc.

A number of annexes for special purposes have been erected in addition to the large buildings for the general purposes of the exhibition.

Inside the grounds and in the fields just outside representative Southern crops have been planted, including a dozen varieties of cotton, sugar cane, sorghum, rice, hemp, potatoes, peanuts, etc., etc. These growing crops show the visitor not only the characteristics of Southern agriculture, but also its needs and the conditions which will have to be satisfied by inventors of time-saving, labor-saving, and crop-saving implements, machinery, and processes for use in the South. The exhibition of cotton machinery is very large, and embraces substantially everything in use by planters and manufacturers. The first committee of the National Cotton Manufacturers' Association pronounce this part of the exhibition the best and most abundant ever before brought together in this country or elsewhere. The evidence of the natural resources of the South in agriculture, in commerce, in minerals, and in timber presented in the annexed buildings, could not be equaled, they say, by any other equal area of the earth's surface; and in the use to which these resources will shortly be applied, they find the promise of great commercial advantage to the North as well as to the South. They concur unanimously in the judgment that greater promise of improvement in many directions, but especially in the handling of cotton, has emanated from this exhibition than from any ever held before. The committee represented more than $100,000,000 of capital, over 1,000,000 spindles, and nearly 25,000 looms.

ENGINEERING INVENTIONS.

Mr. John W. Hayes, of Fort Wayne, Ind., has patented an improved steam engine valve. This invention relates to that class of engine valves that are known as "rotary valves;" and it consists of a cylindrical hollow valve open at top and bottom and closed at both ends, and having concave sides provided with annular and longitudinal packing strips or bands, and devices for giving it an oscillating and slightly endwise motion for the purpose of making the wear upon the valve and its seat and interior of the valve chest more even. The concave sides of the valve form exhaust cavities, and the valve seat is supported on studs, whereby an exhaust passage is established beneath said seat. The valve, being open both above and below for the admission of steam, is approximately balanced, and its general construction is such as to insure great durability.

Mr. William A. Stoddard, of Dallas, Oregon, has patented an improved stump extractor, which possesses many conveniences and is capable of great power. In this machine the main frame, which rests upon the ground when the machine is at work, has combined with it front wheels supported on a swinging axle that is journaled in hand levers pivoted to the frame, and a rear swiveling wheel carried by a hinged frame which is attached by connecting rods to the hand levers. By this combination the main frame with its working parts may be raised from the ground and the machine be readily moved over the surface thereof. The main power lever, which carries the lifting or stump-extracting chain at one end, is operated by a rope and windlass arranged to depress the other end or longer arm of said lever, a draw-rope, to which the horse or other power is applied, passing round a wheel on the windlass to actuate the latter. This longer arm of the power lever is elevated by a separate rope and windlass and adjustable crane, after the load has been raised and detached.

Mr. Samuel Whinery, of Wheeler's Station, Ala., has patented an improved balanced slide valve. This invention consists of a slide valve composed of twin valves, and a frame fitted with flexible diaphragms in interposed relation with the valves and connecting the latter with the frame, in combination with a steam chamber having steam and exhaust ports in its opposite sides. The diaphragms, which project at the ends of the valves, form a chamber between them which is in communication with the exhaust ports of the valves. This construction provides for a pressure on the diaphragms, collapsing the chamber between them, and nearly balances the pressure of the valves outward, also one exhaust pipe serves for both sides of the steam chest.

Mr. Robert L. Stevens, of Albany, Oregon, has patented a novel means for elevating and depressing propellers. The invention has for its object the raising and lowering of steamboat propellers to adapt them to different draughts of water, according to the load on the vessel. It is applicable both to side wheel and stern propellers, and consists in supporting the propeller and its driving engine in such manner that they can be raised or lowered by screw shafts actuated by mechanism driven by said engine, or by a separate engine. By simultaneously raising or lowering the driving engine or engines and paddle wheels or other propeller the proper working of the engines is not interfered with, and the propeller may be positioned for most effective action, or be raised when navigating shallow water.

Mr. William Sneddon, of Burrton, Kan., has patented an improvement in engine governors. This invention is applicable to all governors employing fly-balls, and its object is to secure more perfect uniformity in the speed of the engine. The invention consists in an upwardly-inclining or curved lever applied to exert a lifting action on the valve stem of the governor, and formed with a groove in which a ball or weight is arranged to run loosely, said weight moving nearer to the lever fulcrum as the speed decreases, and *vice versa*. By this means a tension, increasing and decreasing as required, is kept on the valve stem, restraining any sudden movement of the latter, and the action of the governor is greatly improved.

A New Species of Horse.

The *Annals and Magazine of Natural History* for July contains a translation of a Russian paper, in which M. Poliakof brings forward a mass of evidence in proof of the existence of a hitherto unknown species of horse not far from Zaisan, in Central Asia. The animal appears to resemble a small domestic horse, of a dun color; its head is large in proportion to the size of the animal; and the root of its tail is destitute of long hairs for some distance. M. Poliakof names his supposed new species *Equus Przewalskii*, in honor of the traveler who brought the skin to Russia. He regards it as a true horse, and remarks that "if it were possible to prove that culture influenced the growth of the tail, and that this became more hairy, and the mane longer, under altered conditions of life," it might be affirmed that "it was indeed the animal whose ancestors were reclaimed by man in the stone period, the so-called domestic horse of our day."

AGRICULTURAL INVENTIONS.

A very convenient and efficient combined churn and butter worker has been patented by Mr. Joseph S. O'Brien, of North Wilbraham, Mass. The churn, which is preferably a rocking one, is constructed with a flat top of tray-like shape to receive a butter worker, thus making the churn cover serve also as a table for the butter. The butter worker is composed of blocks arranged to slide along the sides of the cover, and having side arms connected by a cross handle pivoted to them, which arms carry one or more butter-working rolls. The operator, grasping the handle, moves the arms back and forth, and with them the sliding blocks and the roll, which latter rolls out the butter with more or less pressure, as desired. A stamp for stamping the butter may also be suspended between the side arms of the butter worker, if required.

An improved straw or feed cutter, which combines great efficiency with easiness of operation, has been patented by Mr. Nathaniel Climenhegg, of Ridgeway, Ontario, Canada. The invention consists in a system of gearing which has a balancing action or effect, and which includes a pair of wheels arranged in front of the main frame, one on either side of the cutting end of the feed box. These wheels have wrist or crank pins on their face connected by a knife bar, which carries the knife that operates with a drawing cut, and works down within a slotted support for the ends of the hay, straw, etc., thereby making a clean cut.

An improved stump extractor, which admits of an increased and varied application of its operating power, has been patented by Messrs. Jacob Barrow, Samuel Barrow, and David Barrow, of Windfall, Ind. The lifting beam of the apparatus is fitted on its under side with a truss rod or plate that is attached to the ends of the beam. This not only strengthens the beam, but, by attaching the chain that connects with the stump to the truss rod, the weight is transferred to the ends of the beam. Combined with this beam are two lifting jacks, that is, one under either end of the latter. With this combination, by operating both jack levers, the beam is lifted at both ends with double power, but either end of it may be raised singly to obtain a lever action of the beam or to position it for obtaining equal strain when both jacks are operated. The lifting jacks, too, are specially constructed with a view to strength, durability, and convenience of action.

