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Improved Time Register for Velocipedes, Etc.

A want has been felt in velocipede schools, livery stables, billiard rooms, pleasure grounds, etc., where articles are rented out by the hour or for any short periods of time, for some instrument that would register accurately these times and save the trouble of recording the same on a registering book; and also obviate any disagreement which might arise from real or supposed errors in the estimation of time.

The invention herewith illustrated is an instrument which supplies this want, and its construction and operation may be described as follows:—Fig. 1 being a front view with a portion of the dial plate broken away to show better important parts lying underneath it; and Fig. 2 being an enlarged detail showing one of these parts still more fully.

The device is connected with the works of an ordinary clock. Around the ordinary dial are placed smaller dials, as shown in Fig. 1, as many being used as required, divided into hour and minute spaces, and each provided with a single hand. These hands are attached to the journals of the small wheels, A, Figs. 1 and 2, and receive motion from them. These wheels revolve in brackets set radially to the center of the main dial, and attached to the frame of the clockwork. The form of these brackets is well shown at B in Fig. 2. The wheels, A, are provided with a stop which prevents them from making more than one revolution, and stops them with their hands upon the zero mark when revolved back. These wheels are also provided with small coiled springs, C, which revolve them back to the zero mark as soon as they are thrown out of gear with the clockwork.

Small pinions, D, are attached to the inner ends of levers, one of which is partially shown in perspective at E, Fig. 2, the form of the remainder, lying underneath the dial plate, being indicated by a dotted outline, with one of the pinions, D, in gear with a central driving wheel, F, Figs. 1 and 2, and also with the wheel, A.

The levers, E, are pivoted to the journals of the wheels, A, or in a line with these journals, so that in whatever direction the levers are moved the wheels, D and A, will always mesh into each other.

The large gear wheel, F, is attached to the hollow spindle which carries the hour hand of the clock. Each of the levers is acted upon by a spring, G, shown in dotted outline in Fig. 2, so that when these levers are left free the action of the springs will run the pinions, D, into gear with F, and the wheels, A, at once commence to revolve and record the time on their respective dials.

The levers, E, are thrust to one side, throwing the pinions, D, out of gear with F by keys of the proper form, H, thrust into keyholes arranged at suitable intervals around the outer portion of the clock case, when the action of the small coiled springs, C, carries the wheels, A, immediately back to the zero point. Each key is numbered to correspond with the number of the dial to which it belongs, to avoid dispute.

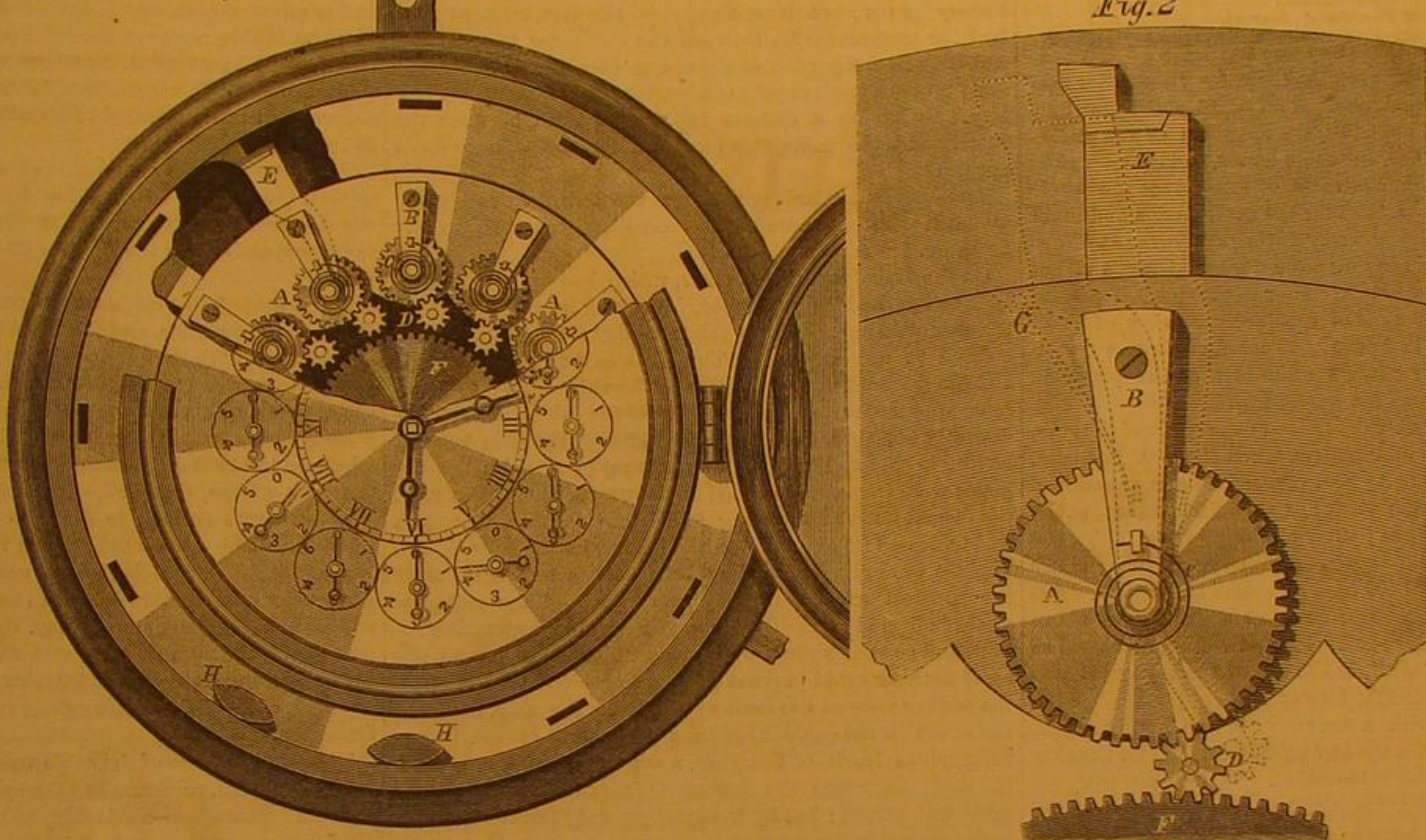
In using this register when a velocipede or other article is rented, the key of one of the dials is withdrawn, and presented to the person renting the article. When he returns the key it is put back in its place and the hand on its dial returns to zero, the time registered thereon being first noted by both parties.

Each dial with its gearing is independent of all the others, and as many may be used as can be arranged around the central driving wheel.

Thus a simple and accurate register is obtained. The same principle is capable of extension to hotel registers for rooms, to timing laborers on docks, and to numerous other purposes which will suggest themselves to the reader.

Application for patent pending through the Scientific American Patent Agency by A. Courvoisier whom address for further information, at Denver, Colorado.

Fig. 1 *Fig. 2*



COURVOISIER'S TIME REGISTER.

Improvement in Mill Bushes.

The object of the invention which we herewith illustrate, is to enable the spindles of millstones to be adjusted with perfect accuracy, and at the same time to furnish bearings of anti-friction material, which may be kept constantly and perfectly lubricated, and from which all extraneous dust or grit calculated to aggravate friction may be kept excluded.

Fig. 1 is a perspective view of this improvement, and Fig. 2 is a sectional view of the same, showing details of construction. A, Fig. 2, is the spindle, playing in segmental bearings, B. There are four of these which, together, make up the entire bearing for the spindle. They are hollow, as shown in the engraving, and faced with anti-attrition surfaces.

The outer sides of these segments are inclined, these surfaces resting against the inclined inner surfaces of the hollow binding wedges, C. Through the lower part of these wedges pass hooked bolts, D, with thumb-nuts at their lower ends, by turning which, the wedges are forced upward, and the segments, B, being prevented from rising by the top plate, E, are forced inward till their surfaces are brought in proper proximity to the spindle.

It is evident that by raising and lowering these wedges as circumstances require the spindle can be adjusted with the greatest accuracy.

Lubrication is secured by placing a store of oil in the chambers, F, of the segmental bearings, B, from which it is fed, as wanted, through the apertures, G, to the bearing surfaces of the spindle and bush.

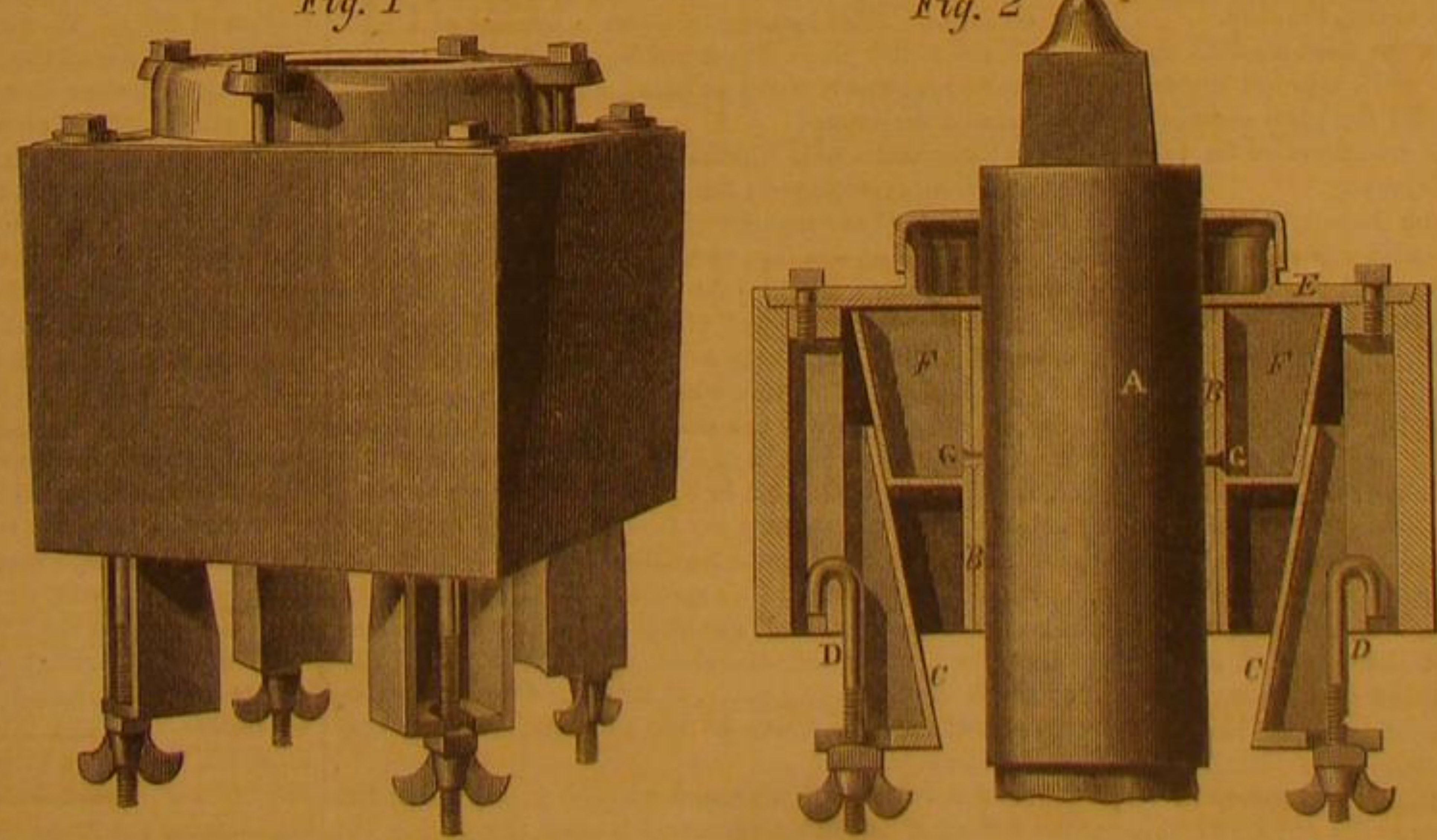
Lastly, the exclusion of dust and grit is secured by forming a chamber, H, upon the top plate of the bush, with an annular cap which shuts down over it and incloses the spindle, in which chamber is placed packing yarn or other suitable material to intercept all extraneous materials of this character.

The top plate is bolted down to the external portion of the bush, and the whole inclosed as shown in Fig. 1.

All experienced millers are aware that the attainment of the above objects by a simple device is a very desirable achievement. By the use of this improvement the adjustment can be readily and accurately made, and the wear of the spindle would seem to be reduced to a minimum.

This improvement was patented through the Scientific American Patent Agency, Dec. 31, 1867, by C. Custer. For further information address C. K. Bullock, 1,128 Market street, Philadelphia, Pa.

Fig. 1 *Fig. 2*



CUSTER'S IMPROVED MILL BUSHES.

Steel Springs.

RULE 1ST. To find elasticity of a given steel-plate spring: Breadth of plate in inches multiplied by cube of the thickness in 1-16 inch, and by number of plates; divide cube of span in inches by product so found, and multiply by 1·66. Result, equal elasticity in 1-16th of an inch per tun of load.

RULE 2D. To find span due to a given elasticity, and number and size of plate: Multiply elasticity in sixteenths per tun, by breadth of plate in inches, and divide by cube of the thickness in inches, and by the number of plates; divide by 1·66, and find cube root of the quotient. Result, equal span in inches.

RULE 3D. To find number of plates due to a given elasticity, span, and size of plates: Multiply the cube of the span in inches by 1·66; multiply the elasticity in sixteenths by the breadth of the plate in inches, and by the cube of the thickness in sixteenths; divide the former product by the latter. The quotient is the number of plates.

RULE 4TH. To find working strength of a given steel plate spring: Multiply the breadth of plate in inches by the square of the thickness in sixteenths, and by the number of plates; multiply also the working span in inches by 11·3; divide the former product by the latter. Result, equal working strength in tuns burden.

RULE 5TH. To find span due to a given strength and number, and size of plate: Multiply the breadth of plate in inches by the square of the thickness in sixteenths, and by the number of plates; multiply, also, the strength in tuns by 11·3, divide the former product by the latter. Result, equal working span in inches.

RULE 6TH. To find the number of plates due to a given strength, span, and size of plate: Multiply the strength in tuns by span in inches, and divide by 11·3; multiply also the breadth of plate in inches by the square of the thickness in sixteenths; divide the former product by the latter. Result, equal number of plates.

The span is that due to the form of the spring loaded. Extra thick plates must be replaced by an equivalent number of plates of the ruling thickness, before applying the rule. To find this, multiply the number of extra plates by the square of their thickness, and divide by the square of the ruling thickness; conversely, the number of plates of the ruling thickness to be removed for a given number of extra plates, may be found in the same way.

THE FRENCH ATLANTIC TELEGRAPH.

From Chambers' Journal.

(Concluded from page 273.)

When the *Great Eastern* left Portland for Brest, after taking in her supply of coal, she had on board about four hundred and fifty persons, including the members of the electrical and engineering staffs, the cable hands, and the crew; and one would think, looking at the list of stores that the whole of London had been ransacked for the sustentation and inner edification of this miniature army during the voyage to Newfoundland and back. Leaving out a thousand items of but little consequence, we need only refer to the 100,000 pounds of meat and poultry, 30 tuns of vegetables, 35 tuns of bread and flour, 15,000 eggs, and over 2,000 dozen of liquors of various kinds, to give our readers some idea of the provision necessary to be made for a six weeks' trip.

We have made a rough calculation of the cargo of the ship, including her engines and boilers, when she left Portland, and believe the following to be a very near approximation—it is certainly not *over* the mark: Cable, 5,520 tuns; cable-tanks and water, 400 tuns; timber shorings for tanks, 500 tuns; paying-out and picking-up machinery, 120 tuns; ship's stores, 250 tuns; coals, 6,400 tuns; engines and boilers, 3,500 tuns; total, 16,690 tuns. Her draft at starting was about 34 feet aft, and 28 feet forward. This, of course, decreased as the cable was paid out, until, at the end of the voyage, it was only about 25 feet aft, and 23 forward.

Before proceeding with a narrative of the laying of the cable, we wish to describe the arrangements made for the electrical testing of it during submersion. These were, with one or two slight exceptions, identically the same as in 1866. Their most interesting feature is the keeping up of a constant test on ship and shore for insulation, by a plan devised by Mr Willoughby Smith in 1865, at the same time allowing of tests for the continuity of the conductor, and free communication between ship and shore to be kept up without in any way interfering with the insulation test. By this means, should a "fault" pass overboard into the sea, it is detected at once, and the paying-out may be stopped before any considerable length of the cable has been allowed to run out. The advantage of this system over the old is apparent from the fact, that formerly it was possible for three or four miles of cable to run out between the occurrence of the fault and its detection; whereas now, except under very peculiar circumstances, within two or three minutes after a "fault" passes overboard, it can be detected, and the signal given to stop the ship.

In conclusion, nothing that could in the least possible way facilitate the execution of the great work was left undone. All the arrangements were of the most complete character, and were placed in charge of men who are unrivaled for their practical knowledge of submarine telegraphy.

The expedition started from Brest on Monday, the 21st of June, and the American end of the cable was safely landed at Duxbury, near Boston, on Friday, the 23d July. The five weeks which elapsed between those two dates were enlivened with incidents of the most interesting nature, and it is to these we shall now refer.

For the first three days all went well. The weather was very fine; the paying out of the cable proceeded without a hitch, and all were beginning to indulge hopes that, as in 1866, the voyage would be made without the occurrence of those unfortunate "faults" which cause such delay and trouble. But our hopes were soon upset, for on the fourth day, the 24th June, shortly after daybreak, we were struck with consternation by the intelligence that there existed an electrical fault in the cable. The intelligence was conveyed all over the ship by means of a powerful gong, which was planted outside the electrical room, ready to be hammered upon as soon as anything of a suspicious nature was indicated on the testing instruments. In obedience to the gong, the ship was speedily stopped, and the engines reversed. The tests showed the fault to exist very near the ship; so, without any more ado, the picking-up engines were set to work, and hauling back commenced. At every three hundred or four hundred yards of cable hauled back, a fresh test was made, until, in about a couple of hours, it was found that the faulty place had come on board. Other two hours were sufficient to make a fresh splice between the cable paid out and that remaining on the ship, and then operations were resumed as if nothing had happened. Fortunately, the weather was very fine and the sea calm, and the hauling back was in consequence attended with but little danger. The occurrence of the fault was perhaps advantageous, inasmuch as it served more fully to impress the staff with the importance of having everything in complete readiness for an accident.

The fault was afterwards found to consist of a minute hole penetrating the coatings of gutta-percha; whether caused accidentally or purposely it is impossible to say. It may be asked why it could not have been discovered before it left the tank. The answer probably is, that it was of too minute a nature to indicate its existence on the testing instruments, until, by passing through the paying-out machines, and then undergoing the pressure of the sea, it became more fully developed.