A very simple and convenient calf feeding apparatus has been patented by Mr. Malcolm G. Marsilliot, of Port Townsend, W. T. The object of this invention is to furnish an apparatus for feeding calves, the use of which will avoid the annoying labor of teaching them to drink. The invention consists in combining a rubber tube having a rear flanged teat on one end and a strainer on the other, with an imitation udder, so that by putting the strainer end of the tube in a vessel containing milk the calf may suck in the usual and natural manner.

Mr. Claus Thelander, of Salina, Kan., has patented an improved grain header which has much merit. The object of the invention is to facilitate the dropping of the cut grain in gavels. The invention consists in a combination with the platform frame of the machine and its endless apron, the elevator frame and its two endless aprons, and a driving mechanism, of bars, arms, and upright rods having a stationary relation, and a sliding frame provided with horizontal rods arranged below the upright rods, and forming in connection with them a box for reception of the grain from the elevator, so that when enough grain has been collected for a gavel, the sliding frame is drawn inward on a fixed frame, and the horizontal rods of the box withdrawn from beneath the grain. This allows the gavel to drop to the ground at the side of the machine and out of the way in the next round.

Mr. James H. McConnell, of Pultney, N. Y., has patented a very ingenious combined hay rake and press. The object of this invention is to furnish an improved machine for collecting hay and pressing it into loose bales or bundles, so that it can be much more easily handled. The machine is constructed so that, when drawn over the ground, it takes up the hay by a front rake, and conducts it to an open-ended box set inclining upwardly in a rear direction. This box is supported by running wheels in front having an elevated axle and a caster wheel in the rear, and is formed at its back with a close top and pendent gate. As the hay is received within the box, it is caught by a series of sliding and pivoted rakes, which, as they move to the rearward, push back the hay and pack it against the gate and close top. When a sufficient quantity of hay has thus been packed, the gate is opened to deliver it in form of a bale. As the sliding rakes move forward they turn on their pivots and pass over the hay in the box.

An improvement in corn planters has been patented by Messrs. Thomas J. Lindsay and William J. Miner, of Windfall, Ind. The improvement consists in several novel features of construction, which render the implement efficient, but which cannot be clearly described without engravings.

An improved track for hay elevators has been patented by Mr. Albert Davy, of Danube, N. Y. The invention consists, mainly, of a rod or track for the pulley block of hay elevators or forks to run upon, supported by a suitable frame, which frame and rod may be easily shifted for depositing the hay or other material at any desired part of the building.

A band cutter and feeder for thrashing machines has been patented by Messrs. Benjamin Stalcup and George W. Stewart, of Worthington, Ind. In this apparatus the bundles of grain are placed lengthwise upon an endless toothed web and carried by it under a series of rotating knives, which cut the bands into short lengths and partially separate the bundles. The grain then passes under retarding devices having arms which act with a spring pressure on the bundles and retard the upper portions of the bundles, and cause them to be gradually carried along by the web to a spreader, which has spirally arranged arms that distribute the straw or grain evenly over the web for feed to the cylinder of the thrashing machine. The apparatus is exceedingly useful, and may be attached to any thrashing machine.

An improved ditching machine has been patented by Mr. Samuel C. Robinson, of Pemberton, Ohio. This invention relates to improvements in a ditching machine, for which the same inventor made an application for letters patent April 19, 1881; and it consists, first, in constructing the outer rim of the ditching wheel so that it shall be oval or convex in cross section, and provided with semi-rotating spades, whereby the earth on the rim will tend to slide off on each side and not adhere to the rim, as it would do were the rim flat, as in the invention above referred to, the convex form of rim also preventing the earth being carried forward and dropped in front of the wheel and in its way. The machine has a series of curved cams arranged on the outer rim of the ditching wheel, so that a cam will be under each spade, each cam being provided with a notch to receive and positively hold the spade across the outer rim in a working position and prevent it from turning sidewise in excavating a ditch and elevating the earth.

The Great Eastern.

The Great Eastern, which was offered for sale October 19, and bid in for $150,000, is 680 feet long, 83 feet broad, and 60 feet deep, being of 22,927 tons builder's, 18,915 gross, and 13,344 net register. She was built at Milwall, from the plans and under the superintendence of the late Sir Isambard K. Brunel, by Messrs. Scott, Russell & Co., her original name being the Leviathan. It was attempted to launch her November 3, 1857, but she stuck on the ways, and not until the 31st of January did she enter the water. The most powerful hydraulic rams were employed in the process, but at times she remained immovable for days even when they were exerting a pressure of six tons to the square inch. When at last she was got into the water and had been towed down to Deptford the company that built her had exhausted its capital of $3,200,000, and a new organization bought her for about a fifth of her cost. The name was changed to the Great Eastern, by way of recalling the old Great Western, the marine giant of an earlier day, and on the 7th of August, 1859, she left Deptford. Two days later, on her trial trip off Hastings, a steam jacket round one of the funnels exploded, killing ten men and causing much damage; already several lives had been lost in launching her. Her ill luck followed her, for on the 21st of January, 1860, her commander, Captain Harrison, an old Cunarder, was drowned when going ashore at Southampton.

The vessel had been intended for the passenger trade, and was meant to carry 800 first-class passenger, 2,000 second class, and 1,200 third-class, with a crew of 400 men, but there was no market for such a traffic. June 17, 1860, under Captain Vine Hall, she sailed for New York, making a passage of ten and a half days, and remained on this side of the Atlantic until the middle of August, one of the "lions" of the season. In April, 1861, she was seized for debt, her unfortunate stockholders being again called upon to subscribe to secure her release. In the same summer she did good service carrying troops to Canada. In 1864 Messrs. Glass & Elliott bought the great ship and found a vocation for her. On June 30, 1866, she sailed with the new Atlantic cable, the laying of which was successfully accomplished July 27. On the 2d of September she lifted the old cable of 1865, which was relaid, and on the 19th returned triumphantly to Liverpool. She was put on the New York passenger route in 1867, but lost money and went into the sheriff's hands on her return. In June, 1869, she laid the French Atlantic cable, and in January, 1870, the Suez cable. In 1873 she once more visited America on a cable-laying expedition.

As a business enterprise, however, she has never paid. Last year she lost $42,165, her value being then placed at $433,575. At present the Great Eastern is fitted with four cable tanks, occupying some cargo space and most of the dining saloons, but all can be easily removed and the ship fitted as originally. The nominal power of her paddle engines is 1,000 horse, and her screw engines are of 1,600 horse power. Her boilers, which are tubular and situate amidships, are eight in number, of which six, by Forester, were new in 1867, and the other two, by Humphreys, Tennant & Co., were new in 1870. The number of plates in the hull is 30,000, and about 3,000,000 rivets were used in fastening them. No less that 10,000 tons of iron was used in her construction, and she was the first vessel fitted with steam steering gear.

The Variability of Bricks.

A correspondent suggests that the market price of bricks should be rated according to their size, weight, and crushing strength. He instances two lots of bricks, sold at the same price per thousand. One lot averaged 2¼ x 3¾ x 7⅞ inches in size, 5 lb. 2½ oz. in weight, and broke at 5,490 lb. per square inch. The second lot ran about 2¼ x 4 x 8⅛ inches in size, weighed only 4 lb. 8¼ oz., and broke at 3,610 lb. per square inch. The real values of these two lots of bricks were obviously very unequal. As our correspondent says, it makes a vast difference to the builder of an arch or pier if he calculates on bricks standing 500 tons to the square foot and gets them half as strong; or if he figures on 4,500 bricks per rod of 306 cubic feet, and it takes 5,500. He thinks that every brickmaker should guarantee a certain size, weight, and crushing strength—which they will probably do when (and not before) builders refuse to purchase bricks which fall short of a stipulated standard of size and quality, or make their contracts with the brickmaker or dealer contingent, as to price, upon the character of the materials delivered.

Restoring Solomon's Temple.

Reuf Pasha, the Turkish Governor of Jerusalem, has recently received imperative orders from Sultan Abdul Hamid to resume the work of restoration of Solomon's Temple, commenced under the reign of Abdul Aziz, but discontinued some five years ago. The Pasha has also been instructed to clear the great square fronting the Temple of all the rubbish and rank vegetation with which it is at present incumbered. In this square stands the famous Mosque of Omar, which derives a revenue of some £15,000 a year from pilgrim contributions and other sources. Hitherto the greater portion of this sum found its way annually to Stamboul. The Sultan, however, has decreed that henceforth it shall be applied to defraying the expenses of the works above alluded to, the present resumption of which, as well as their original inception, is due in reality to suggestions made at different times to the Ottoman authorities by members of the Austrian imperial family. The restoration of the Temple ruins was begun at the instance of Francis Joseph during his visit to the Holy Land, shortly after the accession of Abdul Aziz to the throne; and it was the recent pilgrimage of the Archduke Rudolph to Judea that imparted a fresh impulse to the interrupted enterprise. Not only has the Commander of the Faithful signified it to be his sovereign will that the works should be carried out without further delay, but two officials of the Sublime Porte, Serid and Raif Effendim, have already left Constantinople for Jerusalem with instructions to take measures, on their arrival, for insuring the literal fulfillment of his Majesty's decree.

American Gold Work and Jewelry.

The amount of capital invested in the jewelry trade of the United States, exclusive of silver-ware, is estimated at upwards of $50,000,000. In an extended review of the progress and present condition of the trade the *Evening Post* asserts that in variety of designs and beauty of workmanship American jewelry is unequaled in any part of Europe. There are, it is said, no less than a thousand different designs in lace pins, as many more in earrings, and an equal variety in many other articles. We have not only the most complete machinery, but the largest establishments in the world, for the manufacture of jewelry. The most extensive house in Europe (a firm in Paris) has but one hundred and fifty workmen, while a single factory in Newark keeps five hundred busy upon genuine gold work in ordinary times, and there are several other American houses which employ from one hundred to three hundred men each upon high-class goods. The enormous extent of the manufacture here is made more clearly apparent when it is known that these great firms are chiefly engaged in the production of a few specialties. The largest factory mentioned is operated principally for breastpins, earrings, bracelets, chains, and lace pins. Another establishment is especially devoted to the making of bracelets and gold and cameo rings, and so on through the different branches of manufacture. The very finest jewelry to be obtained in any modern market is made at a certain workshop in this city, whose productions, impressed with a peculiar originality and beauty in the most minute details, are eagerly taken by the most noted dealers, with but little regard to price.

Sea-Weed Sea-Serpents.

In a letter to the *Madras Mail* on the use of gigantic seaweed as a protective agent for shores, Capt. J. H. Taylor, the Master-Superintendent of Madras, gives the following interesting "sea-serpent" story: "A notable incident connected with this sea-weed is recalled to my recollection, by Dr. Furnell's letter. About fifteen years ago, while I was in my ship at anchor in Table Bay, an enormous monster, as it appeared, was seen drifting, or advancing itself round Green Point, into the harbor. It was more than one hundred feet in length, and moved with an undulating snake-like motion. Its head was crowned with what appeared to be long hair, and the keensighted among the affrighted observers declared they could see its eyes and distinguish its features. The military were called out, and a brisk fire poured into it at a distance of about five hundred yards. It was hit several times, and portions of it knocked off. So serious were its evident injuries, that on its rounding the point it became quite still, and boats went off to examine it and complete its destruction. It was found to be a specimen of the sea-weed above mentioned, and its stillness after the grevious injuries inflicted was due to its having left the ground swell and entered the quiet waters of the bay."

WATER FOR FIRE PURPOSES.—The water used by the New York Fire Department last year was 33,102,000 gallons, or a little more than one-third of one day's supply.

NEW INVENTIONS.

An improved millstone, which facilitates the adjustment of the grinding surfaces, has been patented by Mr. Emil Hermann Streitz, of Rauschmühle, near Freienwalde, Pomerania, Germany. It is well known that the outer part of the grinding surface of millstones wears out first, whereas the central part of the grinding surface remains quite intact; but in order to have a level grinding surface the entire surface of the millstones in use heretofore had to be dressed, which involved a considerable amount of time and labor and was very expensive, as the central part of the stone which never became worn off, had to be cut away. This is an item of considerable importance, and the difficulty is avoided by this improvement.

Mr. Adrian C. Selby, of Covington, Ky., has patented a new soap, composed of tallow, olive oil, sal-soda, unslaked lime, rosin, borax, alum, white wax, spermaceti, and benzine, which ingredients are prepared in the manner and combined in certain proportions given in the specification.

Mr. Charles H. Vibbard, of Aurora, N. Y., has patented a cigar lighter constructed with a case provided with a hinged cover and a spring catch for holding the cover closed, a tube provided with a spiral spring and a tubular cap for holding a candle, a slotted and curved partition, having a correspondingly curved spring attached to it for holding a fuse, a four-armed wheel pivoted to the case for raising the fuse, a curved arm attached to the cover for operating the four-armed wheel, a curved arm attached to the cover for igniting the fuse, and a curved spring for raising the cover quickly, so that a fuse will be ignited and a candle lighted by opening the cover, and the fuse raised, ready to be again lit, by closing the cover.

An improved pivoted counter seat, which is raised up against the counter or wall automatically as soon as the occupant leaves it, has been patented by Mr. Reuben J. Spalding, of Rosita, Col. The invention consists in a seat pivoted to the side of a counter or wall, and having a single or forked leg pivoted to its under side, the end of this leg sliding in a grooved vertical guide of the counter and being attached to a spring, the upper end of which is attached to the counter above the seat, so that this seat will be raised against the side of the counter or wall as soon as the occupant leaves the seat.

An improved gasoline stove adapted for cooking and heating has been patented by Mr. George A. A. Siffait, of Portland, Oregon. The invention consists in a stove with a central tubular flue and an annular flue surrounding the central flue, so as to insure a thorough circulation of the heat created by a double gasoline burner arranged below the central flue and fed from a tank or reservoir combined with the stove.