To give our readers some idea as to how a fault is detected, we may (for this purpose only) compare the cable to a long pipe, sealed up at one end into which water is being forced. As long as the pipe remains perfect, only a certain amount of water can be put into it, according to its capacity, and once filled, there is no flow of water; but if, when the pipe is full, a small hole be made in it, the water will of course rush out at once, indicating the existence of the hole by causing a fresh flow of water into the pipe. Now, the cable is always kept charged with electricity up to its full capacity—or, in other words, till it can take no more—and as long as it remains perfect, there is practically no current flowing from the battery into it; but immediately on the development of a fault, or communication between the conductor of the cable and the earth, a portion of the charge escaping through the fault causes a fresh supply of electricity to flow from the battery. By having a delicate instrument fixed between the battery and the cable, this increased flow is at once made apparent.

Another similar fault occurred on the 26th, fortunately unattended with any more serious consequences than in the first case.

On the 29th June, the weather, which had up to that time been so fine, suddenly changed. A strong breeze sprung up towards evening, which, by the morning of the 30th, had increased to a heavy gale. The sea was very rough indeed; and the frequent violent lurches of the ship began to cause some apprehensions as to the safety of the cable. Everybody devoutly hoped that we might get through the gale without having to stop and haul back on account of a fault; but our hopes were frustrated, for just in the very hight of the gale, the dismal notes of the gong announced that another fault had indicated its existence on the testing instruments. The engines were reversed, and hauling back commenced, amid the greatest excitement. At every lurch of the ship, the strain indicated on the dynamometer rose to an alarming extent, and as the hauling in proceeded, it seemed continually as if nothing could prevent the breakage of the cable. Still the testing showed the fault to be outside the ship, and still the strain on the cable kept increasing, until at last, in one tremendous lurch of the ship, a whiz was heard, sending a thrill of horror into the bosom of every one on deck. The cable had parted; but by the greatest good fortune the rupture occurred inside the ship, and by a most admirable promptness, the breaks were successfully put on before the broken end could run out over the stern.

The gale was still far too heavy to risk hauling in any longer, so, with not a moment's delay, the end of the cable was secured to a huge buoy, and sent adrift, to be picked up again as soon as the weather became more moderate. The remainder of that day and the whole of the next were spent in steaming about in the vicinity of the buoy, keeping as near to it as possible—the great ship continually rolling in a most ungainly fashion.

On Friday, the 2d of July, the weather was sufficiently fine to enable us to pick up the buoy to which the cable was attached, and a very few hours sufficed to get the end of the cable on board. After hauling in about a quarter of a mile of cable, the faulty place, which had been the original cause of the stoppage, was brought on board, and very speedily the ship resumed her course.

These three faults well illustrated the advantages of the system of testing employed; for in each case, the existence of the fault must have manifested itself within three minutes after it left the ship—in fact, as soon as the pressure of the sea could force the water into the flaw. After stopping the engines, of course the "way" of the ship would carry her seven or eight hundred yards before the paying out could come to a dead stop, and this, added to perhaps a quarter of a mile run out previous to the detection of the fault, would account for the three fourths of a mile, more or less, which in each case had to be hauled in before the fault was secured. Practically, however, we may say that each of the faults was discovered immediately on its leaving the ship—and this is the great advantage of Smith's system. Neither of the faults was bad enough to prevent the most perfect communication taking place between ship and shore while the tests for localizing the fault were being made, so that the ship could give any instructions whatsoever to the shore which were considered necessary.

On the 5th July, we experienced another heavy gale; but as the testing of the cable remained perfect, the paying out was not interrupted at all. In fact, after the 2d July, nothing occurred to interfere with the progress of the work. The St. Pierre shore end had been laid in readiness for our arrival by the *William Cory*, and the work of the *Great Eastern* was completed on the 13th July.

The rate of paying out the cable was from five and a half to six knots per hour, the ship running five to five and a half knots. Very likely this speed might have been increased without incurring danger; but, considering the immense size and weight of the ship, and the difficulty of stopping her in case of accident, it was no doubt best to keep the speed within narrow limits.

As to the track of the cable, it seems from the soundings taken that the bottom is composed, the greater part of the distance, of the fine mud usually called "ooze" consisting of very minute shells—so minute that without a microscope the shape is not discernible. This "ooze" constitutes the very best bed for a submarine cable. In fact, judging from the experience of 1866, the cable lies in it as securely and as free from harm as when coiled in the tanks at the manufactory; and if picking up should become necessary, the softness of the "ooze" renders the grappling of the cable comparatively easy.

The position of the present cable has one advantage over that of the English cables—namely, that it has been kept carefully off the Newfoundland Banks, and will therefore not be liable to the breakage by icebergs which have already caused such expense and trouble to the English company. The cable is conducted several miles to the south of the "Great Newfoundland Bank," and then proceeds in a northwesterly direction to the western side of St. Pierre Island, passing along a deep gully between the "Green Bank" and the "St. Pierre Bank." The length of the course selected is about 2,330 knots, and the amount of cable paid out 2,580 knots—making about ten per cent allowance for "slack," or spare cable paid out to cover the inequalities of the bottom, and to allow of picking up, should such become necessary. Without taking notice of the 300 knots from the Brest shore, and the 500 knots from Newfoundland, where the water is shallow, the depth varies from 1,700 to 2,700 fathoms, the deepest part being situated in about 45° north, and longitude 43° west.

Two days after the completion of the Brest and St. Pierre section, the laying of the section from St. Pierre to Boston was commenced. The cable was divided into three pieces, coiled respectively in the *William Cory*, the *Scanderia*, and the *Chiltern*.

The course of this cable runs through shallow water nearly the whole distance, and therefore the paying out of it was not attended with that excitement which existed during the voyage from Brest to Newfoundland. It was felt that if even the cable should break, and be for a time lost, it would be a perfectly easy matter to grapple for it and pick it up; so that when, on the 20th July—through a "foul-flake" or tangle in the tank of the *Scanderia*—the cable did actually snap, a very few hours sufficed to drop the grappling-iron, haul up the cable, make a fresh splice, and resume operations in the usual way. The foul-flake was about the only thing that caused any considerable delay in the paying out of the cable, which was completed on Friday, the 23d July, in the presence of a large number of spectators, including about a hundred representatives of the American press, who came down *en masse*, each of them struggling to obtain the earliest information.

The landing place of the cable was at Duxbury, a few miles from Plymouth, celebrated as the spot whereon the Pilgrim Fathers first landed—a coincidence which the Americans did not fail to make the most of in the speechifying which followed the completion of the work.

The length of this shorter section of the cable was 750 knots; adding which to the 2,580 knots from Brest to St Pierre, we have continuous submarine communication for 3,330 knots. The signals through the whole of this immense length are as distinct and readable as between any two points on an English land line, and can be sent at a much greater speed than the business of the line is likely to require. The signals at present consist of the oscillations of a spot of light on a screen, reflected from the mirror of a "Thomson's Reflecting Galvanometer," as in the English cables; but we believe this is likely to be superseded by a very delicate printing instrument, also, if we are rightly informed, the invention of Sir W. Thomson.

Thus is completed the first direct line of submarine communication between Europe and the United States. No doubt there will be found plenty of room for it, without injuring, in any material degree, the interests of the English companies. We notice that the latter have already reduced their tariff, in order to keep up with the French company. This, of course, will be a great boon to a large section of the commercial fraternity, to whom the high tariff hitherto existing has been an insuperable barrier to frequent communication with America.

But, setting aside the interests of private companies, which are of comparatively little consequence, we believe that the present cable will serve still more strongly to unite in sympathy the Old World to the New, and to make it more apparent that the interests of the two worlds are bound up together. We would fain hope that by the increase of traffic, induced by a decreased tariff, there will be found room for still another cable across the Atlantic.

We confess to a slight feeling of pride that this great work has been accomplished by Englishmen; but waiving this, we rejoice that the three greatest nations of the world—England, France, and the United States—have joined in the execution of a work which cannot fail to help forward in a high degree the progress of civilization.

THE material growth of the South during the last four years is strikingly shown by the editorials in some of the Southern papers. The official figures at the Department estimate that the cotton crop of the Southern States this year will be worth $240,000,000; while the total value of the exports of the South is set down at $328,500,000. At this rate, the value of Southern products is about $31·32 per head for the entire Southern population.

CHARLES READE ON "LIFE LABOR AND CAPITAL."

Charles Reade runs to constructive mechanics. The heroes of his tales are apt to be great fellows for making anything, from kites up to statuary. They are, moreover, brave generous, and noble heroes as well as inventive geniuses. Captain Dodd, in "Very Hard Cash," Hazel, in "Foul Play," and lastly, Henry Little, in "Put Yourself in His Place," are all represented as being great mechanical geniuses.

The latter powerful story, now appearing in serial form in the *Galaxy*, has evidently for its object the elucidation of that most absorbing topic of the time the labor question. It is written in no spirit of prejudice for or against either labor or capital, and while it has not as yet given any solution of the problem how to adjust the interests of these two elements of industry, it has shown in vivid colors many of the shortcomings of each.

Among these shortcomings is a general carelessness and recklessness in regard to life. One of the men who had attempted the life of Little, loses his own life through the bursting of a stone, grudging the few hours of labor necessary to hang and race a sound stone.

Dr. Amboyne, a philanthropic physician in the manufacing town which the novelist has called Hillsborough, and in which the manufacture of cutlery is the staple, sets young Little to work to observe and report upon the sanitary condition of the workmen in that town.

He accordingly makes a statement which may be inferred to embody the results of Mr. Reade's observations and reflections upon this subject, the report being however confined to the file cutters. This report, which we reproduce, appears in the form of an appendix to the part of the story which appears in the November number of the *Galaxy*. It is not only exceedingly racy but very suggestive to inventors:

[Extract from Henry Little's "Report."]

THE FILE CUTTERS.

"This is the largest trade, containing about three thousand men, and several hundred women and boys. Their diseases and deaths arise from poisoning by lead. The file rests on a bed of lead during the process of cutting, which might more correctly be called stamping; and, as the stamping chisel can only be guided to the required nicety by the finger nail, the lead is constantly handled and fingered, and enters the system through the pores.

"Besides this, fine dust of lead is set in motion by the blows that drive the cutting chisel, and the insidious poison settles on the hair and the face, and is believed to go direct to the lungs some of it.

"The file-cutter never lives the span of life allotted to man. After many small warnings, his thumb weakens. He neglects that; and he gets touches of paralysis in the thumb, the arm, and the nerves of the stomach; can't digest; can't sweat; at last can't work; goes to the hospital; there they galvanize him, which does him no harm; and boil him, which does him a deal of good. He comes back to work, resumes his dirty habits, takes in fresh doses of lead, turns dirty white or sallow, gets a blue line round his teeth, a dropped wrist, and to the hospital again or on to the file-cutter's box; and so he goes miserably on and off till he drops into a premature grave, with as much lead in his body as would lap a hundredweight of tea."

THE REMEDIES.

"*A. What the masters might do.*

"1. Provide every forge with two small fires, eighteen inches from the ground. This would warm the lower limbs of the smiths. At present their bodies suffer by uneven temperature; they perspire down to the waist, and then freeze to the toe.

"2. For the wet grinders they might supply fires in every wheel, abolish mud floors, and pave with a proper fall and drain.

"To prevent the breaking of heavy grindstones, fit them with the large, strong, circular steel plate—of which I subjoin a drawing—instead of with wedges or insufficient plates. They might have an eye to life, as well as capital, in buying heavy grindstones. I have traced the death of one grinder to the master's avarice; he went to the quarry and bought a stone for thirty-five shillings the quarry master had set aside as imperfect; its price would have been sixty shillings if it had been fit to trust a man's life to. This master goes to church twice a Sunday, and is much respected by his own sort; yet he committed a murder for twenty-five shillings. Being Hillsborough, let us hope it was a murderer he murdered.

"For the dry-grinders they might all supply fans and boxes. Some do, and the good effect is very remarkable. Moreover, the present fans and boxes could be much improved.

"One trade—the steel fork-grinders—is considerably worse than the rest; and, although the fan does much for it, I'm told it must still remain an unhealthy trade. If so, and Dr. Amboyne is right about life, labor, and capital, let the masters co-operate with the Legislature, and extinguish the handicraft.

"For the file-cutters, the masters might—

"1st. Try a substitute for lead. It is all very well to say a file must rest on lead to be cut. Who has ever employed brains on that question? Who has tried iron, wood, and gutta-percha, in layers? Who has ever tried anything, least of all the thing called Thought?

"2d. If lead is the only bed—which I doubt—and the lead must be bare—which I dispute—then the masters ought to supply every gang of file-cutters with hooks, taps, and basins, and soap, in some place adjoining their workrooms. Lead is a subtile, but not a swift poison; and soap and water every two hours is an antidote

"3d. They ought to forbid the introduction of food into file-cutting rooms. Workmen are a reckless set, and a dirty set; food has no business in any place of theirs, where poison is going.

"*B. What the workmen might do.*

"1st. Demand from the masters these improvements I have suggested, and, if the demand came through the secretaries of their unions, the masters would comply

"2d. They might drink less, and wash their bodies with a small part of the money so saved; the price of a gill of gin, and a hot bath, are exactly the same; only the bath is health to a dry-grinder, or file-cutter; the gin is worse poison to him than to healthy men.

"The small wet-grinders, who have to buy their grindstones, might buy sound ones, instead of making bargains at the quarry, which prove double bad bargains when the stone breaks, since then a new stone is required, and sometimes a new man, too.

"4th. They might be more careful not to leave the grindstone in water. I have traced three broken stones in one wheel to that abominable piece of carelessness.

"5th. They ought never to fix an undersized pulley-wheel. Simmons killed himself by that, and by grudging the few hours of labor required to hang and race a sound stone.

"6th. If files can only be cut on lead, the file-cutters might anoint the lead over-night with hard-drying ointment, soluble in turps, and this ointment might even be medicated with an antidote to the salt of lead.

"7th. If files can only be cut on *bare* lead, the men ought to cut their hair close, and wear a light cap at work. They ought to have a canvas suit in the adjoining place (see above); don it when they come and doff it when they go. They ought to leave off their insane habit of licking the thumb and finger of the left hand—which is the leaded hand—with their tongues. This beastly trick takes the poison direct to the stomach. They might surely leave it to get there through the pores; it is slow, but sure. I have also repeatedly seen a file-cutter eat his dinner with his filthy, poisoned fingers, and so send the poison home by way of salt to a fool's bacon. Finally, they ought to wash off the poison every two hours at the taps.

"8th. Since they abuse the masters, and justly, for their greediness, they ought not to imitate that greediness by driving their poor little children into unhealthy trades, and so destroying them body and soul. This practice robs the children of education at the very seed-time of life, and literally murders many of them; for their soft and porous skins, and growing organs, take in all poisons and disorders quicker than an adult.

"*C. What the Legislature might do.*

"It might issue a commission to examine the Hillsborough trades, and, when accurately informed, might put some practical restraints both on the murder and the suicide that is going on at present A few of the suggestions I have thrown out might, I think, be made law.

"For instance, the master who should set a dry-grinder to a trough without a fan, or put his wet-grinders on a mud floor and no fire, or his file-cutters in a room without taps and basins, or who should be convicted of willfully buying a faulty grindstone, might be made subject to a severe penalty; and the municipal authorities invested with rights of inspection, and encouraged to report.

"In restraint of the workmen, the Legislature ought to extend the Factory Act to Hillsborough Trades, and so check the heartless avarice of the parents. At present, no class of Her Majesty's subjects cries so loud, and so vainly, to her motherly bosom, and the humanity of Parliament, as these poor little children; their parents, the lowest and most degraded set of brutes in England, teach them swearing and indecency at home, and rob them of all decent education, and drive them to their death, in order to squeeze a few shillings out of their young lives; for what?—to waste in drink and debauchery. Count the public houses in this town.

"As to the fork-grinding trade, the legislature might assist the masters to extinguish it. It numbers only about one hundred and fifty persons, all much poisoned and little paid. The work could all be done by fifteen machines and thirty hands, and, in my opinion, without the expense of grindstones. The thirty men would get double wages; the odd hundred and twenty would, of course, be driven into other trades, after suffering much distress. And, on this account, I would call in Parliament, because then there would be a temporary compensation offered to the temporary sufferers by a far-sighted and beneficent measure. Besides, without Parliament, I am afraid the masters could not do it. The fork-grinders would blow up the machines, and the men who worked them, and their wives, and their children, and their lodgers, and their lodger's visitors.

"For all that, if your theory of Life, Labor, and Capital is true, all incurably destructive handicrafts ought to give way to machinery, and will, as Man advances."

Improvements in Paper-making Machines.

The invention we are about to describe has been recently brought out in England, and it consists in the application to paper-making of a roller coated with vulcanite and with vulcanized india-rubber, and which is substituted for the ordinary metal under press roll of the machine, and may be used as an under or upper second press roller. We are indebted to the *Mechanics' Magazine* for the details which follow:

"In the paper-making machine now in use, the pulp for forming the material of the paper is projected, in a fluid state, upon an endless wire cloth, and is kept from overflowing at the sides by endless bands (commonly termed deckle straps) after having a greater portion of the water sucked from it by capillary attraction and the action of air pumps. The endless wire cloth, carrying the moist pulp upon its upper surface, passes between a pair of couching rollers, the upper roller of which is usually made to press upon the under roller. These couch rollers are usually covered with a woolen jacket, and, also, are constructed of metal in the case of the under, and of wood in the case of the upper roller. The web of paper, having passed between the upper and under couch rolls, next passes between another pair of rollers called first-press rollers, which have an endless woolen cloth or felting of open texture (technically called a wet felt) between the web of paper and the surface of the under first press roll for the purpose of expressing or discharging the water contained in the paper.

"The under press roll is made of iron, the endless woolen cloth or felting passing between the under press roller, and the upper press roller carries the web of paper with it between the upper and under press rollers. In so passing between the press rollers, the web of paper, as at present manufactured, is subjected to considerable pressure, by which the substance of the paper is made thinner, and the natural elasticity of the fibrous pulp of which the paper chiefly consists becomes greatly impaired. The woolen cloth or felting also being subjected to considerable pressure while passing in a damp state between the ordinary metal first press rollers carrying the moist web of paper, suffers great tear and wear from the attrition caused by the hardness and unyielding character of the two metal rollers.

"By the substitution of a composite under press roller possessing a slight degree of elasticity, the web of paper, in being carried upon the endless woolen cloth or felting between the press rollers, is subjected to a less pressure than is received by the ordinary pair of metal rollers, while, at the same time, a sufficient pressure is given to effect the purposes for which the web of paper is passed through the press rollers, viz., to express or discharge the waters still remaining in the pulp to a degree sufficient to enable the web of paper to be led round the drying cylinders of the machine. From the slightly elastic and softer character of the new under press roller, the natural elasticity of the web of paper is preserved, and the fibrous substance of the web of paper not being crushed together, as in the case of the ordinary metal first press rolls, permits the web of paper in the succeeding process of drying upon cylinders to become more valuable than by the ordinary process, and thereby the character of paper so made thus becomes more akin to paper made by hand, by the great increase of body or bulkiness acquired by the freedom from the effects of the severe pressure imposed in the case of the use of ordinary metal first press rollers. The endless woolen cloth or felting, from being subjected to an elastic pressure, suffers very much less attrition, or tear and wear, in passing over the softer and elastic material of the under press roller, and the action of the felting is thereby such, that it goes much longer without washing, and is not liable to cut by its creasing or otherwise.

"In those paper-making machines in which a second set of press rollers is employed, a composite rubber roller is substituted for the second under press roller, except in those machines in which the second upper press roller serves to carry the wet felt, and which has the wet felt between it and the paper. In this latter instance, the composite rubber roller will be applied to the second upper press roller as it thus performs functions similar to the first under press roller. The materials of which the roller is composed, are as follows, viz:—a metal roller of the ordinary size at present in use has applied to it a first or inner coating of vulcanite cured and hardened only to such an extent or degree as to adhere or stick firmly to the metal shell of the roller, which it covers, and then an outer coating covering the vulcanite coating, composed of vulcanized india-rubber, or india-rubber not so highly cured, and therefore of a softer and more elastic character than the inner coating. With rollers thus covered, there is no tendency in the covering to separate from the metal, and the rollers are thereby much better fitted to withstand the pressure which they receive when in use, and, in consequence of the interposed coating of vulcanite, are not liable to strip."

Horse Nails.

A patent has been taken out in England for a new method of making horse nails. It consists in providing a machine employed in this manufacture with a special furnace through which the nail rod is passed continuously before arriving at the anvil or anvils; also in an automatic feed motion for propelling the nail rod, and in the employment in such machines of two distinct anvils and hammers, one of which anvils is stationary and the other movable. One of these anvils has formed on its face a die representing a nail on its side, and the other a die representing a nail on its flat, or these dies may be formed on the faces of the hammers of the respective anvils, or partly in the hammer and partly in the anvil in each case.

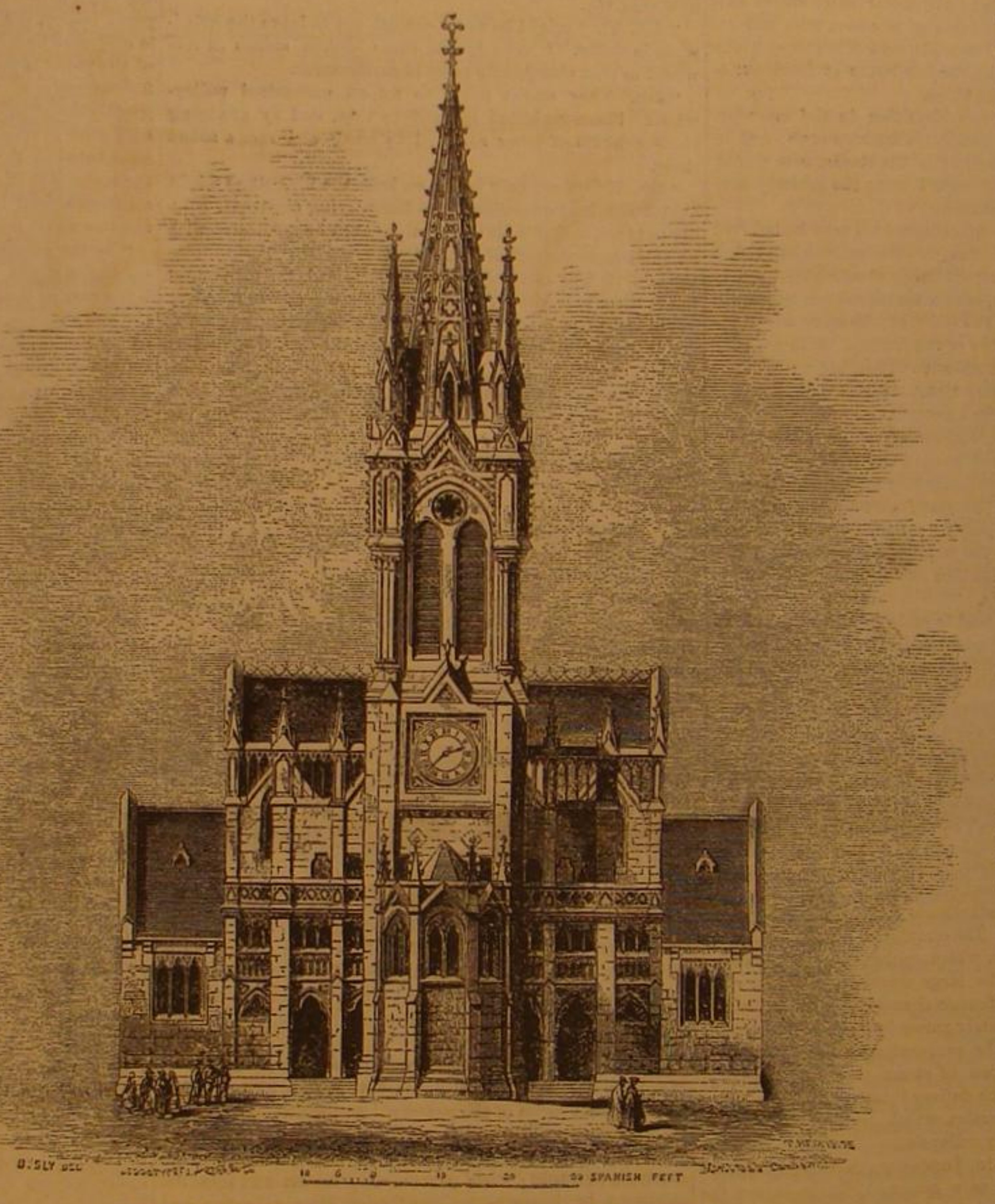
TO PICKLE MUSHROOMS.—Button mushrooms are best for pickling. Peel them, cut the stocks off close to the button; do not pull them off, as that draws out the heart. The appearance of every button will be improved by rubbing it with a piece of flannel and salt. Now put the mushrooms into a frying-pan in single layers, sprinkle them with salt and pepper, and allow them to cook over a gentle fire for about a quarter of an hour. Remember, they are not to be fried, but merely gently cooked in their own liquor. This done, put them into pickle bottles, with a few layers, here and there, of whole pepper, mace, long pepper, and whole ginger. Fill up the bottles with good vinegar, and tie them down air-tight with bladder. In six weeks they will be ready.—*S. Piesse.*

SPANISH PROTESTANT CHURCH PROPOSED TO BE BUILT AT MADRID.

Among the changes wrought by the recent Spanish Revolution, are the establishment of the right of trial by jury and freedom of religious worship. Several Protestant rooms for preaching the Gospel have been opened at Madrid, and it is now proposed to erect the First Protestant Church. In connection with the historical importance of this event, our readers will be interested in the architectural design of this church, an engraving of which we herewith present, M. Juan Madrazo being the architect. The elevation is that of the west end of the building.

To the Madrid committee the municipal corporation have granted, gratuitously, a piece of ground 17,000 square feet in extent, for the purpose of building this church.

The entrance to the building will be at the west front, through a sort of cloister or narthex, separating the baptistery from the body of the church, above which the clock and bell tower, with a perforated stone spire, will rise about 155 feet high. Entering the church, there will be found accommodation for 500 persons in open seats. A small court will separate the chancel from the schools and clergyman's house, forming a rear wing. These buildings will be of stone (a kind of Bath stone). Both nave and chancel will have an open timber roof, supported by arches built of brick, spanned across. In the center of the transept a louver in the roof will be provided for ventilation, taking externally the appearance of a spire. This and the roofs will be covered with slates and lead. The cost of the whole is estimated at £10,000.



THE PROPOSED SPANISH PROTESTANT CHURCH.

On Fresh Meat Preservation, by John Gamgee.

After many trials, the process which was found to act best was the exhaustion of air from the vessel containing the meat to be preserved, and the introduction of various vapors. Among other substances, the following were tried: Ozone, chloroform, ether, tetrachloride of carbon, bichloride of methylene, carbolic acid, chlorine, hydrochloric acid, and binoxide of nitrogen; but these were ultimately abandoned for sulphurous acid, introduced into the preserving vessel condensed in the pores of charcoal. "I believe," writes Mr. Gamgee, "that charcoal, saturated with sixty-five times its volume of sulphurous acid, will remain, to the end of days, the cheapest, most manageable, and most universally employed antiseptic that the meat preserver can use. It is, perhaps, bold to predict, that which I do with the greatest confidence, that charcoal and sulphurous acid will, in a few years' time, to a great extent, supersede the use of salt." For various reasons, however, sulphurous acid could not be used alone; and the experiments of Hoppe Seyler suggested the simultaneous employment of carbonic oxide, as it was found to preserve the color of the meat and to expel the oxygen from the tissues; it also acted as a neutral gas to surround the meat in air-tight vessels in place of atmospheric air. The meat to be preserved was placed in a vessel capable of being exhausted by an air-pump; lumps of charcoal saturated with sulphurous acid were then added, and the vessel was exhausted as completely as possible; carbonic oxide was then introduced until the normal atmospheric pressure prevailed within the preserving vessel. Meat thus preserved was found to keep perfectly, not alone in closed cans, but in open vessels, and it could not be distinguished, as regards taste, from recently killed meat. Of course the chief obstacle to the adoption of the process is the expensive nature of the apparatus, and attempts have been made to displace the oxygen from the neighborhood of the meat, by driving carbonic acid through the preserving vessel by means of a fan; it is obvious, however, that the tissues would still remain charged with oxygen. Whatever may be the value of this process on the large scale, there can be no doubt that few inventions could, at the present time, be of greater value to the human race at large than one which would secure the utilization, as food, of the thousands of tuns of meat which are now wasted in Australia and Texas, and the Argentine Republic. To allow myriads of oxen to attain maturity, and to destroy them for the sake of their skins alone, seems an act comparable to that of the Roman Emperor who caused several hundred flamingoes to be destroyed that he might be provided with a dish of their tongues.

RAILWAY PLANT--SLEEPERS, TIES, AND CLIPS.

From Auchincloss' Report on Steam Engineering at the Paris Exposition.

The rapid extension of railway interests in tropical countries, as Egypt, India, Algeria, and South America, with the increased scarcity of timber for ties in more civilized portions of the world, have concentrated the efforts of inventive talent toward the production of what may justly be termed a permanent road bed. The present Exposition contains some interesting signs of progress in this direction; a few only will be selected as types, uniting simplicity of construction with practical utility.

The cast-iron pot sleeper introduced on the Alexandria, Cairo, and Suez Railway, by Mr. R. Stephenson, in the year 1851, receives the unqualified approbation of the local engineers, as best adapted to the compact sands of the Suez isthmus and the loose alluvial soil of the Nile delta. Even heavy engines running at high speeds over the Egyptian rails (which weigh 65 pounds per yard) have no serious effect on these sleepers. As to the rigidity of the road-bed compared with the wooden-sleeper system, we are sure that those who have traveled the length of this route must have discovered no cause of complaint; but, on the contrary, have admired the smooth running of the trains.

This sleeper known as Griffen's patent is an oval casting (26 inches by 17 inches) having a channel along the dome-like surface for the reception of the rail; distance bars are let into cored sockets and maintain the uniformity of the gage. The Economic Permanent Way Company, of London, manufacture a hollow chair whose upper surface forms portion of a cylinder 30 inches long, the chord of the arc 13 inches, and versed sine five inches. A channel cored in the back of the casting receives the rail, which is held in place by two bolts passing through four lugs, two fixed and two movable. Distance bars regulate the gage, and the chairs are placed 44 inches between centers. The system of Mr. J. Vantherim, of Fraisans, is adopted on portions of the Northern Railway of France and the railway of Lyons. He submits a rolled iron sleeper for wood, and retains the rail with gibs and keys passing through wrought-iron clamps and the sleeper. The latter has a base of 10 inches, hight of $2\frac{5}{8}$ inches; is 5 inches in width at the top and $\frac{1}{2}$ inch in thickness. A curvature with a versed sine of 3 inches is impressed on all the sleepers, thus carrying their centers below the ballast, and by the arched form imparting greater rigidity to the beam.

The Marcinelle Couillet Company, of Charleroi, Belgium, exhibit a section of railway with its wrought-iron ties attached, which has been in actual service during four and a half years, and gives evidence of great durability. It is worthy the attention of parties opposed to wrought-iron ties (from their want of the elasticity peculiar to wooden ones), since it forms a compromise between the two; in which wood acts as the mere cushion; iron the solid foundation. The rails are $4\frac{7}{8}$ inches deep, with $2\frac{3}{8}$-inch head and $4\frac{1}{2}$-inch base, the gage 4 feet $8\frac{1}{2}$ inches; all the joints are formed on the "fished principle," and secured with $4\frac{5}{8}$-inch bolts. The sleepers are simply rolled I-beams 8 feet 5 inches long (7 inches deep, $\frac{5}{16}$-inch web, and $2\frac{1}{4}$-inch heads), placed 36 inches between centers. Instead of resting directly on these, a painted oak block is interposed between them and the rail. Such blocks are 10 inches long, by $6\frac{1}{4}$ inches wide, by $2\frac{1}{4}$ inches thick, and have a channel $4\frac{1}{4}$ inches wide by $\frac{1}{2}$ inch deep, in which the base of the rail rests. Two $\frac{7}{8}$-inch bolts with $1\frac{5}{8}$-inch round washers) secure the rail to the I-beam; the latter, it should be observed, lies with its web in a horizontal position. The bolt holes are bored close to the flanges of the rails, to allow of the washers clamping the latter, and the points of the bolts are slightly burred to prevent the loosening of the nut. An increase in the diameter of the washer might be made with evident advantage.

The Hartwich system, introduced on the Rhénan and Cologne Railway dispenses with sleepers altogether by using very deep rails having broad bases. Their rails are rolled $9\frac{3}{8}$ inches deep (with $2\frac{3}{8}$-inch head, $4\frac{7}{8}$-inch base, $\frac{5}{8}$-inch web), and the gage regulated by 1-inch rods placed six feet three inches apart, having threads on their ends and a nut on each side of the rail webs. To preserve the upper parts of these deep rails from variation, the rods pass through holes only three inches below the head, and every fourth space between rods has an intermediate one near the lower flanges of the rails. Fish-joints give the rails the rigidity possessed by continuous beams, while the ballasting covers all except their heads. Steel rails, and iron rails with steel heads, are well represented in all the departments and produce the impression that the plain iron rail, for roads of very extensive traffic, will soon be a relic of the past. Several manufacturers show specimens of steel reversible crossings, while Austria and Holland are creditably represented by those of chilled iron.

Mr. G. E. Dering, of Lochleys, Welwyn Herts, England, exhibits samples of a tempered steel spring clip for rail joints, which appeared in the Exhibition in 1862, and has since performed good service on lines like the Great Northern, also Great Southern and Western Railways. This clip forms a steel case enveloping the extremities of the rail, and binds the same with increased tenacity under the pressure of heavy loads. A joint constructed on this principle was carefully tested by D. Kirkaldy, Esq., and found to have a deflection of 1·31 inch under a load of 26,000 pounds, with supports 36 inches apart. When the load was removed the clip assumed its normal condition free of permanent set. He also tested under the same conditions two rails united by the ordinary fish-joint. Seventeen thousand pounds served to produce a deflection of 2·78 inch, from which the joint failed to recover after the removal of the load. This clip is entirely free of bolts, nuts, etc., which are liable to become loose even under the closest inspection.

The subject of railway plant should not be concluded without first alluding to a new spike thimble. One serious objection to soft, cheap timber for railway ties has hitherto been the liability of the spikes holding down the rails to become loosened. This results in part from the tendency of the rails to spread under the action of heavy trains running at high speed, thus crowding the spike laterally into the soft fiber.

Mr. Desbrière, 68 Rue de Provence, Paris, has patented a cast-iron thimble for surrounding the spike and bringing a greater number of the fibers to bear in resisting its crushing effect. These thimbles are two inches in diameter, one and one quarter inch thick, having a three quarter-inch square or round hole cored in the center, and are slightly dished on the under side. A recess one quarter inch deep is left on the upper side in which the rail rests, and prevents any tendency to its rotation. Either spikes or galvanized wood screws (three fourths inch by four and a half inches) are used for retaining the rails. Specimens of ties laid with these thimbles in April, 1862, on the Algerian Railway, near Blidah, well illustrate the benefits to be derived. They are in use on the Northern Railway of France, at Charentes and at Mont Cenis. This principle might render important service in parts of our own country where ties of durable close-grained woods are difficult to procure.

THE MANUFACTURE OF SULPHURIC ACID.

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

METHODS AND PROCESSES OF MANUFACTURE.

Burning the Sulphur—Sulphur Furnaces.—It is not necessary to dwell upon this part of the subject, from the fact that there are so many various ways, each said to be excellent, for securing the combustion of the sulphur used for the manufacture of acid. Reference will be made simply to the principles involved in the best form of furnace. It is better to have one large than many small furnaces (called the sulphur furnace), and to have all the sulphur used for one day's combustion (say from one to four tuns) introduced at one charge, and to have just sufficient air admitted to keep up the combustion without heating the mass too much, as thereby more sulphur is volatilized. The vapor from the sulphur furnace should pass to the combustion furnace, in which sufficient air is admitted to complete the combustion, allowing an excess of about two to three per cent of oxygen. From the combustion furnace the sulphurous acid therein formed passes to the niter oven, and from thence the mixed vapors pass into the lead chambers.

Lead Chambers.—Too great care cannot be given to the construction and working of the sulphuric acid chambers. The plumbers should be required to distribute the straps uniformly, and not to have too great a strain on any one, as the lead of the chamber is often torn by the neglect of this; the chambers should be kept in perfect repair and free from holes, or otherwise the sulphurous acid is lost in greater or less quantity. Where repairs are neglected, the practical yield with the same amount of material may range in three years from 82 to 68 per cent of product.

The sulphur is not often lost from an incomplete conversion of the sulphurous into sulphuric acid by too little steam, too much air, and an insufficient quantity of niter, but more frequently from too little chamber space to the amount of sulphur burnt.

In connection with lead chambers it is interesting to refer to the chambers of Kuhlmann, of Lille, that prince of industrial chemists, the neatness and cleanliness of whose immense works are only excelled by the skill exercised and the purity of the articles manufactured. His chambers have a capacity of about 53,000 cubic feet. There are six different compartments, the first a small one, which is a cooler and purifier; the second a small denitrifying chamber; the third a small nitrification chamber; the fourth a large chamber; and fifth and sixth small chambers, called the tail chambers. Nitric acid is employed for oxidizing, which is introduced into the third chamber, in a small stream divided into a spray by convenient arrangements. The circulation of the liquid acid proceeds from chamber five, which opens into chamber six; from this it flows into the large chamber, which receives also the acid from the nitrification chamber; the acid collected in the large chamber ultimately passes into the denitrification chamber before it reaches the evaporating pans; to secure a perfectly regular distribution of steam through the whole system, the lead pipes which deliver it into the chambers are provided with platinum nozzles, which prevent the orifices of the tubes from gradually collapsing.

Some of the chambers in Lancashire have over 100,000 cubic feet capacity; and, as a general rule, the larger the chamber the better the proportioned yield. One of the most important problems in the improvement of sulphuric acid chambers is to produce chambers of small dimensions capable of producing the greatest amount of sulphuric acid free from arsenic. To diminish the amount of capital in establishing a lead chamber for this acid, multiplies their number, and brings an article requiring a certain amount of useless water and bulky receivers nearer to the consumers, diminishing the cost of transportation.