Mr. James A. Dubbs, of Lansing, Kan., has patented an improved carriage body support for painters' use, whereby carriage bodies may be firmly and securely supported and turned side for side and end for end, or held in any position desired, and the surface leveled with very little trouble.

An improved barrel swing has been patented by Mr. Sylvester W. Sheldon, of New York city. The object of this invention is to improve the construction of the barrel swing for which Letters Patent No. 227,848 were issued to the same inventor May 18, 1880, in such a manner as to make it more convenient and satisfactory in use.

Mr. Peter Forshay, of Amite City, La., has patented an improved cotton condenser for use with gins, for receiving and compacting the cotton. The object of this invention is to prevent the drums from choking and escape of cotton with the refuse.

Mr. George A. A. Siffait, of Portland, Oregon, has patented an improved coffee pot provided with cup-shaped sieve, through the bottom of which a central tube passes, surmounted by a perforated cap, and the lower end of this tube is threaded, so that it can be screwed into the upper end of a tube of a filling piece, fitting in and closing an opening in a false bottom or horizontal partition a short distance above the bottom of the pot. This filling piece is of greater or less size, accordingly as a greater or less quantity of coffee or tea is to be made.

Messrs. Thomas Lawrence, Absolom C. Stratton, and James M. Wolf, of Mountain Home, Ark., have patented a cheap, safe, and reliable fire-lighting device to be used in the place of ordinary matches, it being intended more especially for outdoor use. The invention consists, principally, of a cord saturated or coated with some easily ignitible substances or mixture and a lamp, both contained in a suitable small case or box, the cord being adapted to be drawn out, as it is used for lighting the lamp, through a small aperture, which aperture is protected with a hinged or sliding cover.

Mr. Albert Ayers, of Rahway, N. J., has patented an improvement in that class of devices designed to hold window sashes at any desired elevation, and to prevent their rattling, and is especially designed for car and carriage windows. The invention consists of a rubber tube closed at one end, provided with a head having a polygonal face or edge and a projecting central boss, and containing a loosely-fitting rigid pin, which tube and pin constitute the stop, several of which are designed to be set in suitable sockets in the edges of the sash, so that opposite faces will bear against the sides of the sash grooves in the window frame and the bosses against the bottoms of the grooves.

A convenient portable showering device, to be applied to any washing or bathing tub, has been patented by Mr. Edward Williams, of Griffin, Ga. The invention consists of a pump provided with a clamp for securing it to the edge of the tub, and of a perforated pan or sprinkler and an upright pipe connecting the same with the pump, so that a person standing in the tub can operate the pump to force water up into the sprinkler, whence it will fall upon the operator.

An improved apparatus for the manufacture of alkali balls has been patented by Mr. Minard M. Smith, of New York city. The object of this invention is to produce alkali balls without wires, thereby saving the cost of the wires and the trouble caused by their presence in the balls. The invention consists in forming the balls on screws or screw-threaded pins, and in the combined pin bars and pins used in the manufacture.

An improvement in album clasps has been patented by Mr. Thomas Kelly, of New York city. The object of this invention is to furnish albums with extensible clasps, so that when the books become stretched by being filled the clasps can be lengthened to correspond, instead of becoming useless, as is usually the case.

An improvement in reclining chairs has been patented by Mr. Theodore Hofstatter, Jr., of New York city. This invention relates to chairs having backs adjustable for varying their inclination to the seat; and the object of the invention is to furnish a chair of that general character which can be readily manipulated by the occupant.

An improved wash boiler has been patented by Mr. John Murray, of Woodman, Wis. This invention relates to that class of wash boilers which have their bottoms sunken or formed into a pit, and it consists of a removable plate adapted to fit over the mouth of the depression or fit in the bottom of the boiler, and provided with a pipe seat and pipe at one end, holes for the passage of water at its opposite end, and a partition or frame having openings and valves, and resting on the bottom of the pit, which frame serves the threefold purpose of a valve seat, a brace to support the plate, and a means for preventing lateral movement of the plate.

An improved washing machine has been patented by Mr. William T. Hollis, of Corsicana, Texas. The object of this invention is to regulate the pressure of the rubber upon the clothes, and thus facilitate the operation of washing clothes.

Mr. Charles W. Gelett, of Oakland, Cal., has patented a portable and inexpensive apparatus that can be operated by hand for freezing cream and cooling water when ice cannot readily be obtained for such purposes. The improvements relate to the class of machines in which volatile liquids are used as the freezing agents.

Messrs. Isidore Gerard and Peter Tremblay, of Newton, Kan., have patented an improved washing machine which is simple, convenient, and effective. The top of the reservoir is covered with the removable cover, which prevents the water in the reservoir being splashed out, and it is provided with the hinged door near the rear end. The washer may be operated by foot-power or by steam or horse power.

Positive Pictures on Gelatino-Chloride.

A form of the hydro-kinone developer which Dr. Eder and Captain Pizzighelli recommend is prepared as follows: Water, 100 volumes; alcoholic hydro-kinone solution, 1 and 20, 4 volumes; sodium chloride solution, 1 and 30, 12 volumes; ammonium carbonate solution, 1 and 30, 20 volumes. This is considerably slower in its action than the iron developer previously described, and an exposure of three or four times the usual length is advisable. Another point to be remembered is the circumstance that pictures developed with hydro-kinone are very much more reduced during the operation of fixing than is the case with pictures developed by means of iron; and it is consequently necessary to carry on the action until the picture appears much denser than it should ultimately remain.

The hydro-kinone developer yields, in the case of the non-ammoniacal emulsion, very fine yellowish-red or bright-red tones, well adapted for lantern transparencies or for transparencies intended to be used in making enlarged negatives, while the ammoniacal emulsion gives grayish-red and unartistic tints. An ordinary gold toning bath slowly changes the color of the reddish images to highly pleasing violet tints Should it be wished to obtain more intense images than are yielded by the developer as described, it is merely necessary to give a longer exposure, and to dilute the developer with about an equal bulk of water. A diminution in the proportion of hydro kinone, and a corresponding increase in the ammonium carbonate, tends toward flatness and fog; a similar result also following any considerable diminution in the amount of sodium chloride present. Any considerable increase in the proportion of sodium chloride or of hydro-kinone is undesirable, the former leading to extreme hardness and deep ruby shadows, while the latter causes a greenish fog to form over the transparent parts of the picture. A simple addition of more carbonate of ammonium is useful in case of under-exposure, but the results are not nearly so satisfactory as when the correct exposure has been given and the normal developer used.

As a rule, the gelatino-chloride pictures tone with some difficulty, an ordinary neutral gold bath acting with extreme slowness; but the following answers very well in all ordinary cases:

No. 1.—Water, 500 parts; ammonium sulphocyanate, 20 parts; sodium hyposulphite, 1·5 parts.

No. 2.—Water, 500 parts; chloride of gold solution, 1 and 50, 40 parts.

For use, equal parts of the two solutions are mixed, and the fixed prints are immersed, but care must be taken not to allow the pictures to remain too long in this bath, or the more delicate half tones will acquire an unpleasant bright blue tint; by careful watching, however, it is possible to obtain a very considerable variety of tones.

The chloride emulsion process appears to possess very notable advantages over the bromide method for the production of positives on paper, and the paper may be coated with emulsion just in the same way as carbon tissue is prepared, the plain paper being drawn over the surface of the melted emulsion. Another method adapted for the production of small quantities is to rub a glass plate with French chalk, and coat with emulsion. After this has set a sheet of damp paper is squeegeed down upon it, and when all is dry, the gelatino-chloride paper may be stripped from the glass, the French chalk serving to prevent adhesion.—*Photographic News.*

Terra Cotta Lumber.

One of the most important of recent practical inventions is that of the manufacture of lumber from fire clay, patented by Mr. C. C. Gilman, of Eldora, Iowa.

The process is fully described in his letters patent, from which we extract the following: The composition consists of kaolin clay, free from grit, one part; resinous sawdust, from one to three parts, as porosity may be required; water sufficient to thoroughly incorporate the above, by the aid of machinery, into a plastic mass.

Removed from the grinding tubs, where it has been ground, the spongy product is forced by plungers driven by steam through iron or steel cylinders to express the superfluous moisture therefrom, and issues forth in the shape of long blocks or logs, of length, form, and size best fitted for handling, usually eight to twelve inches in thickness and four to six feet in length. When sufficiently dry to render handling safe these logs are moved into kilns or clamps calculated for the purpose. After the steam and vapors are driven out by a slow, steadily increasing fire, the temperature is rapidly raised to nearly a white heat, which not only consumes the sawdust, but brings the clay itself into the first stages of vitrifaction. On cooling, the logs are removed to the mill and sawed into planks, boards, and dimension-stuff, as lumber from wood is manufactured, and subsequently fashioned in the workshop into such forms and articles as demanded by purchasers. This material, being free from grit and tough in texture, can be cut, sawed, bored, planed, and carved with edged tools, and before or after such treatment can, after slipping and glazing, be submitted to a second firing, with fine results in ornamentation obtained.

Kaolin is the upper stratum of fire or feldspathic clay beds, and owing to the absence of sand or free silica is unsuited to common pottery uses, as its warpage in drying and firing unfits it for moulding purposes.

Mr. Gilman's invention overcomes this trouble, inasmuch as the material is reduced to form with edged tools *subsequent to firing.*

New York's greatest present want is a fire-proofing, cheap, and undoubted in its capacity for every emergency. Her stately ten-storied buildings can in a conflagration receive but little aid from the fire department, especially when Croton is as scarce as it is now.

Terra cotta lumber is indestructible by fire, gases, or acids; is a poor conductor of heat, sound, and electricity; and possesses molecular attraction to an extent which allows of plastering without first lathing.

Its weight is one-half less than common building brick, and is erected with nails instead of cement or mortar, virtually rendering fire-proofing a work of carpentry instead of masonry as heretofore. Mr. C. C. Gilman's present address is room 71, No. 71 Broadway, New York.

A Notable Chinese Scroll.

The Chinese merchants in San Francisco have lately received from the Emperor of China a handsome scroll in recognition of the contributions sent by them to the victims of the Chinese famine three years ago. The scroll is four feet high and twelve feet long. The surface is entirely cross-grained and indented with miniature squares formed by lines running from opposite corners. These squares, uniformly covered with old gold, stand out in bold relief by means of a darker shade of gilt with which the lines are traced. Four large Chinese letters in ebony are carved at regular intervals across the face of the scroll, around which is a rich border of flowers and fruits. The scroll itself is inclosed by a deep, wide frame, upon which is carved a large number of allegorical figures, so wrought and blended together as to appear to have been made of one solid piece of wood. At the lower corners are placed two figures of Chinese gentlemen, each holding a sword, the upper corners being devoted to two maidens, each having a tambourine in hand, and depending from which is a long veil, completely encircling their body. The space intervening between the figures is blocked with dark glass, so that under an artificial light the effect is very beautiful. The imperial present has caused a commotion among the Chinese, and great curiosity is manifested.

MODIFICATION OF RUHMKORFF'S COIL.—With an induced coil, arranged in two blocks placed on the poles of the magnetic nucleus and communicating with each other, so that their points of junction may be at equal distances from the nucleus, effects are obtained of much greater power than with the ordinary arrangement.—*MM. Scarpa and Baldo, in Les Mondes.*

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

OFFICE OF SCOTT & HALL,
Burlington, Kansas, March 10, 1881.

We, the undersigned citizens of Burlington, hereby certify that the H. W. Johns Asbestos Roofing, put on our new stores last summer by S. H. Davis, of this place, is perfectly wind and water-tight, as well as fireproof. This was proven on Sunday, the 27th of February last, when the stores adjoining burned, and the flames being blown by a strong wind directly upon the buildings, had no effect upon the asbestos, even when the woodwork inside the front cornice caught fire and communicated to the sheathing and rafters, which burnt out from under the roofing, so that the roofing had to be cut away to put out the fire underneath. If it had not been for the asbestos our buildings would probably have burned, as well as most of the business part of the town.

D. E. SCOTT, J. M. ALLISON, W. W. VOENARD.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Coal Oil Vapor Torch. Powerful light for foundries and shops. T. R. Loomis, 32 Marion St., Cleveland, O.

To the Iron Trade.—Patent Sectional Furnace. Convenient, rapid. Products equal to best Swedish iron. Inquire of A. W. Almqvist, 37 Park Row, N. Y.

For Sale immediately.—Fraunhofer Equatorial Stand, with graduated circles and verniers driven by clock. Price $400. Address Carl Becker, 1193 Broadway, N. Y.

Telegraphic, Electrical, and Telephone Supplies, Telegraph Instruments, Electric Bells, Batteries, Magnets, Wires, Carbons, Zincs, and Electrical Materials of every description. Illustrated catalogue and price list, 72 pages, free to any address. J. H. Bunnell & Co., 112 Liberty St., N. Y.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

Wanted—A Competent Engineer. One who can take indicator cards, and understands economizing fuel. Address, with references and price, R. F. Learned, Natchez, Miss.

For Sale—A complete set of Patterns, Flasks, and Core Arbors, for making Cast Iron Flanged Pipe, Elbows, Tees, and Greenhouse Fittings. Will be sold low to clean out a branch of a business. Address C., Box 1358, New York.

Abbe Bolt Forging Machines and Palmer Power Hammers a specialty. S. C. Forsaith & Co., Manchester, N. H.

Foot Lathes, Fret Saws, &c. 90 pp. E. Brown, Lowell, Mass.

"How to Keep Boilers Clean," and other valuable information for steam users and engineers. Book of sixty-four pages, published by Jas. F. Hotchkiss, 84 John St., New York, mailed free to any address.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Ball's Variable Cut-off Engine. See adv., page 332.

Combination Roll and Rubber Co., 27 Barclay St., N. Y. Wringer Rolls and Moulded Goods Specialties.

Punching Presses & Shears for Metal-workers, Power Drill Presses, $25 upward. Power & Foot Lathes. Low Prices. Peerless Punch & Shear Co., 115 S. Liberty St., N. Y.

Rollstone Mac. Co.'s Wood Working Mach'y ad. p. 301.