At Bordeaux, Fournet has established the manufacture of sulphuric acid in a manner that deserves special attention, as it looks toward this economy just referred to. By means of apparatus skillfully arranged, in which the gas is made to circulate more than once in pipes filled with coke, so as to bring about an intimate mixture, and then passing it into a small lead chamber, Fournet has succeeded, with a chamber of only 12,000 cubic feet, in burning 1,000 pounds of sulphur a day, and obtaining a yield of three tuns of sulphuric acid, an amount nearly equal to the theoretical yield.

(To be continued.)

Drying Oils for Varnish.

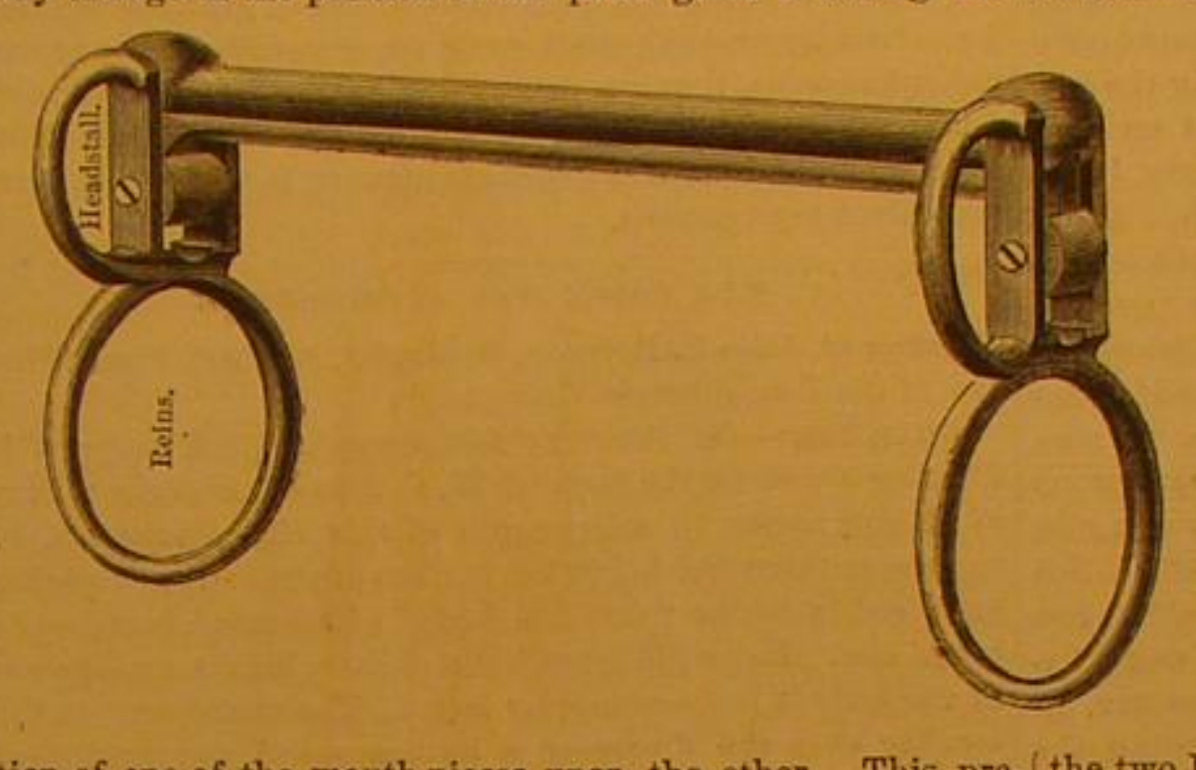
In a recent work on varnish, by Violette, he quotes as follows from a celebrated manufacturer: "The oil is allowed to stand in a reservoir of lead for one or two months, after which the upper three quarters of it are drawn off to make drying oils for varnish, while the one fourth remaining at the bottom of the tank can be sold to grind paints, it being utterly unfit for varnish making. This settling of the oil is indispensable, in order to separate the mucilaginous impurities which all oil contains, and it is a precaution that should always be faithfully observed." After converting this oil into drying oil, he adds: "We always take the precaution to have five or six months' stock of this prepared oil in advance; after which time it is better, and gives a varnish with more body and more solid drying."

When, in addition to the above, it is remembered that the varnish must be kept six months, after being made, in order to allow it to ripen, it may be seen that the capital required by some firms must be very large. It is by careful attention to the above points that the English manufacturers have attained their high reputation.

IMPROVEMENT IN BITS FOR HORSES.

This bit, known as the "Baldwin Bit," was patented May 29, 1868. Its appearance is shown in the accompanying engraving, and the principle of its working may be easily understood.

It consists of two parallel bars, one of which sets into a rabbet in the other which answers to the ordinary bit. The rings into which the reins are buckled are formed with two parallel projections, which extend forward to the ends of the principal mouth-piece, and are pivoted to the same. They are also pivoted further back, to the second mouth-piece, which plays in the rabbet in the principal mouth-piece, so that any change in the position of the parts gives a sliding motion of one of the mouth-pieces upon the other. This prevents the horse from seizing the bit and holding it in his teeth.



The proprietors of this bit have full confidence that those who believe in treating the horse rationally and humanely will realize its merits. It is the habit of many to place a very severe and cruel bit in the mouths of horses inclined to be vicious and unreliable. It is claimed that this bit will secure full control of the horse without cruelty. As soon as the horse attempts to catch the bit in his teeth, the weakest driver acquires great power over him by gently working one rein at a time, as it is so arranged that while one mouth-piece is stationary the other is moved at the will of the driver, so long as the reins are pulled unequally.

It is well adapted for ladies' use, and is claimed to be equally adapted to driving all horses, as its governing powers are such that a horse will obey it without fear, and it is easy for both the horse and the driver.

For further information address Jos. Baldwin & Co., 254 Market street, Newark, N. J.

HEAT FROM THE MOON.

[From The Spectator.]

A long-vexed question—one which astronomers and physicists have labored and puzzled and even quarreled over for two centuries at least—has at length been set at rest. Whether the moon really sends us any appreciable amount of warmth has long been a moot point. The most delicate experiments had been made to determine the matter. De Saussure thought he had succeeded in obtaining heat from the moon, but it was shown that he had been gathering heat from his own instruments. Melloni tried the experiment, and fell into a similar error. Piazzi Smith, in his famous Teneriffe expedition, tried the effect of seeking for lunar heat above those lower and more moisture-laden atmospheric strata which are known to cut off the obscure heat rays so effectually. Yet he also failed. Professor Tyndall, in his now classical "Lectures on Heat," says that all such experiments must inevitably fail, since the heat rays from the moon must be of such a character that the glass converging-lens used by the experimenters would cut off the whole of the lunar heat. He himself tried the experiment with metallic mirrors, but the thick London air prevented his succeeding.

The hint was not lost, however. It was decided that mirrors, and not lenses, were the proper weapons for carrying on the attack. Now, there is one mirror in existence which excels all others in existence in light-gathering, and therefore necessarily in heat-gathering power. The gigantic mirror of the Rosse telescope has long been engaged in gathering the faint rays from those distant stellar cloudlets which are strewn over the celestial vault. The strange clusters with long out-reaching arms, the spiral nebulæ with mystic convolutions around the blazing nuclei, the wild and fantastic figures of the irregular nebulæ, all these forms of matter had been forced to reveal their secret under the searching eye of the great Parsonstown reflector. But vast as are the powers of this giant telescope, and interesting as the revelations it had already made, there was one defect which paralyzed half its powers. It was an inert mass well poised—indeed, so that the merest infant could sway it, but possessing no power of self-motion. The telescopes in our great observatories follow persistently the motions of the stars upon the celestial vault, but their giant brother possessed no such power. And when we remember the enormous volume of the Rosse Telescope, its tube—fifty feet in length—down which a tall man can walk upright, and its vast metallic speculum, weighing several tuns, the task of applying clock-motion to so cumbrous and seemingly unwieldy a mass might well seem hopeless. Yet without this it was debarred from taking its part in a multitude of processes of research to which its powers were wonderfully adapted. Spectroscopic analysis, as applied to the stars, for example, requires the most perfect uniformity of clock-motion, so that the light from a star, once received on the jaws of the slit which forms the entrance into the spectroscope, may not move off them even by a hair's breadth. And the determination of the moon's heat required an equally exact adaptation of the telescope's motion to the apparent movement of the celestial sphere. For so delicate is the inquiry, that the mere heat generated in turning the telescope upon the moon by the ordinary arrangement would have served to mask the result.

At enormous cost, and after many difficulties had been encountered, the Rosse reflector has at length had its powers more than doubled by the addition of the long wanted power of self-motion. And among the first-fruits of the labor thus bestowed upon it, is the solution of the famous problem of determining the moon's heat.

The delicate heat-measurer, known as the thermopile, was used in this work, as in Mr. Huggins' experiments for estimating the heat we receive from the stars. The moon's heat, concentrated by the great mirror, was suffered to fall upon the face of the thermopile, and the indications of the needle were carefully watched. A small but obvious deflection in the direction signifying heat was at once observed, and when the observation had been repeated several times with the same result, no doubt could remain. We actually receive an appreciable proportion of our warmth supply from "the chaste beams of the wat'ry moon." The view which Sir John Herschel had long since formed on the behavior of the fleecy clouds of a summer night under the moon's influence was shown to be as correct as almost all the guesses have been which the two Herschels have ever made.

And one of the most interesting of these results which have followed from the inquiry confirms in an equally striking manner another guess which Sir John Herschel had made. By comparing the heat received from the moon with that obtained from several terrestrial sources, Lord Rosse has been led to the conclusion that at the time of full moon the surface of our satellite is raised to a temperature exceeding by more than 280° (Fahrenheit) that of boiling water. Sir John Herschel long since asserted that this must be so. During the long lunar day, lasting some 300 of our hours, the sun's rays are poured without intermission upon the lunar surface. No clouds temper the heat, no atmosphere even serves to inter pose any resistance to the continual down-pour of the fierce solar rays. And for about the space of three of our days the sun hangs suspended close to the zenith of the lunar sky, so that if there were inhabitants on our unfortunate satellite, they would be scorched for more than seventy consecutive hours by an almost vertical sun.

There is only one point in Lord Rosse's inquiry which seems doubtful. That we receive heat from the moon he has shown conclusively, and there can be no doubt that a large portion of this heat is *radiated* from the moon. But there is another mode by which the heat may be sent to us from the moon, and it might be worth while to inquire a little more closely than has yet been done whether the larger share of the heat rendered sensible by the great mirror may not have come in this way. We refer to the moon's power of *reflecting* heat. It need hardly be said that the reflection and the radiation of heat are very different matters. Let any one hold a burnished metal plate in such a way that the sun's light is reflected towards his face, and he will feel that with the light a considerable amount of heat is reflected. Let him leave the same metal in the sun until it is well warmed, and he will find that the metal is capable of imparting heat to him when it is removed from the sun's rays. This is radiation, and cannot happen unless the metal has been warmed, whereas heat can be reflected from an ice-cold plate. There has been nothing in the experiments conducted by Lord Rosse to show by which of these two processes the moon's heat is principally sent to us; nor do we know enough of the constitution of the moon's surface to estimate for ourselves the relative proportions of the heat she reflects and radiates towards us.

We do not mention this point from any desire to cavil at the results of one of the most interesting experiments which have recently been carried out. But the recent researches of Zöllner upon the light from the planets, have shown how largely the surfaces of the celestial bodies differ as respects their capacity for reflecting and absorbing light, and there is every reason to infer that similar peculiarities characterize the planet's power of absorbing and reflecting heat. The whole question of the heat to which the moon's surface is actually raised by the sun's heat depends upon the nature of that surface, and the proportion between its power of absorbing heat or reflecting it away into space.

Steeple Jacks.

"Steeple Jack" is commonly but erroneously supposed to be an individual, whereas, as we have before pointed out, he is a genus, or a species, though, it may be, few in number. As his way of working is not known to every one, the London *Builder* describes it, in connection with one or two of his more recent exploits. Some of the factory chimneys at New Swindon having got out of repair, the company resolved to employ a "Steeple Jack," who accordingly made his appear at New Swindon and set to work. His plan of proceeding was to fly an Indian kite, with two strings attached The kite rises nearly perpendicularly, and when above the chimney-top is guided over it. The second string is then pulled, and thus a complete communication is formed over the chimney. By means of the string a double copper wire is drawn up, and by this wire some pulleys and tackling. "Steeple Jack" then ascends hand over hand, and places an iron band around the chimney, which he secures tightly. Planks are then drawn up and laid upon irons projecting from the band, and thus in a short time a scaffolding sufficient for his purpose is erected, and at a cost very much less than that of a regular builder's. "Jack" had two or three assistants, and managed in his aërial manner, to pull down one of the factory chimneys which had become so badly out of repair as to require rebuilding. He is still engaged in repairing others. His scaffolding looks at a distance like a huge india-rubber band, around the chimney, with ropes depending from it.

An exciting occurrence, displaying great intrepidity, and involving the utmost peril to the person concerned, took place lately at Millbank Chemical Works, Garngad-road, Glasgow. Messrs. Burns & Son, of Ayr, who have been employed in similar duty at Townhead and other establishments, had been engaged to point a stalk at the works mentioned, measuring 260 ft. in height. The preliminary process of flying the kite was gone through no fewer than fifteen times, but on each occasion it failed, in consequence of the string being burnt through by the gas and flames emitted from the stalk. About an hour and twenty minutes were spent in these fruitless endeavors, when Mr. Burns, resolving that whatever personal risk might be incurred, the object must be accomplished, determined for this purpose to ascend the stalk himself. Accordingly, in spite of the remonstrances of his son, he proceeded to mount by the aid of the conducting-rod but no sooner had he got safely at the top than the rope was again burnt through, and he was left hanging by the hands. Not a moment was to be lost. The son flew the kite in about five minutes afterwards, and having succeeded in once more fixing the rope, the father was got down; he was, however, in an extremely exhausted condition, and notwithstanding the leathern gloves he wore, he was much burned about the hands, while his left side was likewise considerably scorched.

Correspondence.

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

English Iron and Iron Screw Steamers.

Messrs. Editors:—The national—I may almost aid, the world's supply of iron, has hitherto been shared by England, Scotland, France, Germany, Belgium, etc.—Scotland doing the lion's share. Now, however, the laurels are fast being wrested from Scotland, and England must inevitably defeat all rivals. Imagine! The main Cleveland seam, in Yorkshire, has been estimated to contain 20,000 tuns of ore per acre, and at this rate there must be within the limits of the area named close upon five thousand million tuns of ironstone! It must be borne in mind that it is not poor ironstone, as it yields in many cases upward of 33 per cent of metallic iron, and in some instances 41 per cent. It is probable that something like 6,000,000 tuns of Cleveland ore will be required next year to keep all the blast furnaces in the district engaged! At present the annual make of Cleveland pig iron is estimated at 1,439,640 tuns, and at this time next year it is assumed that the make will be increased to 1,739,640 tuns of pig iron. At this moment Cleveland is making about one third of our production. The prime requisite in the shape of raw material is raised so cheaply that it can be laid down at the furnaces at a cost of 3s. per tun, less, at the present rate of exchange, than $1 per tun of 2,240 lbs. Containing, therefore, from 28 to 41 per cent of metallic iron, the ore for a tun of iron costs less than 10s., or $3!

Perhaps one of the applications of iron that interests Americans mostly is that for maritime purposes. Twenty years ago, and since, wooden ships as we all know, were discarded for iron, and a wooden-ship builder of consequence now-a-days is a thing of the past. But now iron ships—yes! iron shipbuilding is going to decay, so far as sailing vessels are concerned. Those that, at the time referred to, cost £25, say $150 per tun, can now be had at one half, and no takers! What next? Why, iron steamers—long, 300 to 400 feet iron screw steamers—these are to supersede everything and do the traffic of the world. The ink is scarcely dry on the prospectus of one of our new local companies, who have contracted to build twelve such iron screws. And they are right, apart from the question of capacity; they sail so shallow that they will float "almost wherever it is damp;" but, if not this, they will, at any rate, save the Cape of Good Hope by the Suez Canal, and, in due time, Cape Horn by the canal of Panama.

Alex. S. Macrae.

Liverpool, England.

Value Received.

Messrs. Munn & Co.:—Some four or five years ago I made a tool called "Substitute for the Slide Rest," which I advertised and sold through your paper. After I had made a number of them the party who manufactured absconded with the patterns, and brought me to grief. This is in the nature of things, and although I have held up my head since I don't wish to complain. But I *do* complain that for about every week since parties write to me asking for price list and cuts, and I wish they would stop it. How long after a man is dead and forgotten will people keep writing to him, if he has advertised in your paper?

This is to give notice that I have had the worth of my money in advertising and don't wish any more.

Robert P. Watson.

New York city.

Testimony of a Veteran Inventor.

Gentlemen:—I have this day sent you a box containing two models, and shall be with you on Friday, to explain the same and have the papers drawn. I have taken out upwards of thirty patents, and have had some difficult cases, and I must say that nowhere have my interests been more zealously guarded than by you, nor any specifications more clearly and definitely drawn. I consider your efforts as second only in importance to the inventive genius of our country, in developing its resources at home, and honor abroad. With high esteem, I am respectfully yours,

Joseph A. Miller, Mechanical Engineer.

Boston, Mass., Oct. 20.

Inventions at the South.

We are happy to recognize a gradual increase in the number of inventions coming to us from the South. Dr. R. J. Draughon, of Claiborne, Ala., under date of Oct. 11, 1869, writes us as follows:

Messrs. Munn & Co.:—It was with much gratification that I received by to-day's mail your communication, conveying the information that my patent was, on the 1st inst., allowed. I now write to convey to you my sincere thanks and kind wishes for the kind and generous manner in which you have conducted my business.

The Fossil Man of Onondaga.

Letter of John F. Boynton, Geologist, to Prof. Henry Morton, of the Pennsylvania University:

Dear Sir:—On Saturday last, some laborers engaged in digging a well on the farm of W. C. Newell, near the village of Cardiff, about 13 miles south of this city, discovered, lying about three feet below the surface of the earth, what they supposed to be the "petrified body" of a human being of colossal size. Its length is ten feet and three inches, and the rest of the body is proportionately large. The excitement in this locality over the discovery is immense and unprecedented. Thousands have visited the locality within the last three days, and the general opinion seemed to be that the discovery was the "petrified body" of a human being.

I spent most of yesterday and to-day, at the location of the so-called "fossil man," and made a survey of the surroundings of the place where this wonderful curiosity was found. On a careful examination, I am convinced that it is *not* a fossil, but was cut from a piece of stratified sulphate of lime, (known as the Onondaga Gypsum). If it were pulverized or ground, a farmer would call it plaster. It was quarried, probably, somewhere in this county, from our Gypsum beds. The layers are of different colors—dark and light. The statue was evidently designed to lie on its back, or partially so, and represents a dead person in a position he would naturally assume when dying. The body lies nearly upon the back, the right side a little lower; the head leaning a little to the right. The legs lie nearly one above the other; the feet partially cross one another. The toe of the right foot, a little lower, showing plainly that the statue was never designed to stand erect upon its feet. The left arm lies down by the left side of the body, the fore arm and hand being partially covered by the body. The right hand rests a short distance below the umbilicus, the little finger spreading from the others, reaching nearly to the pubes. The whole statue evidently represents the position that a body would naturally take at the departure of life.