Pure Oak Leather Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Paragon School Desk Extension Slides. See adv. p. 334.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

The Sweetland Chuck. See illus. adv., p. 300.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro. 234 Broadway, New York.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 10 Cortlandt St., N. Y.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 36 Jefferson St., Philadelphia, Pa.

4 to 40 H. P. Steam Engines. See adv. p. 318.

Electric Lights.—Thomson Houston System of the Arc type. Estimates given and contracts made. 611 Arch, Phil.

Draughtsman's Sensitive Paper. T. H. McCollin, Phila., Pa.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N. J.

Skinner's Chuck. Universal, and Eccentric. See p. 300

For Machinists' Tools, see Whitcomb's adv., p. 300.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Improved Skinner Portable Engines. Erie, Pa.

Ajax Metals for Locomotive Boxes, Journal Bearings, etc. Sold in ingots or castings. See adv., p. 300.

Peck's Patent Drop Press. See adv., page 333.

Fire Brick, Tile, and Clay Retorts, all shapes. Borgner & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Brass & Copper in sheets, wire & blanks. See ad. p. 334.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 15,000 Crank Shafts, and 10,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Cope & Maxwell M'f'g Co.'s Pump adv., page 334.

New Comb'd Milling and Gear Cutting Machines, large range. C. A. Condé & Co., Makers, Philadelphia, Pa.

Wren's Patent Grate Bar. See adv. page 333.

List 27.—Description of 3,000 new and second-hand Machines, now ready for distribution. Send stamp for same. S. C. Forsaith & Co., Manchester, N. H., and N. Y. city.

Learn Telegraphy. Outfit complete, $4.50. Catalogue free. J. H. Bunnell & Co., 112 Liberty St., N. Y.

Diamond Planers. J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

Geiser's Patent Grain Thrasher, Peerless, Portable, and Traction Engine. Geiser Mfg. Co., Waynesboro, Pa.

Saw Mill Machinery. Stearns Mfg. Co. See p. 333.

Tight and Slack Barrel machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 334.

For the manufacture of metallic shells, cups, ferrules, blanks, and any and all kinds of small press and stamped work in copper, brass, zinc, iron, or tin, address C. J. Godfrey & Son, Union City, Conn. The manufacture of small wares, notions, and novelties in the above line, a specialty. See advertisement on page 334.

The I. B. Davis Patent Feed Pump. See adv., p. 334.

Magic Lanterns and Stereopticons of all kinds and prices. Views illustrating every subject for public exhibitions, Sunday schools, colleges, and home entertainment. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., New York.

New Economizer Portable Engine. See illus. adv. p. 334.

Upright Self-feeding Hand Drilling Machine. Excellent construction. Pratt & Whitney Co., Hartford, Conn.

Catechism of the Locomotive. 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 332.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new Injector, worked by a single motion of a lever.

Supplee Steam Engine. See adv. p. 270.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) B. J. F. asks: How is the "snow-flake" appearance produced on card board? A. Mix with a very concentrated aqueous solution of good clean table salt enough of a warm aqueous solution of dextrine to make a very thin mucilage. Apply this with a wide soft brush to the card board—the thinnest possible coating is all that is required. Sulphate of magnesia, acetate of soda, and stannous sulphate are employed in a similar manner.

(2) F. M. asks: Which has the more power: an engine with a 12 inch cylinder and a 24 inch stroke, or an engine with a 12 inch cylinder and a 24 inch stroke, the pistons traveling the same number of feet per minute, other conditions being the same on both? If they had equal power, does one take more steam to run it than the other? And which is preferable for a saw mill? A. There is little difference: the 24 inch stroke would be a trifle more economical, as there would be less loss from clearances and waste spaces; but the 30 inch stroke might be best for a saw mill, as less shafting would be required to get up the speed of the saw.

(3) G. H. H. asks: How can I make a brilliant scarlet ink? I have made a fair carmine by mixing carmine No. 40, 1 oz.; water, one gallon; and a little strong solution of ammonia, but it is no better than the carmine ink sold by stationers. I want to make a pretty ink for fancy ledger work. Cheapness and simplicity are, of course, desired. A. 1. Brazil wood, 2 oz.; stannous chloride, ½ drachm; gum arabic, 1 drachm. Boil down in 32 oz. soft water to 16 oz., and strain. 2. Dissolve crimson aniline (soluble) in a sufficient quantity of soft water. 3. Pure carmine, 12 grains; aqua-ammonia, 3 fluid oz.; dissolve, then add powdered gum, 18 grains. Half a drachm of powdered drop lake may be substituted for the carmine where cheapness is an object.

(4) J. S. says: One of the serious problems before a farmer is that of roofing, and any mode which lessens the cost is most desirable. It has been stated that a flat roof made of jointed boards covered with tar paper, and that smeared thickly with coal tar on which road dust is sifted until no tar will appear through it, and this smearing and dusting continued till a thickness of three-eighths or half an inch is attained, will make a durable and effectual roofing. Will it? Such a roof will cost about half that of other roofs, and if as good as claimed should be made. I have some outhouses to construct, and would like to have your opinion and experience. A. Where the dip of the roof is very slight, and the tar has been boiled for several hours before using, and the gravel is thoroughly dry when put on, a roofing such as described will last a long time and fulfill the requirements very well. If the tar has not been well boiled—to exclude moisture and light volatile matters—it is apt to soften under a hot summer sun, and crack in very cold weather.

(5) S. M. P., Jr., and W. C. ask: What treatment does petroleum (the crude oil) go through in "refining," and what are the products of the treatment? A. Crude petroleum is an intimate mixture of a large number of hydrocarbon oils, which are usually roughly separated by fractional distillation into about half a dozen commercial products. The apparatus employed in the process usually consists in a large iron still provided with an iron worm condenser or series of wrought iron pipes submerged in water for the purpose of keeping the metal cool. When heat is applied to the still the first products which pass over are *rhygoline* and *chymogene*—light gases at ordinary temperatures, and which require an ice-packed condenser and an air pump for their condensation to the liquid state. These are usually permitted to escape. As the contents of the still is more strongly heated condensable vapors soon begin to pass over and a stream of oil trickles from the end of the condenser or worm into the receiving tank. The first oils have a gravity of about 95° Baume, and as the distillation proceeds they become heavier, 90° B., 85° B., 80° B., and so on. In most refining establishments it is customary to allow the first distillate to run into one tank until the gravity of the product reaches about 60° B. This product is called crude naphtha, and is separated by redistillation into gasoline (the lightest), naphtha, and benzine. When the oil distilled reaches a gravity of about 60° B., the stream is diverted into the kerosene tank and continues to run into this until it reaches a gravity of about 38° B. This second fraction is the burning oil or kerosene. The oil of a greater gravity than 38° B. is allowed to flow into the paraffine oil tank. When the distillation is finished the residuum of coke or tar is removed from the still. From the third fraction—paraffine oil—solid paraffine is obtained by cold and pressure; the expressed oil serving for the preparation of lubricants, etc. Special products are sometimes made by modifying the fractioning operation. Kerosene oil forms the heart of the crude oil, of which it comprises about 55 per cent.