There is perfect harmony in the proportions of the different parts of the statue. The features are strictly Caucasian, having not the high cheek bones of the Indian type, neither the outlines of the Negro race, and being entirely unlike any statuary yet discovered of Aztec or Indian origin. The chin is magnificent and generous; the eyebrow, or superciliary ridge, is well arched; the mouth is pleasant; the brow and forehead are noble, and the "Adam's apple" has a full development. The external genital organs are large; but that which represents the integuments, would lead us to the conclusion that the artist did not wish to represent the erectal tissues injected.

The statue being colossal and massive, strikes the beholder with a feeling of awe. Some portions of the features would remind one of the bust of DeWitt Clinton, and others of the Napoleonic type. My opinion is that this piece of statuary was made to represent some person of Caucasian origin, and designed by the artist to perpetuate the memory of a great mind and noble deeds. It would serve to impress inferior minds or races with the great and noble, and for this purpose only, was sculptured of colossal dimensions. The block of gypsum is stratified, and a dark stratum passes just below the outer portion of the left eyebrow, appears again on the left breast, having been chiseled out between the eyebrow and chest, and makes its appearance again in a portion of the left hip. Some portions of the strata are dissolved more than others by the action of water, leaving a bolder outcropping along the descent of the breast toward the neck; the same may, less distinctly, be seen on the side of the face and head. I think that this piece of *reclining* statuary is not 300 years old, but is the work of the early Jesuit Fathers in this country, who are known to have frequented the Onondaga Valley from 220 to 250 years ago; that it would probably bear a date in history corresponding with the monumental stone which was found at Pompey Hill, in this county, and now deposited in the Academy at Albany. There are no marks of violence upon the work; had it been an image or idol worshiped by the Indians, it could have been easily destroyed or mutilated with a slight blow by a small stone, and the toes and fingers could have been easily broken off. It lay in quicksand, which, in turn, rested upon compact clay.

My conclusion regarding the object of the deposit of the statue in this place, is as follows: It was for the purpose of hiding and protecting it from an enemy who would have destroyed it, had it been discovered. It must have been carefully laid down, and as carefully covered with boughs and twigs of trees which prevented it from being discovered. Traces of this now decomposed vegetable covering, can be seen on every side of the trench, and it is quite evident, this vegetable matter originally extended across and above the statue.

Above this stratum of decayed matter, there is a deposit of very recent date, from eighteen inches to two feet in thickness which may have been washed in and likewise turned on by plowing. A farmer who had worked the land told me that he had "back furrowed" around it, for the purpose of filling up the slough where the statue now lies.

It is positively absurd to consider this a "fossil man." It has none of the indications that would designate it as such, when examined by a practical chemist, geologist or naturalist. The underside is somewhat dissolved, and presents a very rough surface, and it is probable that all the back or lower portion was never chiseled into form; and may have been designed to rest as a tablet. However, as the statue has not been raised, the correct appearance of the under surface has not been determined, save by feeling as I passed my hands as far as I could reach under different portions of the body, while its lower half lay beneath the water.

This is one of the greatest curiosities of the early history of Onondaga county, and my great desire is, that it should be preserved for the Onondaga Historical Society. Efforts are being made by some of our citizens to secure this in the county where it belongs, and not suffer it to bear the fate of other archeological specimens found in this region.

Syracuse, October 18th, 1869.

Peat Manufacture in Ohio.

According to a writer in "Putnam's Monthly," for November, the following is the method employed in the manufacture of Peat near Ravenna, Ohio:

"The peat is dug to a depth of from eight to fifteen feet with shovels and slanes, the latter being a kind of spade, with a wing at the side bent at right angles with the blade, so as to form two sides of a square, and loaded into dump cars which are drawn up an inclined plane upon iron rails by friction gearing, and the contents rapidly emptied into an immense hopper containing one hundred and fifty tuns of crude peat. At the bottom of the hopper is a large elevating belt, running over drums upon which the peat is thrown and rapidly carried into the condensing and molding machine. Two men are all that are required to keep the machine full. The condensing and manipulating machine is run by steam-power. It receives the crude peat from the elevating belt in a wet or moist state, and delivers it in a smooth, homogeneous condition, through ten oval-shaped dies, each $3\frac{3}{4}$ inches by $4\frac{1}{4}$ inches in area, from which it is delivered on drying racks, passing horizontally under the machine. Each rack is 26x72 inches, constructed of light pine, holding five bars or canes of peat, which, when dry, will yield, to each rack, from thirty to sixty pounds of fuel, according to the density of the peat. The racks are carried from the machine on an inclined tramway made of light friction wheels, so that the racks will almost glide from their own gravity. These racks are taken from the tramway and set up like an inverted V, on the drying ground, where, being exposed to the sun, and the air circulating freely around and between the bars, they dry in from ten to twelve days, and are ready to be loaded into cars for shipment and use. The distance between the legs or base of the V being the same as their length, the drying ground is greatly economized. An acre will hold about five thousand of these racks, from fifteen thousand to twenty thousand being a requisite complement for the machinery. Sixteen men and ten boys on the rackway will make eighty tuns of prepared fuel per diem—indeed, there is hardly a limit to the capacity of the machinery if labor enough is employed. With thirty-seven men digging and clearing off the racks from the tramway, one hundred and fifty tuns of dried fuel can be made per day. This fuel can be delivered at a less price than the best coal, and the cost of preparing it for market is lighter than that required in coal mining. It can be afforded as low as $4·50 per tun, and even lower, within a reasonable distance from the bogs, and it is more economical than coal.

"An analysis of the surface peat of this bog gives the following result: carbon, 68 per cent; oxygen, 18; water, 16; and ash 3·68 per cent. It also contains ammonia, acetate of lime, fixed and volatile oils. The deeper the peat found, the richer is it in carbon, and there are portions of the bog which will yield 70 to 75 per cent of carbon. The average amount of carbon, thus far ascertained by analysis of the various peat bogs of the United States, equals 50 per cent."

The use of ornamental pyrographic woodwork is being revived in England. In the ordinary samples, the designs are burnt into veneers of sycamore or maple, and are supplied wholesale to builders, cabinet-makers and others, ready for laying in the ordinary manner; but, if preferred, the designs can be applied to the solid work, to insure greater durability. By the use of wood so ornamented all necessity for painting is, of course, avoided. It is inexpensive and worth looking to.

A vein of excellent coal has been discovered, extending along the line of the Kansas Pacific Railroad east of Denver. This discovery shows that the workable coal-beds of the Rocky Mountains extend miles eastward into the great plains, and is of the greatest importance both to settlers and to the railway company.

The Union Pacific Railroad Company have commenced the erection of snow fences along the line of their road between Omaha and the Rocky Mountains.

Improved Traction upon Steel Rails and Steel-Headed Rails.

It has been too much the practice of railway managers to consider only the increased durability of steel. A less striking, but perhaps equally important advantage, is that it has double the strength and more than double the stiffness of iron. Some three years since, Mr. George Berkley made, in England, above 600 tests of the stiffness of steel and iron rails of equal section. The rails were supported on five feet bearings, and loaded with dead pressure at the middle. The first rails tried weighed sixty-eight pounds per yard, and loads respectively of twenty tuns and thirty tuns were applied. The average of 427 tests of the Ebbw Vale Co.'s and two other standard makers of iron rails, gave, with twenty tuns, a deflection of five-eighth inch and a permanent set of one-half inch. With thirty tuns the deflection was two and one-fifth inch and the permanent set two and one sixteenth inch. With Brown's steel rails, forty-five tests gave an average deflection of but five-sixteenth inch and a permanent set of one-eighth inch. With heavier rails and loads, the comparative stiffness of steel was still more marked. The great and constant resistence to traction, and the wear and tear of track wheels and running gear, due to the deflection of rails between the sleepers and the perpetual series of resulting concussions, may be much reduced, or practically avoided, by the use of rails of twice the ordinary stiffness; in such a case, however, reasonably good ballasting and sleepers would be essential. When a whole series of sleepers sinks bodily into the mud, the consideration of deflection between the sleepers is a premature refinement. If the weight of steel rails is decreased in proportion to their strength, these advantages of cheaper traction and maintenance will not, of course, be realized. The best practice here and abroad, is to use the same weight for steel as had been formerly employed for iron.

Many attempts have been made in England, on the Continent, and in this country, to produce a good steel-headed rail, and not without success. Puddled steel heads have all the structural defects of wrought iron, as they are not formed from a cast, and hence homogeneous mass, but are made by the wrought iron process, and are, in fact, a "high," steely wrought iron. They are, however, a great improvement upon ordinary iron, although probably little cheaper than cast steel heads. Rolling a plain cast steel slab upon an iron pile has not proved successful. The weld cannot be perfected, on so large a scale, and the steel peels off under the action of car wheels. Forming the steel slab with grooves, into which the iron would dovetail when the pile was rolled into a rail, has been quite successful. The greater part of some 500 tuns of such rails, made in this country, and put down where they would be severely tested, about four years ago, have outworn some three iron rails. Others failed in the iron stem, which was too light, after a shorter service. Rolling small bars of steel into the head of an iron pile has been recently commenced at various mills in this country and in England. No conclusions are yet warranted by the short trial of these rails.

There is a growing feeling among engineers and steel-makers that the compound rail, made wholly or partly of steel, will prove more safe and economical than any solid rail, and that the defects of the old compound iron rail, largely used in this State some years since, may be avoided, since these defects were chiefly due to the nature of the material. The experiments in this direction will be watched with great interest by railway managers, for if the same durability of track can be obtained with a steel cap as with an all steel rail, the first cost will be greatly decreased. A rail made in two or three continuous parts, breaking joints, is also a practical insurance against disaster from broken rails.—*State Engineer's Report on Railroads.*

Saline Solutions for Street Watering.

The Superintendent of street cleansing, etc., of Liverpool, has just issued his report to the Health Committee upon the trials made during the past season of Mr. Cooper's street watering salts. The main thoroughfare along Lord, Church, and Bold streets, chiefly macadamized, is considered to have afforded as severe a test as possible from the heavy traffic over it during the hottest period of summer. It is stated in the report that the use of these salts has been entirely successful, and beyond comparison superior to plain water. In practical results, two water carts with the weak solution were found equal to seven under the old system upon the macadamized road; but in paved streets one may be expected to do the work of five where the traffic is only ordinary. Financially, notwithstanding the saving of horses and carts, it appears that, at the price of £3 per tun hitherto charged for the salts, no economy can be effected; but then the supply has been so far in experimental quantities, and it should be stated that the patentee is now prepared to deliver in quantity at forty shillings. It is further considered that a reduction of 70 per cent would be effected in water wasted in the streets, and that there is the collateral advantage of the surface of the roadways being maintained in superior condition, a saving of 20 per cent in the cleansing being due to this effect. The system has also been tested in Greenock, and is reported upon equally favorably by Mr. Barr, C.E., the master of the works.

THE last trip of the *Pereire* from Havre to New York was performed in eight days and sixteen hours. If our memory serves us, this is the fastest trip on record.

A COMPANY of gentlemen are about erecting a large building in Hartford, Ct., for the accommodation of small families who do not wish to board under the present system, and yet cannot afford to keep house.

ON THE SUPPOSED ACTION OF LIGHT ON COMBUSTION.

BY CHARLES TOMLINSON, F.R.S., F.C.S.

The popular idea that "light puts out the fire," is so fixed that probably no conclusions drawn from actual experiment are likely to disturb it, especially if they be averse to the notion. It is a matter of daily experience, people say, that, if the fire is nearly out, and you put a screen before it, or draw down the blind, or close the window shutters, it will immediately begin to revive. It is generally forgotten that a fire that looks dull, or "out," in a well-lighted room, will appear to be in tolerable condition in the same room when darkened. It only requires to be "put together" to make it burn up, and it might have been done so just as well in the light.

Experiments on this subject are not easy to make, on account of the many disturbing causes. In an old volume of the "Annals of Philosophy," is an account of some experiments by Dr. M'Keever, who took two portions of green wax taper, each weighing 10 grains, and ignited both at the same moment. One piece was placed in a dark room, at 67° Fah.; the other was exposed to broad sunshine, at 78° Fah.

In five minutes { The taper in sunshine lost........8½ grains.
" darkened room lost..9¼ "

The taper, divided into inches, was also burnt in the colored portions of the solar spectrum, when it was found that the time required to burn two inches of taper varied as follows:

	Minutes.	Seconds.
In the red ray it took..............	8	0
In the green it took................	8	20
In the violet it took...............	8	39
In the verge of the violet..........	8	57

The conclusion is, that the solar rays, in proportion to their intensity, have the power of retarding, to a considerable extent, the process of combustion; and it is supposed that the chemical rays act, in some way, on the portion of oxygen about to combine with the fuel, so as to delay, if not prevent combination.

Supposing, in the experiments, the taper was so uniform, that one inch contained precisely the same quantity of matter as another inch, the time occupied in burning was too short to justify so important a conclusion as Dr. M'Keever arrived at, whether the results were taken by measure or by weight.

Every one engaged in photometrical observations must be aware of the difficulty of getting rid of disturbing causes and perplexing results. In comparing candles of the same make, the light is affected, both in quantity and economy, by a number of small circumstances, such as the warmth of the room, the existence of slight currents of air, the extent to which the wick curls over in burning, and so on. In testing the quality of gas, the standard candle defined by act of Parliament is a sperm candle of six to the pound, burning at the rate of 120 grains per hour. From such a standard we get the terms "twelve-candle gas," "fourteen-candle gas," etc.

Mr. Sugg, in his "Gas Manipulation," has pointed out some of the difficulties in obtaining a uniform standard candle. The wick does not always contain the same number of strands; they are not all twisted to the same degree of hardness; the so-called sperm may vary in composition—one candle containing a little more wax than another, or variable quantities of stearine or of paraffine; the candle may have been kept in store a long or a short time; the temperature of the store room may have varied considerably, and the temperature of the room in which it was burnt may have been high or low. All these circumstances affect the rate of combustion, and the illuminating power of candles, irrespective of the action of light, if such action really exist.

I have lately had a good opportunity of testing this action at the works of Price's Patent Candle Company, at Battersea. Under the direction of Mr. Hatcher, the accomplished chemist of the Company, the greatest possible care is taken to insure identity of composition and illuminating power in candles of the same name. There has lately been an extensive series of experiments on the photometrical value of sperm candles, during which, at my request, Mr. Hatcher was good enough to note the rate of combustion of such candles in a darkened room, and also in broad daylight, and even in sunshine.

In the first observation three hard and three soft candles were burned, each for four hours, in a dark closet. A similar set of candles, taken from one and the same filling, were burned during the same time, in open daylight, partly in sunlight. The average consumption per hour of each candle was as follows:

Sperm, in the dark..................134 grains
" " light..................141 "
No. 2 composites { In the dark..........133 "
" light..........140 "

It must be noticed that the temperature in the light was 72°, and in the dark 71°; moreover, in the light there was a much greater motion of the air than in the dark closet. Both these circumstances would operate in producing a larger consumption of candle.

In a second trial with No. 2 composites, the results were:

In the dark........................140 grains
In the light........................134 "

In a third trial, also with No. 2 composites, the results were:

In the dark........................131 grains
In the light........................129 "

In these two trials, the flames were protected, as far as possible, from currents of air; and, in a third trial, the temperature, both in the light and in the dark, was nearly equal.

The fourth trial was made on a bright, sunshiny day, with hard sperm candles, which are less affected by variations of temperature than the composites. The results were:

In the dark (temperature, 81°), 544 grains, or 136 grains per hour.
In the light (temperature, 84°), 567 grains, or 142 grains per hour, nearly.

It is evident that, in this case, the increase of temperature caused by the bright sunshine led to an increased consumption of material.

It will be seen that, in the first and fourth trials, there is a greater consumption of material in the light than in the dark; and in the second and third trials, the consumption is greater in the dark than in the light; but, in any case, the difference is so small—amounting only to from two to seven grains per hour—that it may fairly be referred to accidental circumstances, such as difference in temperature, in currents of air, and in the composition and make of the candles; the final conclusion to which I am led being that the direct light of the sun, or the diffused light of day, has no action on the rate of burning or in retarding the combustion of an ordinary candle.

Ammonia Powder.

The following account of a new explosive material appears in the "Kölnische Zeitung," May 19, which gives the "Militär-Wochen-blatt" as its authority: It is now some time since the proprietors of the Nora-Gyttorp Powder Mills obtained a patent in Sweden for the discovery of the so-called "ammonia powder," a substance which has hitherto been only employed in a few mining districts, but which otherwise seems wholly unknown. We are, therefore, fully justified in calling attention to the particular properties of this new explosive material. During the short time that it has been employed, it has won the approval not only of the proprietors of mines, but also of the working miners themselves. Its explosive force may be compared to that of nitro-glycerin, and, consequently, far surpasses that of dynamite. It cannot be exploded by a flame or by sparks, and the explosion is affected by a heavy blow from a hammer. Blast holes loaded with this powder are exploded by means of a powerful cap, or, better, by means of a cartridge containing common powder, for this forms a more reliable exploder. Miners who have been obliged to give up the use of nitro-glycerin, on account of the danger connected with this powerful explosive agent, have a most satisfactory substitute in the ammonia powder, as the danger of using it is so small that it surpasses in safety every other blasting material. One of the useful and important properties of this new powder is, that it does not require heating in cold weather, whilst nitro-glycerin and dynamite must first of all be warmed, and this has been the cause of many accidents. The price of ammonia powder is the same as that of dynamite. The same paper further adds: According to information we have received, ammonia powder was discovered by the chemist Norrbin. The German "Building News" contains extracts from a report of the Prussian architect Steenke, who makes the following remarks upon the safety of ammonia powder: Experiments were made by fastening a lamp to a pendulum, which was caused to oscillate; gunpowder, gun-cotton, nitro-glycerin, and dynamite all took fire as the flame passed over them, but the ammonia powder did not begin to burn till it had been touched by the flame twenty times. In making experiments upon the force of the blow required to explode it, it was found that, with the apparatus employed, where the fall of a weight from 4ft. to 5ft. would explode gunpowder, nitro-glycerin only required 1¼ft. to 2ft., dynamite 2¾ft. to 3ft. fall, whilst a fall of from 12ft. to 15ft. was necessary to cause the explosion of the ammonia powder.

Varnish for Iron.

The following is a method given by M. Weiszkopf, of producing upon iron a durable black shining varnish: "Take oil of turpentine, add to it, drop by drop and while stirring, strong sulphuric acid until a sirupy precipitate is quite formed, and no more of it is produced on furthur addition of a drop of acid. The liquid is now repeatedly washed with water, every time refreshed after a good stirring, until the water does not exhibit any more acid reaction on being tested with blue litmus paper. The precipitate is next brought upon a cloth filter, and, after all the water has run off, the sirupy mass is fit for use. This thickish magma is painted over the iron with a brush; it it happens to be too stiff, it is previously diluted with some oil of turpentine. Immediately after the iron has been so painted, the paint is burnt in by a gentle heat, and, after cooling, the black surface is rubbed over with a piece of woollen stuff dipped in, and moistened with linseed oil. According to the author, this varnish is not a simple covering of the surface, but it is chemically combined with the metal, and does not, therefore, wear off or peel off, as other paints and varnishes do, from iron."

PORTLAND CEMENT.—We are in receipt of numerous inquiries relative to Portland cement, where it is made, whether it will make a good mill-dam, how it will answer for concrete pavements, what are all the details of mixing, etc., etc., and lastly, who makes and sells it in this country. We have already devoted considerable space to this subject. To answer all the inquiries put to us in regard to it, we should have to write a work equal in size to Reid's "Practical Treatise on Portland Cement," published by Henry Carey Baird, 406 Walnut St., Philadelphia. We recommend those desiring information to get this work, and those who are interested in the sale of this cement to advertise it in the SCIENTIFIC AMERICAN.

Improvement in Rotary Molding Cutters.

This machine is designed to cut all kinds of irregular, circular, or elliptic molding, for which kinds of work it possesses many advantages. These advantages will become apparent upon an examination of the accompanying engravings and a brief description of its construction.

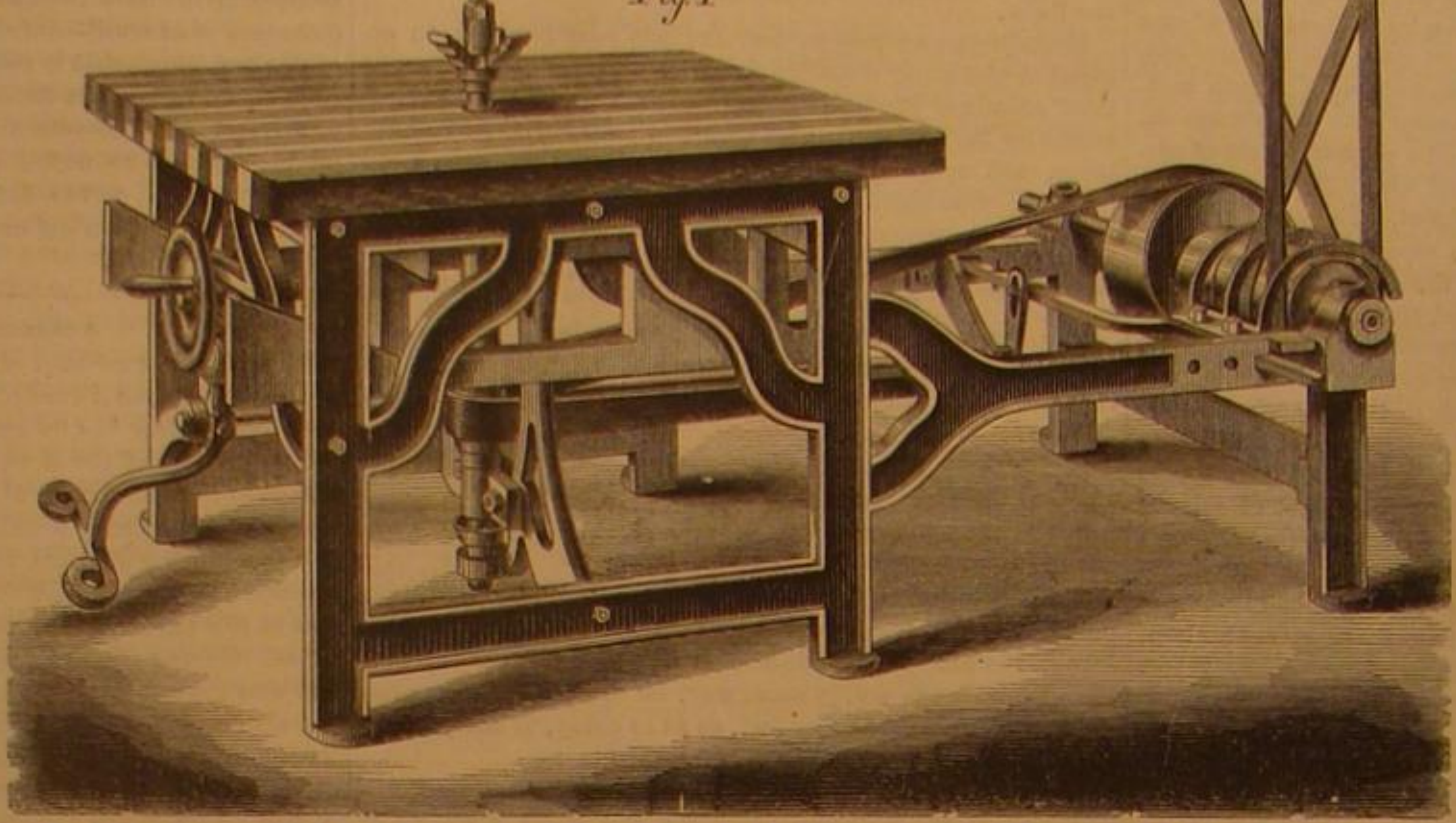
The cutter, shown in Fig. 2, is made from a block of steel by first turning it on the outside to the form of the molding required. The inside is next turned out concave, as shown in the engraving, reducing the steel to the requisite thinness, then bored to fit the spindle. Portions are then cut from the outer part of the cup-shaped piece of steel formed by the outside and inside turning, leaving radial branches or segments, as shown in the engraving.

The cutter is secured to the spindle by a single nut turned down upon a collar which rests upon the flat portion of the interior of the cutter. It is shown thus attached in Fig. 1.

The advantages of this form of the cutter are, first, that the concave form of the interior affords ample space for the clearance of the cuttings; second, facility in sharpening, as an oil stone of the proper size and form may be readily applied; and third, the securing of thin beveled edges, whereby a much cleaner and smoother cut can be obtained.

The machine on which this cutter is placed, Fig. 1, is constructed as follows: The table is raised or lowered by parallel inclines operated by a hand-wheel and screw. By means of a straight and a cross belt, with fast and loose pulleys on the primary shaft of the machine, a right or left motion is given to the cutter at the will of the operator; the belt shipper being operated by a foot lever, as shown, attached to a longitudinal rock shaft, having at its opposite end a slotted arm, which moves the shipper.

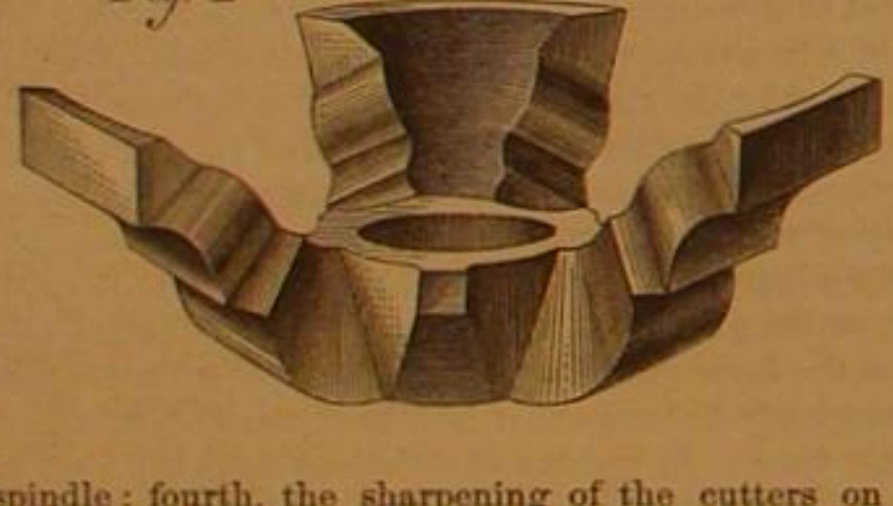
Fig. 1



McKINLEY & MELLOR'S ROTARY MOLDING CUTTER AND MOLDING MACHINE.

The advantages secured in this combination of machine and cutter are, first, the capability of running the cutter to the right or left by which the work is certain to match; second, the short time required to set the cutters; third, perfect freedom in moving the work on the table, as there is but

Fig. 2



one spindle; fourth, the sharpening of the cutters on the inside, by which the pattern remains unaltered; and fifth, working in a smaller radius than any other cutter.

Those who have used these cutters state that they do the work smoother than any other cutter they have used, and we can ourselves testify to the beauty of moldings shown to us as the work of this machine. The machine is constructed in a neat, tasteful, and substantial manner, and cannot fail to do good work.

This machine, as we have described it, is covered by several patents, the property in which is now vested in the firm of Mellor & Orum, 448 North Twelfth street, Philadelphia, Pa., who may be addressed for further information.

The Hartford Steam Boiler Inspection and Insurance Company.

This Company makes the following report of inspections for the month of September:

Visits of inspection made, 357; boilers examined, 541; external examinations, 471; internal examinations, 176; number tested by hydraulic pressure, 67. The whole number of defects discovered are 512, only 29 of these, however, are regarded as especially dangerous.

These defects are as follows: Furnaces out of shape, 9; fractures in all, 212—5 dangerous. These fractures are usually the result of over-heating, and accumulation of deposit on the crown sheet. In one of the above cases, the tube sheet of an externally fired cylindrical boiler was in a very dangerous condition, and but for the timely examination of the inspector, might have been the cause of a serious accident. In other cases the fire sheets of boilers have been found covered with deposit, and, consequently, over-heated and badly fractured. These cases show the importance of frequently cleaning the fire sheets of boilers from all deposit and incrustation.

Burned plates, 23—1 dangerous; blistered plates, 35—6 dangerous; cases of incrustation, deposit, and scale, 74—4 dangerous; external corrosion, 34—4 dangerous; internal grooving, 7; water gages out of order, 20; blow-out apparatus out of order, 6; safety valves over-loaded, 31—4 dangerous (three of these last were corroded fast in their seats, showing that they had not been raised for some time, and being useless for the purpose intended); steam gages out of order, varying from 7 to 20 pounds, 44—3 dangerous; boilers without gages, 4; cases of deficiency of water, 4—2 dangerous; faulty bracing, 11.

Relative to the mal-construction of boilers, we copy as follows from the report of L. E. Fletcher, Chief Engineer of the Manchester Steam User's Association. In commenting upon an explosion, he says: "The simple cause of the explosion was the mal-construction of the boiler. The manhole was not strengthened as it should have been, with a substantial cast-iron mouth-piece, through the neglect of which so many explosions have from time to time occurred. At present boiler makers can palm off on the public bad boilers, and steam users employ them with the certainty that when they explode with fatal consequences they will, by the help of a coroner and his jury, be publicly absolved from all responsibility and the event proclaimed to be accidental."

One of our inspectors writes us that he has examined a set of boilers which have been used for upward of thirty years, and although the water is in some respects bad, he regards them as in first-class condition. They have been under the care of a competent engineer for twenty-five years. This shows what careful management will do in prolonging the working age of boilers.

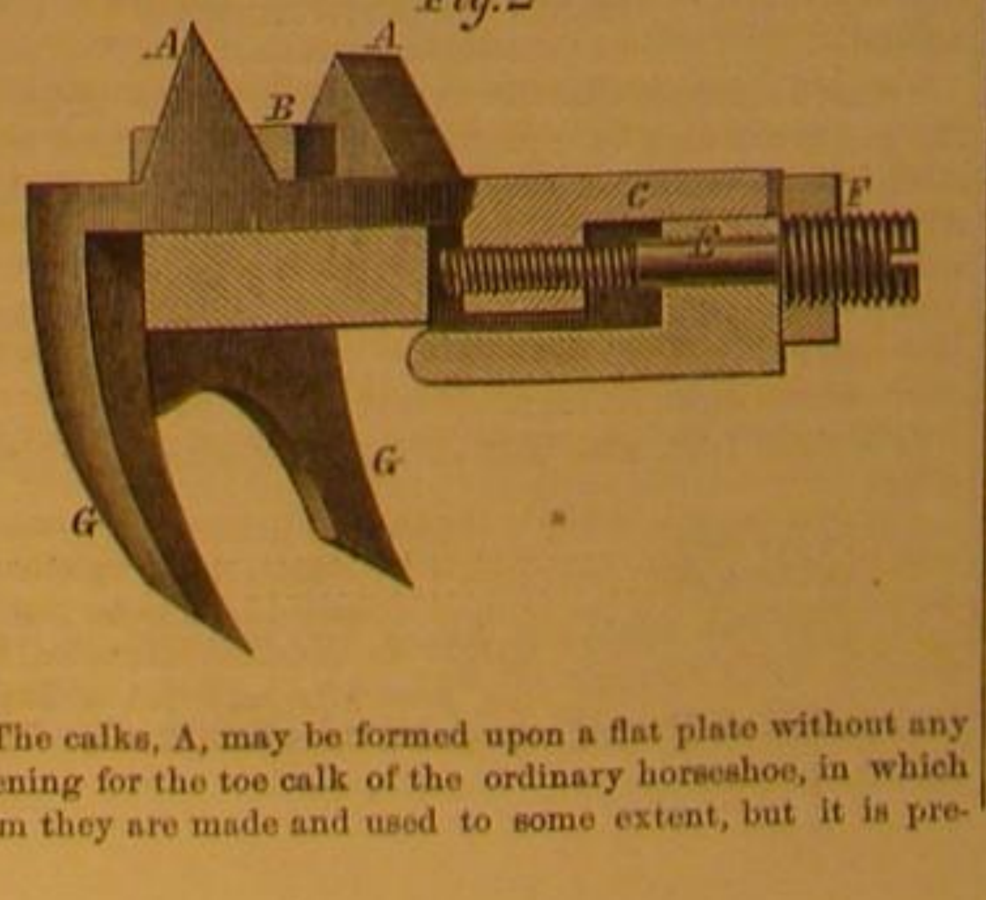
IMPROVEMENT IN DETACHABLE CALKS FOR HORSESHOES.

Our readers have several times had their attention called to the desirability of a good detachable calk for horseshoes.

Fig. 1.

and we need not therefore repeat at present what we have said upon this point. We have, however, this week to present to their consideration another improvement of this character, an engraving of which accompanies this article.

Fig. 2



The calks, A, may be formed upon a flat plate without any opening for the toe calk of the ordinary horseshoe, in which form they are made and used to some extent, but it is preferred to make the plate with an opening to admit the toe calk, B, as shown in the engraving.

A tongue, C, with beveled or dovetailed sides extends back a short distance from the calk plate. Upon this tongue slides a clasp, its two lateral wings, D, being dovetailed to fit C, and having its front edge made of the proper curve to fit the toe of the shoe. It also has on its under side a flange which fits under the horseshoe when the attachment is made. A screw, E, with a counter screw and nut, F, serves to draw and hold the flange of the clasp under the inner edge of the shoe. Two curved prongs, G, also rise from the front of the shoe and rest against the front of the hoof. To secure a uniform bearing, to obviate all rattling, and to protect the hoof, a rubber cushion may be inserted between the prongs, G, and the hoof.

The calk is easily attached or detached, and, being made of malleable cast iron, is very cheap. The calks, A, are case-hardened, and are placed so that their angles prevent side slipping. The attachment is made upon the strongest part of the hoof. It would seem that this calk must be useful wherever roads are icy, or whenever the toe calk on the shoe becomes worn.

Patented, May 18, 1869, by W. J. Berne, whom address for further information at Cincinnati, Ohio.

Telegraph Extension.

Schemes for constructing and laying submarine lines of telegraph from Europe to America are being promoted with a rapidity, which is marvelous, when the magnitude of the project is considered. We understand, says *Morgan's British Trade Journal*, that the Ocean Telegraph Company intends to lay a new line from the southwest of Ireland to Halifax, in Nova Scotia. A new submarine system is also to be constructed between Germany and America. A concession granted by the Chancellor of the North German Confederation to certain gentlemen interested in the scheme, provides for the landing of the cable at a suitable point of the North German sea coast, and also for the erection near the place of landing of all the appliances necessary for its working. The Chancellor reserves to himself the right of selecting a point at which the cable is to be landed and connected with the telegraph lines of North Germany. He, on the other hand, will make the arrangements necessary for guarding against the malicious destruction of the cable, and for protecting it against injuries from vessels or fishing boats. The incorporators may lay the line direct without touching any other territory than those of the two countries named, or *via* England and Newfoundland, to any point between New York and Boston. They have the option also of constructing a new cable, or of buying any submarine cable already existing which may be available for their purpose. If the latter alternative be adopted, the Chancellor reserves to himself the right, before the purchase of the cable or cables, to cause the same to be examined with a view to test the working capacity, as well as to consider the risks to which it or they may be subjected. He also reserves the right of refusing to allow the purchase. Those to whom the concession is granted, are permitted to enter into connection with the Indo-European Telegraph Company for the interchange of messages between America and Asia or Australia.

The Chancellor of the North German Confederation will promulgate the regulations regarding the transmission and exchange of cable telegrams. In order to secure connection between the new system and the telegraph lines of the interior, especially as concerns Hamburg, Bremen, and Berlin, provision will be made by the North German Bund.

Regarding the messages which will be transmitted from India *via* England to America, future arrangements must be made with the Indo-European Company. Though the telegraphic communication will be subject to the rules laid down in the International Telegraph Convention, made at Vienna in 1868, no higher rate will be charged than that adopted by the Transatlantic telegraph companies.

The construction of the cable, which, as may be conjectured, will be made after the most approved method, must, according to the conditions, be commenced within six months after the concession is granted, and the whole line must be completed within two years after the date referred to. The concession will become null and void if the working of the cable be interrupted for two years. The concession will expire after a lapse of twenty-five years unless it be resolved upon to make a new agreement.

Any differences of opinion between the Chancellor of the North German Bund and the incorporators will be decided by an arbitration of three judges, to be nominated for that purpose by the civil department of the Prussian Supreme Court. In Northern Germany it may be added that the telegraphs are under the control of the Government. The concession, therefore, substantially constitutes a treaty. It is expected that the *Great Eastern* will sail on or about the 10th of November with that part of the British Indian telegraphic system which is to be laid between Aden and Bombay.

It is probable that the newly designed floating telegraph stations round the coast will shortly be widely adopted, and several of them are being constructed at the present time.

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Contents:

(Illustrated articles are marked with an asterisk.)

THE MEASUREMENT OF HEAT WITH THE THERMOMETER.

Two classes of instruments are employed for the measurement of heat, namely, thermometers and pyrometers. Thermometers are only employed to measure comparatively low temperatures, and we shall confine our remarks entirely to this class in the present article.

Modern physics having demonstrated that heat is merely a mode of motion in matter, the principles upon which its measurement depends are, perhaps, more difficult to understand than the false theory prevalent before the establishment of this doctrine. So long as heat was considered a substance, even though an imponderable one, it was not difficult to understand how its absorption into a body might definitely enlarge that body, as wood is enlarged by the absorption of water. Why a body becomes enlarged by the increased motion of its particles is more difficult of comprehension. If we, however, drop the consideration of the why in this case, and confine ourselves to the law or manner in which this expansion takes place, we may arrive at definite and practical results. It is, nevertheless, proper to state that the ultimatum which science has reached in regard to the reason for this expansion is, that heat is in some way opposed to cohesion. At present it is entirely futile to seek to go further than this. The fact, however, that such expansion takes place in both solids and liquids, and that it is, within certain limits, sufficiently uniform in certain substances to become a means of measuring the temperatures to which these substances are exposed, is the basis of thermometric measurement.