(6) E. A. and F. M. ask: What are the best methods of preserving autumn leaves and when should the leaves be gathered? A. It depends somewhat upon the season when the leaves develop their greatest beauty and variety of tints. Sumac and the leaves of similar plants or trees are usually gathered early in October. Maple, alder, oak, linden, etc., are now at their best. To preserve the leaves they should be thoroughly dried as soon as possible after gathering and trimming. A simple method of drying the leaves expeditiously is the following: Spread the leaves and press in a suitable pan with alternate layers of fine sifted dry sand heated as hot as the hand can bear and set aside to cool. When the sand has cooled the leaves may be removed, smoothed under a hot iron, dipped for a moment in clear French spirit varnish, and allowed to dry in the air. Melted paraffine and wax are sometimes preferred to the varnish. The following is another way: Spread several thicknesses of fine wrapping paper on the ironing table; arrange the leaves of the spray, picking off those which do not add to its beauty, and lay it out smooth. Pass a warm flat iron over a cake of wax and then over the leaves—first on one side and then on the other. Then place the sprays between sheets of bibulous paper, and put under pressure between two flat boards, for several weeks, changing the paper several times.

(7) J. McD. asks: 1. At what rate of speed does combustion move through the atoms of nitro-glycerine? A. It has never been ascertained. 2. Does any other substance admit of a more rapid propagation? A. We think not.

(8) F. A. S. asks: Can a common photograph of large dimensions be photo-lithographed and reduced by photo-lithography? A. As we understand you, yes. See Printing by Photography, in SUPPLEMENTS, Nos. 143 and 146.

(9) F. L. W. writes: I want something cheap, efficient, and tasteless, for preserving mince meat. If there is anything of the kind please let me know through your correspondence column. If not, please state the best method, and oblige a reader. A. Salicylic acid has been recommended for this purpose, ten to fifteen grains to the pint.

(10) J. M. S. asks: What is the temperature of steam generated directly from water at a pressure of ninety pounds to square inch? A. The temperature of steam under a pressure of ninety pounds per inch is 324·3° Fah. 2. What increase in pressure is had by superheating steam at 90 to a temperature of 340° Fah.? A. About 29·2 lb. per inch.

(11) T. P. N. asks: What is the chemical process by which the article known as "paper board" is made? A. See the Technology of the Paper Trade, contained in SUPPLEMENTS, Nos. 109, 110, 116, 117, 118, and 123.

(12) N. S. asks: Would it pay to work a mine of pure mica, if in large sheets, with say $15 or $20 freight per ton to San Francisco? A. See article on Mica and its Utilization, page 257, current volume.

(13) H. F. asks: 1. How often is it necessary, and how often has the Atlantic cable been laid? A. None of the Atlantic cables have been relaid or laid a second time. They have been frequently broken, but the ends have been taken up and rejoined. 2. What and where is the greatest depth of water known, and which is the roughest for navigation? A. The greatest depth of soundings taken is 4,655 fathoms. Not taking into account monsoons, typhoons, and other extraordinary storms, the Atlantic Ocean is roughest.

(14) C. H. asks: How is citrate of magnesia made, the same as that prepared by druggists? A. Effervescing citrate of magnesia is prepared as follows: Carbonate of magnesia, 25 parts; citric acid, 75 parts; distilled water, q. s. Mix and reduce to a rather thick paste, which dry at a temperature not exceeding 86° Fah. Mix 14 parts of the dried mass with sodium bicarbonate, 13 parts; citric acid, 6 parts; white sugar, fine powder, 3 parts. Moisten the mixture with a sufficient quantity of alcohol, and pass it through a tinned iron sieve to form a coarse granular powder. Dry the powder in a moderately warm place, and preserve in well closed bottles.

(15) P. H. G. asks: In making a basswood or cedar canoe is anything besides paint necessary to keep the water from soaking into the wood? A. Paint is all that is required.

(16) E. H. C. asks: 1. Is a knowledge of geometry necessary to a mechanical draughtsman? A. Yes. 2. Can a person become a finished mechanical draughtsman by means of self instruction from lessons in the SCIENTIFIC AMERICAN SUPPLEMENT? A. Yes.

(17) S. L. L. writes: 1. A horse is attached to a rope fifty feet in length, one end of which is made fast to a post. The horse is started, and pulls 500 pounds. Question: How many pounds strain is there upon the rope? A. 500 pounds. 2. Two horses are attached to a rope fifty feet in length, one at each end, and pointed in opposite directions. They are started simultaneously, and each of them pull 500 pounds. Question: How many pounds strain is there upon said rope? A. 500 pounds. 3. Is there any point in the rope where a greater strain occurs than at others? A. No.

(18) W. and P. asks: Can you tell us how to make a dip for regilding brass trimmings on gas chandeliers that have been stained by flies? A. Try the following: Phosphate of soda, 1 oz.; gold chloride 12 grains; water, ½ pint. Use at or near a boiling heat. Use a dilute aqueous solution of mercuric nitrate to quicken the parts to be gilded.

(19) W. E. asks (1) how and why people get into the habit of burying their dead with the head to the West? A. Originally, as sun worshipers, men buried their dead facing the rising sun. Afterwards, among Western Christians, the dead were buried facing the East—the Holy Land. 2. Last fall I filled a new oak tank with vinegar; it was then perfectly tight, now it leaks badly. With what can I coat the inside so that it will hold vinegar? A. We know of no desirable coating for vinegar tanks. Better dry out the tank, rebrace it, and swell the wood with water before storing the vinegar.

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

E. W.—It is chiefly composed of lime carbonate containing a little sulphide of iron.—W. H. R.—Argentiferous galena ore—a good ore.

NEW BOOKS AND PUBLICATIONS.

THE CENTURY—(SCRIBNER'S MONTHLY).—As this is the period for annual subscriptions to literary periodicals it will not be out of place to call attention to the wealth of solid and interesting reading matter furnished in a year's number of the above splendid magazine. After looking over the two handsome volumes for last year it may be said that they comprehend an epitome of the best thought of the time. They are a little library in themselves. Some of the best serial novels, the best short stories and sketches, and the most delightful bits of verse that have appeared in this country during the year, are in these attractive pages. A list of contributors would simply be a list of the best names familiar to students of the literature of the day. Among those who have contributed to the magazine during the past year are: Mrs. Frances Hodgson Burnett, W. D. Howells, George W. Cable, H. H. Boyesen, Eugene Schuyler, Dr. J. G. Holland, John Burroughs, Theodore Thomas, Richard Henry Dana, E. C. Stedman, Ralph Waldo Emerson, Sir Julius Benedict, George E. Waring, Jr., Joel Chandler Harris (Uncle Remus), R. W. Gilder, and a great multitude of men and women eminent in letters, and gifted with the faculty of ornamenting every subject that they touch. No other magazine designed for the instruction and pleasure of the English speaking people, we are confident, embraces in its scope so vast a variety of topics which come home to the business and the home life of its readers. In art especially, the conductors of the magazine have created a complete revolution. Much has been written, and much more might fairly be said, about the change and the improvement wrought in American art, as illustrated in wood engraving and printing, since the establishment of Scribner's Magazine. The illustrations are simply superb. The freshness of the monthly pages of Scribner's has been a subject for the admiration and pleasure of its readers; and it is a satisfaction to find that they do not become stale by the passage of the months. $3 a year. Published by the Century Company, Union Square, New York.

THE TEETH OF SPUR WHEELS. By Professor C. W. MacCord. Hartford, Conn.: The Pratt & Whitney Company.

Develops mathematically the principles which should govern the construction of spur gearing, and describes the machines employed by the Pratt & Whitney Company for the accurate formation of cutters for spur wheels.

BROWN BROTHERS & CO.'S CATALOGUE OF SUPPLIES FOR COTTON, WOOLEN, SILK, JUTE, AND FLAX MILLS. Providence, Rhode Island.

This illustrated price list of supplies for textile manufactures contains also a large number of rules and tables useful to spinners.

A CATECHISM OF THE MARINE STEAM ENGINE. By Emory Edwards. Third Edition. Philadelphia: Henry Carey Baird & Co.

To the earlier edition (favorably noticed some months ago) Mr. Edwards has prefixed a chapter on the philosophy and operation of the marine steam engine, and has introduced considerable new matter descriptive of recent types of marine boilers. Curiously no mention is made of the valuable improvements made by Mr. Herreshoff.

U.S. ENTOMOLOGICAL COMMISSION BULLETIN, No 6. GENERAL INDEX AND SUPPLEMENT TO THE NINE REPORTS ON THE INSECTS OF MISSOURI. By Charles V. Riley, M.A. Ph.D. Washington: Government Printing Office.

If Professor Riley could find time to extract from his Missouri reports the vast amount of information which they contain of value to all American farmers, gardeners, horticulturists, and students, it would make a volume or two well worth printing by the Department of Agriculture It is for the general lack of just such information that noxious insects are allowed to multiply until their annual cost to the country is $50,000,000 at the least calculation, and sometimes three or four times that amount.

ELEMENTS OF THE INTEGRAL CALCULUS, WITH A KEY TO THE SOLUTION OF DIFFERENTIAL EQUATIONS. By William Elwood Byerly. Boston: Ginn, Heath & Co. 8vo. cloth, pp. 76.

A sequel to Professor Byerly's work on the Differential Calculus, recently noticed, and, like it, is intended for use as a text book and not as an exhaustive treatise.

A PRACTICAL TREATISE ON HERNIA. By Joseph H. Warren, M.D 2d edition. Boston: James R. Osgood & Co. 8vo, Illustrated. pp. 428.

A new introduction has been written for this edition, and six new chapters have been added. Though giving a valuable summary of the history and treatment of hernia from the earliest times, the main purpose of the work is to set forth the advantages of a cure for hernia, which at the author's hands has been eminently successful. The treatment is a modification of Professor Pancoast's, and consists chiefly in a subcutaneous injection of a stimulating fluid in such a manner as to cause an effusion of plastic limph which binds together the ruptured tissues and effects a radical cure.

CELESTIAL OBJECTS FOR COMMON TELESCOPES. By Rev. T. W. Webb. New York: The Industrial Publication Company.

In this fourth edition of his well known handbook for the amateur astronomer Mr. Webb has presented much new matter, increasing the list of interesting and available objects by about 1,500. Our readers have been told how to make a serviceable telescope at small expense. With a home-made instrument (if a better cannot be afforded) and Mr. Webb's book the student need not lack for years of instructive and most enjoyable recreation.

REPORT OF THE COMMISSIONER OF EDUCATION FOR THE YEAR 1879. Washington: Government Printing Office. 1881.

A bulky volume of about a thousand pages of educational discussions, reports, statistics, etc., domestic and foreign. Detailed statistics are given of 48 schools of science endowed with the national land grant, and 34 unendowed schools and collegiate departments of science. The number of students of science was about 11,000. The schools of medicine, of dentistry, and of pharmacy number 114. The number of patents granted during the year for improvements in school furniture and appliances was 114.

THE LABOR QUESTION. By Amicus Humani Generis. Chicago: The Chicago Legal News Company. 12mo, cloth, pp. 186.

A book unskillfully written and badly printed. Had the author stuck to his text the effect would have been much better. To overweight a discussion of this nature with a "new theory of cosmogony" and disquisitions upon the beginning and ending of all things, the biblical story of creation and the like, all crudely conceived, is to disgust some readers and divert others from the real argument the author wishes to offer. He will find few to largely agree with him at the best (and we are certainly not of the number); yet the evident honesty of his thinking and the practical shrewdness and germinal value of some of his thoughts sufficiently attest his mission to speak and make one regret that he has not spoken more to the point.

THE GUN AND ITS DEVELOPMENT; WITH NOTES ON SHOOTING. By W. W. Greener. London and New York: Cassell, Petter, Galpin & Co.

Mr. Greener is well known to the American sportsman as a successful English inventor and manufacturer of sporting guns. Naturally he writes with English prejudices and with a somewhat exaggerated opinion of the contributions of English gunmakers toward the development of modern firearms. Nevertheless the author aims to be impartial, and has brought together much matter of interest to American as well as British sportsmen. The chapter on early firearms, though incomplete even with regard to English inventions, is instructive as well as entertaining. The publisher's part of the work is, as usual, admirably done.

REVISTA MARITIMA BRAZILIERA. Vol. I., Nos. 1 and 2. Rio de Janeiro. 1881.

The need of a journal to represent the interests of the navy in the great empire of Brazil having long been recognized, a monthly review with the above title has recently been started in Rio de Janeiro to supply the want, under the editorship of Lieut Garces Palha. The first two numbers which have reached us present a very neat appearance, typographically considered, and the character of their contents appears to indicate that this new venture is destined to hold a rank in its particular field of journalism equal to that occupied by American, English, French, and Spanish journals devoted to the same specialty. We wish the Revista every success.

English Patents Issued to Americans.

From October 21 to October 26, 1881, inclusive.

Battery, secondary, T. A. Edison, Menlo Park, N. J.
Berth, ship's, D. Parks, Boston, Mass.
Dynamometer, Transmitting Dynamometer Company, New York city.
Dynamo machines, T. A. Edison, Menlo Park, N.J.
Electric lamp, H. B. Sheridan, Cleveland, Ohio.
Electricity, measurement of, T. A. Edison, Menlo Park, N. J.
Firearm, Colt's Patent Firearm Manufacturing Company.
Fireproof composition, C. C. Gilman.
Hot blast apparatus, J. C. Long, Richmond Furnace, Pa.
Life boat, A. Holmes, Petaluma, Cal.
Lubricator, L. Bastel, Brooklyn, N. Y.
Meter for measuring electric current, T. A. Edison, Menlo Park, N. J.
Receptacle, W. H. Miles, Jr., New York city.
Steam boiler furnace, G. W. Clarke, San Francisco, Cal.
Water closet, G. E. Waring, Jr., Newport, R. I.

{OFFICIAL.}

INDEX OF INVENTIONS

FOR WHICH

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

October 25, 1881,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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Air cooling apparatus, A. C. Garratt ... 248,732
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