But another point must be distinctly borne in mind; thermometers only measure sensible heat. Thus one pound of steam at 212° Fah. contains heat enough to raise five and one half pounds of water to the same temperature, a fact easily demonstrated by experiment. It follows that the absolute or total number of heat units contained in any substance, must be determined by some other means than the thermometer, and that a degree on the thermometer cannot be considered a unit of heat. What then is a unit of heat? It has been agreed to consider the amount of heat necessary to raise one pound of water from 32° Fah. to 33° Fah. as a unit of heat, and although doubtless there are some small sources of error in the method, it is sufficiently accurate to regard the amount of heat necessary to raise one pound of water one degree, anywhere between 32° Fah. and 212° Fah. as a constant quantity.

It is also a correct inference that any particular substance in a uniform state, as regards the cohesive power of its particles, must exhibit the same temperature so long as it maintains that condition, since heat is the opposite force to cohesion. The more heat the less cohesion, and *vice versa*. Water, when passing from the liquid to the solid state, maintains such a uniformity of condition; its temperature may, therefore, be regarded as constant. It also maintains the same uniformity of condition while passing from the liquid state into steam at the boiling point. The freezing and boiling points of water may therefore be considered as the two prominent landmarks of temperature from which the amount of expansion of some uniformly, or nearly uniformly expanding substance, as mercury, immersed in water in the two conditions named, being noted on a scale, divisions may be arbitrarily made each way on the same scale, which will indicate temperatures above or below these points.

The Centigrade scale makes the hight of a mercury column immersed in freezing water, zero, and divides the distance between this point and the hight of the same column immersed in boiling water, into one hundred degrees, while the Fahrenheit scale makes the first named hight 32 degrees above zero, and divides the space between this hight and the hight at which the mercury stands in boiling water, into one hundred and eighty divisions, or degrees.

How it is possible to determine the amount of heat in any body from thermometric indication next claims our attention. The following law has been established. The *total amount* of heat in any body is the sum of its latent heat and its sensible heat. The latent heat is determined by the known capacity of the body under examination, at given temperatures to absorb heat, or, in other words, to render it latent. This term, latent heat, is not a good one, though we are still obliged to use it for want of a better. We use it only to distinguish the heat which, acting within a mass of matter, and expending its energy in antagonism to cohesive attraction, cannot be recognized by sensation, like the free or sensible heat. The latent, or specific heat of various bodies has been made the subject of careful study, and tables of reference have been constructed to afford a ready means of computation; but the specific heat of all bodies is changed by any cause which lessens or increases the distance between the particles which make up their mass. The compression of steam lessens its specific heat while it increases its temperature, and *vice versa*. The specific heat of steam, then, is only constant at *a constant pressure*.

It will now be seen that the total amount of heat contained in any body can be determined by the assistance of a thermometer, only when its specific heat for all temperatures has been predetermined. This has been done for many substances, including water and steam, to which the application of heat measurement is of the highest importance, as it is only by such measurement that questions of economy in steam generators can be settled. The amount of water evaporated from a constant temperature per pound of combustible consumed, under a constant pressure, being the only reliable test of the economy of a steam boiler. When the evaporation takes place at 212° the required uniformity of pressure and consequently of temperature is easily maintained, which would not be the case if an engine were driven by the steam generated, or if an attempt were made to produce the steam at a constant higher temperature. The temperature of the feed water may be easily maintained at a constant point, either at 212°, or at a lower temperature, and the amount of this water which a pound of fuel will convert into steam at 212° is an exact index of the power of the boiler to transmit heat through its shell into the contained water.

A NEW METHOD OF SETTING TIRES.

The old method of tire setting, as our readers are well aware, consists in first expanding the tires by heat and then allowing them to contract upon the wheels. In this way a powerful—sometimes too powerful—pressure is brought to bear upon the wheel, consolidating its parts and increasing what is known as the dish of the wheel.

A patent has been recently taken out in England for an entirely new method of setting tires without heat, which, while we are not prepared to admit the value claimed for it, is sufficiently ingenious to warrant some notice; and if on trial it should be found to answer the purpose, it will really be an important improvement.

The invention is based on the general principle that action and reaction are equal. In a wagon wheel the tire cannot exert any greater pressure upon the woodwork than the woodwork exerts upon the tire. If then, the woodwork can be contracted and permitted to expand against the interior of the tire, the same effect would be produced as is now obtained by the contraction of the tire.

If a wheel be laid flat, and supported only by a circular bearing on which the side of the rim rests, no other part being supported, and downward pressure be applied to the hub, a contraction of the rim will take place relatively to the dish given to the wheel by the pressure on the hub, provided the rim were so firmly attached to the spokes, and the spokes to the hub, that no withdrawal could take place.

As, however, the parts of a wheel are not so strongly attached to each other as to overcome the resistance of the rim to pressure, the method we are describing employs also external pressure upon the rim of the wheel, an hydraulic pump being employed to generate the required pressure.

As the pressure is applied and the wheel contracts, it is made to descend into a funnel-shaped support, so that when the external pressure is taken off of the rim, the pressure upon the hub,giving dish to the wheel,being still maintained, the contraction of the rim is kept up till the tire is placed around it.

The hub being next released from pressure, the elasticity of the woodwork carries the hub back to its normal position with reference to the other parts of the wheel, a general expansion takes place, and the tire becomes permanently set.

It is said that the method can be applied with great rapidity and that the results seem satisfactory. It can, within certain limits, be applied to wheels of different diameters, and with greater economy than the old method of heating, a saving in time and labor, as well as a total saving of fuel being secured.

Our readers will concede the ingenuity of the system, but will probably share our doubts in regard to its excellence; nevertheless, it may prove upon extended trial to be just the thing required. If so, it will be another demonstration, that even in those things long generally regarded a having reached the limit of impsovement, there is still scope for inventive genius.

THE EDUCATION OF THE HAND.

People, with a few unfortunate exceptions, have each two hands. We should not mention this fact, were it not that in the education of youths, only one seems to be generally considered. Children are told to hold their knives in the right hand when cutting their food, and when this necessary operation is completed, to lay it down and use their forks while eating, still employing the right hand. The only further instruction they receive in regard to the left hand, is to keep it clean in common with the right hand, and not to get into the habit of thrusting it into their pockets. They are taught that whenever one hand only is required, the preference is to be given to the right. Thus the left hand is, with the large majority of people, a comparatively useless member, employed only to supplement the other in all manual operations.

Without pausing to inquire into the origin of this senseless custom, it is sufficient for our purpose to say that it has no foundation in the anatomy of the hand, or in any natural peculiarity of the human mind. To the anatomist both hands are alike gifted by nature, and constitute most beautiful and complex machines. So much does the power and dominion of man over inferior animals, crude materials, and natural forces, depend upon the hand, that were it possible to deprive the human race of this important member, and put in its stead a mere paw, or a hoof, it might well be asserted that man would soon find a common level with the beasts, notwithstanding his superior intellect. This assertion, of course, does not admit the possibility of using the foot as a substitute for the hand, which has been successfully done in several remarkable instances.

Should any one of our accomplished book-keepers, editors, or any other class of professional men, accustomed all his life to write with his right hand only, get that hand crushed by an accident on his way home some evening, the inconvenience, loss of time, and perhaps loss of lucrative position that would be likely to accrue before he could recover its use, or in case of its total loss, before he could acquire the art of writing with his left hand, would be a serious matter. Many a young man found the loss of the right hand a serious matter during the recent war, and many another has thanked God while submitting to the surgeon's knife, that it was only the left arm that had to be sacrificed.

As well might we teach children to hop about on the right foot, to keep the left eye closed, and to stop the left ear with cotton, as to teach them to magnify the value of the right hand at the expense of the left. Nor, in renouncing this absurdity, would it be necessary to violate existing social conventionalities. The fork may be held in the right hand when eating, and the knife may take its place in cutting food. These are small matters, observed only for conventional reasons. In driving on country roads we always turn out to the right, but on that account we do not consider a spavin on a horses left leg, any less serious than one on his right leg.

The first thing then to be considered in the education of the hand is the establishment of both hands on an equal footing. We may next pass to the consideration of its uses and structure.

The hand is essentially the organ of touch. Few people appreciate the vast amount of information we obtain through this one avenue to the mind; what subtile ideas of texture and quality in material, of comparative weight, of unseen motion and temperature, are obtained solely through the sense of touch. Fewer still appreciate to what an extent this sense can be educated. The blind substitute it for sight, and are enabled to gain ideas, and perform feats of manual skill through its exercise which are indeed surprising to those who see. Surgeons cultivate this sense till by laying a finger upon an artery throbbing under a stratum of overlying tissues, they can judge how deep to make the incision over it, without endangering the blood-vessels. Moreover, all very skillful surgeons use the knife in either hand with equal facility.

Such nicety of touch is essential in all very nice and delicate manipulations. And here let us note a fact first brought to our notice by a very skillful German watchmaker, to wit, that the practice of punishing children with the ratan or ferule on the hand, prevalent in many of our schools, must necessarily be detrimental to this sense. It was his custom when taking his children to school, to request the teacher to adopt some other mode of punishment than this barbarous method, explaining that as his children were to be bred to the art of watchmaking, it was essential that their delicacy of touch should remain unimpaired. While we do not intend to discuss here the much debated question of the necessity of corporal punishment, in the training of children, we will say that if such punishment is ever needed, nature seems to us to have provided for the emergency, and that no delicate nerves, muscles, and bones need be endangered in its administration.

We should extend this article too much, were we to attempt a minute analysis of the anatomy of the hand; but we assert that the most complete education and development of its powers can only be obtained through a perfect knowledge of its parts, and their offices. This fact has been appreciated by at least one of the authors of piano-forte methods now in use in the schools, and also by private music teachers; and in a long experience and observation upon this subject we have found that pupils progress much more rapidly both in music and penmanship, who are first prepared by a knowledge of the structure of the hand, and by special exercises calculated to develop the weaker muscles, and to render each independent of the others. In the education of the fingers, the first thing the instructor has to surmount, is not only natural but artificial inequalities in their strength and mobility. The fingers are not naturally of equal power, and the relative disability of the weaker ones is increased by the employment of the stronger, and disuse of the weaker ones. In the playing of musical instruments, it is necessary to eliminate inequalities of power, and render the fingers, as nearly as may be, of equal power, without weakening the naturally stronger ones. In other words, the weak fingers should at least be as relatively strong as is natural, while all ought to be much stronger than any would be without a thorough course of education.

It is a fact known to all good teachers that excellence in penmanship—ease and rapidity being assumed as indispensable elements of excellence—is only obtained by first securing a proper position for the hand and arm while holding the pen. All teachers must have observed how difficult of attainment a proper position is with the majority of pupils. One pupil finds it impossible to flex the thumb properly without aiding the feeble muscles, thus called almost for the first time into play, by gripping the pen as though it were to be pinched in two. Another braces the hand by sticking out the third and fourth fingers upon the paper, and almost drops the pen when he attempts to withdraw them; his muscles will not act independently. Others seem to have only the power to open and close the fingers all together, and clutch the pen as though it were a miniature club, with which the fair sheet before them is to be thrashed. Their efforts are absolutely painful to them, and are apt to be uncharitably looked upon by teachers. As well might they be expected to stand upon one foot with ease and comfort as to control the feeble, undisciplined, aching, and trembling muscles, upon which these new and extraordinary demands are made.

A common sense view of this subject suggests that long before the hand grasps a pen, or the fingers touch the keys of a piano, the weak muscles should be gradually strengthened by proper exercise; and while it is not our purpose to specify such a course of exercises, we suggest to those now engaged in promoting physical education in our schools, that they ought to prepare proper exercises designed to meet the requirements of the case. They might easily be adapted to music, and introduced into the schools, and could be practiced by even the youngest, while singing, or with the accompaniment of an instrument.

If proof were wanted of the generally deficient education of the hand, nothing better could be adduced than the fact that, notwithstanding writing is one of the most important and universal of manual operations, it is on the average perhaps the most imperfectly executed. There are many men who can peg shoes, or do fine sewing, or play a violin for many hours together; but there are comparatively few who can write many consecutive letters without great fatigue. On the contrary, the extent to which its powers can be developed is shown in the manipulations of jugglers, and in very many important mechanical operations.

The subject of physical education is now attracting universal attention, and its importance is generally admitted. It has, however, been too exclusively considered in its relation to health, and instruction has been confined principally to the development of the larger muscles of the body and increase of general strength. This is all right so far as it goes, but it ought not to be forgotten that in the emergencies of life the hand plays by far the most important part of all the members, and that to enlarge its powers, is to add directly to the resources of its possessor. If legs are lost, skillful hands can supply partial substitutes. If eyes are extinguished, the hand if educated can still supply the physical necessities of the blind. If hearing fails, the hands replace spoken language by an inferior but intelligible language of signs, but if the hands are lost what can in any measure compensate for this overwhelming calamity? The feet can only in a measure take the place of hands after many years of practice, and immunity from the severe labor of walking; and it is very doubtful whether any adult could ever succeed in making toes do the work of fingers, although children born without arms have been known to do so.

What excuse can there be then, for neglecting the early and careful instruction of *both* hands. We are not speaking of an impracticable thing when we say it is possible to rear children so that whatever one hand can do the other may do equally well. We know this has been accomplished in many notable instances, where the disability of the left hand has been rectified, in spite of all obstacles arising from bad habits acquired in childhood. We have seen surgeons transfer an instrument from one hand to the other during an operation whenever convenience required it, without the least awkwardness. We have seen draftsmen using both hands in coloring drawings, an immense advantage both to rapidity of work and eveness of shading. We have seen woodmen chop timber "right or left handed," and one carpenter who used a hammer or saw with either hand with nearly equal facility. In all these cases, the use of the left hand in common with the right gave very much greater efficiency.

We have seen many instances of children whose parents were foreigners, growing up among children of American birth; and speaking the language of their parents, or of their playmates with equal facility, and we are confident that the two languages are acquired in such cases as easily as one would be. The same ease would undoubtedly attend the learning to use either hand for all necessary manipulations, so that no fear that both would become awkward need be apprehended.

Thus the resources of those dependent upon manual labor for subsistence would be nearly doubled, much time and expense would be saved in the acquirement of arts specially requiring the employment of the left band, and the superior grace and dignity attending complete and symmetrical development would be in a much larger measure attained.

Much more might be said in regard to the education of the hand, but as this article is only intended to arouse the attention of thinking people to a radical defect in physical education, we may appropriately close our remarks with the following quotation from that admirable poem "The Hand and its Work," by Mrs. Hale.

"All wants that from our nature rise,
Life's common cares, the hand supplies
It tends and clothes our myriad race,
And forms for each a resting place;
And ceaseless ministry doth keep
From cradle dream to coffin sleep."

DEPRESSION IN AMERICAN COMMERCE.

The present depression and decline in American commerce has had few parallels. So marked has this depression become, that scarcely any investment can be made with a leaner promise of profit than a purchase of shipping. Under this state of affairs a special Congress committee are engaged in trying to discover the causes for the decline, and if possible to apply a remedy.

To this end a session was held by the committee in New York, ending Saturday the 16th October, in which a number of gentlemen, prominent in commercial circles, were examined.

The general causes of the existing depression as elicited from these gentlemen, may be enumerated as follows:

First, high prices of labor and materials.

Second, depreciation in our currency.

Third, increased cost of sailing our vessels after they are built, consequent upon injudicious taxation, as well as high prices.

Fourth, the subsidizing policy of England which gives her commerce great advantages not enjoyed by our shipowners.

Fifth, the substitution of iron and steel vessels, in the building of which we cannot, under existing circumstances, compete with England.

Sixth, the high duties on shipbuilding materials.

In relation to the first four causes enumerated we cannot do better than to quote from the testimony of Mr. A. A. Low:

"Most of our laws are framed with a view to protect our various industries, but the laws which generally protect our interests bear pretty heavy upon this special interest. They are really a burden upon our shipping interest."

"By the Chairman.—We would like to have you give your views on the causes that have operated to produce this effect upon our commerce." "We have high-priced labor and material which enter into the construction of a ship, and we have a depreciated currency. We have the increased cost of the ship in the first instance and also the increased cost of sailing the ship after she is built. I think the American shipping interest had suffered before the war. The California trade had caused the building of high-priced ships, and in large numbers, and the traffic in that direction soon proved unremunerative. The war came on, and the privateers burned our vessels. Insurance could not be obtained, and these combined drove our commerce from the ocean. My own belief is that the policy of England in subsidizing lines of steamers to various ports of the world, has given her a prestige almost insuperable.

"We have just now one important steam line, and its property has been greatly injured since the completion of the Pacific Railroad. We have given $60,000,000 to a railroad, together with lands, and, out of all support from the Pacific Mail lines, I suppose we have suffered an injury of six or eight millions of dollars.

"The capital of the line two years ago was $20,000,000; now it is $6,000,000. It would have been just as good now if it had not been that Congress had given money to the railroad. There does not seem to be a law on the statute book that does not seem to inflict an injury. Then the policy of England is perfect. They are a nation of large supplies; they have manufactories in abundance to supply the distant markets; their colonial policy is excellent, and all their laws are in the interests of commerce. Our opportunities here for the employment of commerce are so great that our Legislature has not given them that advantage. I think they have acted wisely in subsidizing their lines. It is easier to tell the causes of the depression than to find the remedy. If subsidies could be given to ocean iron steamers, it would be an offset to the extra cost of building them. My own impression has been that large subsidies should be given. These subsidies, while they cost the Government largely in the beginning, cost nothing in the end."

Mr. Low also explained that the English Government allow all their steamers to receive their supplies from bonded warehouses, while American shipowners are obliged to pay duties on their supplies.

Mr. George Opdyke, ex-Mayor of New York city, a gentleman of acknowledged ability on all subjects connected with political economy, gave more prominence to the fifth and sixth causes above specified, but dwelt mainly upon the depreciation of our currency. He maintained that everything is about 75 per cent higher than under the old currency. The American shipbuilder has, therefore, to pay a difference of 75 per cent over the foreign shipbuilder. He thought it would be very many years before we can build ships of iron as cheaply as they can be built in Europe. As long as protection is the policy in this country we cannot expect them to make an exception in this regard. If we should adopt the policy of free trade, shipbuilding would increase. Subsidizing is another remedy. While he was opposed to all government subsidies, it would seem essential that we should try to control commerce, and that, to some extent, our Government should follow the policy of Great Britain. How far that policy should go, he was not prepared to say. He was opposed to it altogether, but from the present crippled condition of our commerce we desire to regain the position that we once held, and he believed that it would be judicious for the Government in proper cases where lines are established between this and other important countries, to meet Great Britain with her own weapons.

The question arises, Can these causes be removed without great and permanent injury to other industries? We believe they can. A sound protective policy does not merely imply indiscriminate imposition of duties; and if the burdens of shipowners are too great they should be lessened. Subsidies and drawbacks are protection in the most ultra meaning of the term. Permission to take supplies from bonded warehouses is only another form of protection. England protects her commerce; always has protected it. Let us now protect ours by the same means she employs, and, as Mr. Opdyke recommends, turn her own weapons against her.

CLOSE OF THE FAIR OF THE AMERICAN INSTITUTE.

It is officially announced that the Fair of the American Institute will positively close on the 30th of October.

The managers may congratulate themselves upon the success of the exhibition. It has been well attended, and has generally, we believe, satisfied both exhibitors and visitors.

A common remark of narrow-minded people is, that such exhibitions are mere advertising dodges, got up for the special benefit of the exhibitors, that there is really very little that is new exhibited, and that it does not pay to visit them. Yet these same narrow-minded people are to be found annually in attendance at such displays, finding, it is to be supposed, sufficient pleasure in grumbling to compensate for a trifling expenditure of money and time.

There is very little novelty to be expected in any such display in proportion to the large number of things exhibited. The world never gets on so fast as to satisfy those to whom it owes nothing. No class of men work harder to benefit their fellows than inventors, and yet those croakers who never had an original idea in their brains, and never would have should they live to the world's end, find fault at the slowness of mechanical progress.

These people will spend an evening strolling up Broadway, gazing in at the shop windows at the beautiful things displayed, and never think of finding fault that these things are placed in the windows to advertise them; yet, at one of these fairs where a collection of curious, instructive, and beautiful articles and machines is brought together, such as they could not see in a week of strolling and gaping at windows, they make complaint because the exhibitors are likely to reap some pecuniary benefit. Of course they are; and if you who grumble object to this sort of thing, you are welcome to stay away, a thing which you cannot do, for it is a characteristic of such people to be found in every place where their growling can mar the pleasure of others.

For ourselves, we are satisfied to see the gradual improvement made in old and standard manufactures, and do not complain that it is only now and then anything meets our eye that can be called a "novelty." It is this gradual improvement that makes up the bulk of human progress.

We have, in our notices of various departments, already called attention to the most noteworthy improvements exhibited. We have, doubtless, overlooked some, although it was our intention to treat impartially all exhibitors of important improvements. Some of the departments not calculated to greatly interest our readers, we have not specially mentioned at all. Those, however, who have followed us in our weekly notices will own that we have dealt very liberally indeed with exhibitors, and we have received ample assurances that the exhibitors themselves so regard it.

We shall now discontinue these notices, with the hope that the future exhibitions of the American Institute may be as successful as this has been, and with the heartiest wishes for the success of such of the exhibitors as are endeavoring through the facilities thus afforded, to introduce new inventions. Many of these will date the commencement of success from the Exhibition of the American Institute for 1869.

A Perilous Balloon Voyage.

The Saginaw (Michigan), *Enterprise*, relates the story of one of the most perilous balloon voyages on record. Professor La Mountain was the only occupant of the balloon, which ascended from Bay City on the afternoon of the 12th instant. The balloon had leaked badly, and his companion was obliged to get out of the car, when those who held the balloon let go suddenly, and the air vessel passed upward with dreadful velocity, without either ballast, instruments, food, or companion. In a few minutes the balloon had attained an altitude of two miles, and was driven by a very strong gale directly towards the lake. It passed into a snow cloud, which speedily coated it and everything in and about it. The escape valve was frozen tight, and Professor La Mountain, in pulling with all his might to open it, drew out the rope and thus cut off another means of escape. The balloon still passed upward, and emerged into the clear cold air above. The involuntary traveler felt that something must be done, and quickly. He climbed the ropes above the hoop and felt for his knife, but he had left it below. Clinging with one hand to the ropes, he tore with his other hand and his teeth a hole in the side of the balloon. Passing to the other side he repeated the process and then returned quickly to the car. His fingers had been frozen while thus exposed. He heard the cloth tear and saw the rent open from the bottom to the top. The balloon had gradually slackened its upward progress, rested a moment in equilibrium, and then began to descend, slowly at first and then with a velocity more frightful than that of the ascent. At the hight of two miles from the ground the gas had completely left the balloon, but the air had rushed in and made it a sort of parachute. Professor La Mountain was in a half unconscious state during the descent, although he remembers passing through the cloud, less distinctly the sensation on seeing and nearing the earth, and then he became wholly unconscious. When his senses returned he was lying in a wood, and several persons had come to his assistance, having seen him fall. He had been stunned and severely bruised, but had broken no bones, and suffered no internal injury. The spot where he landed was seven miles from Bay City; the time he had been in the air is not stated.

Bells and Carillons, or Continental Chimes.

Mr. Thomas Walesby communicates to the *Builder* an interesting article on bells. He says:

"Our great musical historian, Dr. Charles Burney, in his interesting work, 'The present State of Music in Germany, the Netherlands,' etc. London, 1773, speaking of his visit to Courtray, says:

"'It was in this town that I first perceived the passion for *carillons*, or chimes, which is so prevalent throughout the Netherlands. I happened to arrive at eleven o'clock, and half an hour after the chimes played a great number of cheerful tunes, in different keys, which awakened my curiosity for this species of music so much, that, when I came to Ghent, I determined to inform myself, in a particular manner, concerning the *carillon* science. For this purpose I mounted the town belfry, from whence I had a full view, not only of the city of Ghent, but could examine the mechanism of the chimes, as far as they are played by clock-work, and likewise see the *carillonneur* perform with a kind of keys, communicating with the bells, as those of the harpsichord and organ do with strings and pipes. * * * * * * The great convenience of this kind of music is, that it entertains the inhabitants of a whole town without giving them the trouble of going to any particular spot to hear it.'

"So far so good. The respected author then goes on to say—

"'But the want of something to stop the vibration of each bell, at the pleasure of the player, like the valves of an organ, is an intolerable defect to a cultivated ear; for by the notes of one passage perpetually running into another, everything is rendered so inarticulate and confused, as to occasion a very disagreeable jargon.'

"Now, having myself examined the bells and mechanism —*cylindre et clavier*—of the most celebrated *carillons* in Europe, and repeatedly listened to their music at various distances, I beg to assert most distinctly that the statement made by the learned doctor in the last paragraph is false. I deny that 'everything is rendered inarticulate and confused,' or disagreeable. On this point I speak the more plainly, because almost every Englishman who has written a line about *carillons* since 1773, has followed Burney's dictum, and told us that the great defect is the want of a damper to each bell. Several examples relating to Boston and other chimes have been contributed to public journals since Christmas last.

"Perhaps the following observations may suggest what led the Doctor to entertain and publish the notion just mentioned:

"Every musician worthy of the name knows that instruments strung with wire 'which have nothing to stop the sounding-strings, make an intolerable jangle to one that stands near,' as, I may add, bells do to one that is *in the bell chamber*, and hears the continuing sound of dissonant tones. Such an instrument of the wire-string kind is the dulcimer. But the piano-forte has a simple contrivance—a damper—for stopping the vibrations of the strings when the fingers are lifted from the keys.

"If, then, instead of going to a spot at some convenient distance from the tower, as he ought to have done, with a view to 'inform himself in a *particular* manner' concerning *carillon music*, Dr. Burney stood *in the bell chamber* during a performance, the effect must indeed have been intolerable to a cultivated ear.

"I maintain, however, that musical bells suspended in a tower, require no damper whatever; for, when their sounds have issued from the openings in the sides of the building, they spread themselves in the air, and ultimately reach the auditor with precision in subdued and pleasing tones. Even rapid passages in *carillon* music, if properly harmonized so as not to weaken or confuse the melody, and executed by, or upon, a good instrument, produce an admirable effect.

"It would be well if the vibrations of many noisy and discordant things called bells were completely stopped. But to say that musical tower bells require dampers in order to produce the desired effect is truly absurd. It is equal to any of the 'moonshine' on bells in general with which we have been favored during the last fourteen years."

Convenient Method of Ascertaining the Constitution of Flames.

M. Dufour recommends the following process for demonstrating, for instance, that the flame of a candle is formed of a hollow cone, luminous on the outside only, and dark in the interior. For this purpose it is necessary to cut the flame; the most preferable method of doing this is by means of a sheet of water or air. The arrangement is as follows: A caoutchouc tube has, at one of its extremities, a gas jet, such as is used for common gas flames; this jet has an almost semicircular slit of 0·4m.m. in depth. The other end of the tube communicates with a reservoir of water placed at a convenient hight. Upon a suitable pressure, the water flows cut by the slit in the jet, producing a clear sheet, capable of preserving for a sufficient length of time, an invariable form and size. The slit is placed in such a manner that the sheet presents a horizontal surface; and this will easily cut the flame of a candle, showing a perfect section. The hot gases and carbonaceous particles are carried off by the water. On placing the eye above the hollow cone, the luminous wall, etc., can be distinctly seen. Sections may easily be made near the wick or near the point; nothing hinders observation, which may be prolonged at pleasure, and a lens may be used if desired. A flame of gas may be cut and examined in the same manner, but the current of gas must not be strong enough to traverse the sheet of water. If a current of air be caused to come out of the slit by bellows, an invisible sheet of air is formed which is, also, very convenient for making a section of flame. Close observation is quite possible; for the aërial current prevents the heated gases from reaching the eyes, and a lens may be used, as in the former case. The flame forms a cone, whose luminous walls are extremely thin, and their interior can be plainly seen. A platinum wire may be introduced across the section; and on being plunged as far as the wick, it will remain unreddened in the dark interior of the cone.

A jet of gas issuing from a circular opening, of from 1 to 2m.m. in diameter, may also be cut very conveniently by the sheet of air. It will be seen to consist of a cone whose walls are brilliant and extremely thin. Upon bringing the sheet of air close to the aperture whence the gas escapes, the flame will be divided at its base and will reappear a little higher. By this means, the entire length of the luminous cone, its thin walls, and their interior may be examined.

If a jet of gas produced by a fan-tail burner be cut, the luminous fan will be found to consist of two brilliant blades, between which there is a narrow obscure space. The blades are at a greater distance apart, and the dark space is wider towards the end of the fan-tails; and, by assuming a suitable position, it is easy to see through the section of flame into the dark space which separates the brilliant walls, and at the end of this will be seen the slit by which the gas escapes.

Instead of throwing the sheet of air perpendicularly to the flame, M. Dufour thinks it better to throw it partly on one side, on such a plane as to make a slight angle with the axis of the conical flame, or with the plane of the fan shaped flame. A lateral suction is then produced by the influence of the current, which draws the flame, and inclines it against the sheet of air, by which it is cut. By placing the sheet of air on a more or less inclined plane, and approaching or removing it from the base of the flame, the section is easily made at points more or less distant from that base.

The method described above may, of course, be applied to any kind of flame. M. Dufour suggests that it might be of service in the chemical analysis of flames. When a flame is cut by a sheet of water, the water draws off the gases of which it is composed. If the section be made with a sheet of air, it will be easy, by placing suction pipes through the length, and ending at fixed points in the interior of the cone, to collect the gases whose composition is desired to be ascertained.—*Les Mondes*.

The Mound Builders in the Rocky Mountains.

An account was recently given of the opening of an ancient mound in Southern Utah, similar to those of the Mississippi Valley, in which were found relics of the unknown builders indicating much artistic skill. It was stated that this was the first evidence found of the existence of the Mound Builders west of the Rocky Mountains. We are now able to announce, for the first time, as we suppose, the discovery of similar mounds, evidently built by the same race, high up on the Rocky Mountains. The discovery was made by Mr. C. A. Deane, of Denver, while at work on a Government survey, in the mountains, a few weeks since. He found upon the extreme summit of the snowy range, structures of stone evidently of ancient origin, and hitherto unknow or unnoticed. Opposite to and also north of the head of South Boulder Creek, and on the summit of the range, Mr. Deane and his party observed large numbers of the granite rocks, many of them as large as two men could lift, in a position that could not have been the result of chance. They had evidently been placed uprig t in a line, conforming to the general contour of the dividing ridge, and frequently extending in an unbroken line for one or two hundred yards. Many of the stones have fallen over or are leaning, while others retain their upright position. In two places, connected with this line, are mounds of stone, loosely laid up, about two feet in hight, and embracing a circular area of about ten feet in diameter. The stones were evidently collected on the spot, as the surface is cleared for a space of several yards around the structures. These lines and mounds of stone bear every mark of extreme antiquity, as the disintegrated granite has accumulated to a considerable depth at their base, and the rocks in the mounds are moss-grown. The feature, more particularly identifying these structures with those of the Mound Builders elsewhere, is that they present, at intervals, projections pointing to the westward. We are thus particular in the description of these Rocky Mountain mounds which are extraordinary in position if not in character, in the hope that antiquarians, visiting our Territory, may be induced to examine them. It would not involve much labor to open them and possibly they cover relics that may add something to our small stock of knowledge of the ancient race who constructed these and similar works ll over the continent. The walls and mounds are situated 3,000 feet above the timber line. It is, therefore, hardly supposable that they were built for altars of sacrifice. They were not large enough for shelter or defense. The more probable supposition is, that like the larger mounds elsewhere, they were places of sepulture, and perhaps, also, at the same time, historical memorials, pointing, with their stone fingers, in the direction of the country from which the builders, or their ancestors, migrated. The three mounds may mark the resting places of those who, for some distinction, were buried as near to heaven as possible.—*Rocky Mountain News*.

Steam Plowing.

We learn from the *Engineer* that a highly interesting test of steam apparatus for cultivating and plowing the soil was carried out recently at Eye, near Peterborough, England. The object on this occasion was two-fold, viz., to introduce an improved self-acting anchor for using with the round-about system, and to show what could be done with more powerful machinery and direct action by the use of two engines. The latter system was exhibited by Messrs. Fowler and Co., of Leeds.

The new application referred to was invented by Mr. Champion, a practical farmer near Shalding. It consists in what we may term a self-acting anchor. The form of the invention is simply a cross-bar in which are fixed spikes or claws for entering the ground. There are two or three spikes fastened by clasps on each side of the square iron bar, according as the soil may be, hard or soft, and more or less resistance is required. The iron bar which carries these spikes is placed across the back part of Messrs. Fowler and Co.'s disk anchor and outside the frame, attached to the revolving bar, is a ratchet with four catches, into which falls the stop notch of a lever. The distance, therefore, which the anchor advances depends on the square and the length of the spikes and the size of the ratchet. The one shown at work on this occasion was so constructed that the anchor advanced three feet each time the lever was raised, and the ratchet turned round one fourth of its circle or side. When a plow or digger, however, has four breasts or "diggers" on it, and more than three feet of work is done at a drag, the anchor does not advance sufficiently far if the ratchet is allowed to turn only one fourth round. Every three or four drags, therefore, which the plow takes, it is allowed to turn half round, which keeps it in the right position for a direct action of the rope. But this is a matter of minor detail.

The result of this application is, the claw anchors, which required a man at each end to shift and keep in their place, are entirely dispensed with, and three men and two boys, viz., one man at the engine, one at the windlass, and one on the plow, with the two boys at the rope-porters, can now do the work more easily than the five men and two boys previously required, could do. An important difference in the cost on first outlay is also the result of this system.

The anchor is undoubtedly the most simple and efficient that has yet been introduced. It will bear a strain of 20-horse power, and it has never been turned over; while in hard ground the claw anchors are difficult to insert, and in soft ground it is next to impossible to keep them in a proper position.

In this method of plowing, clip-drum engines are placed at each end of the field, and the gang of plows is drawn backward and forward by a wire rope. Results, therefore, need only now be given. Here almost a revolution is just now occurring. The small 10-horse engines are being replaced by 30-horse engines, and for the superior work and greater economy of this increased power it has been satisfactorily calculated that 50-horse engines will be even more efficient. By 30-horse engines and thirteen-tined cultivators an average of thirty-six acres per day has been accomplished, the cost of which is actually 2s. 6d. per acre. The calculation mentioned with regard to the 50-horse engines is that the cost can thereby be reduced to 1s. 6d. or 1s. per acre at a depth of 10 inches.

The practical experience which has led to these conclusions has occurred at Buscote Park, Berks. Mr. Campbell has there worked since harvest the 30-horse engines, weighing twenty-eight tuns each, which we saw at the royal meeting at Manchester. He has done between two thousand and three thousand acres at the actual cost named—2s. 6d. per acre—his land being of the strongest and heaviest kind. The rate at which he works is from three and a half to four miles per hour, at which pace from three to four acres are broken up in the same time. The increased efficiency, too, of the work done by this greater power is greatly due to the increased pace which it permits, for not only is the soil smashed up, but it is shattered at the same time.

The work done with the 10-horse engine and cultivator was perfection itself. Nothing could be better at the depth of 10 inches. Between 7 A. M. and 2·30 P. M. eighteen acres were done in the way described.

APPLICATIONS FOR EXTENSION OF PATENTS.

MACHINE FOR HEADING BOLTS.—William S. Booth, of New Britain, Conn administrator of the estate of H. M. Clark, deceased, has petitioned for an extension of the above patent. Day of hearing, December 29, 1869.

MEANS FOR REGULATING AND WORKING STEAM VALVES AS CUT-OFFS.—Charles H. Brown and Charles Burleigh, of Fitchburg, Mass., have applied for an extension of the above patent. Day of hearing December 29, 1869.

MAKING CLOTHES PINS.—Ephraim Parker, of Marlow, N.H., has petitioned for the extension of the above patent. Day of hearing, December 29, 1869.

LUBRICATOR.—William Gee, of New York city, has applied for an extension of the above patent. Day of hearing, January 24, 1870.

SPREADING ROLLERS FOR STRETCHING CLOTH.—Jonathan I. Hillard, of Fall River, Mass., has applied for an extension of the above patent. Day of hearing March 29, 1870.

SHINGLE MACHINE.—Edward Hedley, of Philadelphia, Pa., has applied for an extension of the above patent. Day of hearing May 3, 1870.

MANUFACTURING, MINING, AND RAILROAD ITEMS.

During the week ending October 17, over 1,100 passengers arrived in California by the Central Pacific Railroad.

The London house painters held a meeting recently, for the purpose of forming a society of workmen to promote technical education in connection with house painting and decoration.

It is said that the railroad connecting the Hudson River railroad at Spuyten Duyvil with the Harlem Railroad, and the new Union depot to be built on Fourth avenue, will be begun this fall.

The citizens of Louisville, Ky., have voted on a proposition to subscribe $500,000 in aid of the projected Louisville, New Albany, and St. Louis air-line railroad. The motion was carried by a majority of about 500.

The extent of omnibus travel in Paris may be judged from the fact that, during the year 1868, the number of persons carried in omnibuses amounted to 120,000,000, or nearly sixty-five times the population of that city.

Russia has established at Warsaw a mechanical school for women, with the object of training them in all kinds of handicraft that may be pursued without injury to health. The school is to be under the immediate supervision of the government.

It has been discovered by careful experiments in Charleston that the weight of a bale of cotton varies slightly with the temperature. A fall of ten degrees in the thermometer causes a bale of cotton to gain about a pound and a half in weight.

The San Francisco papers say that the first article of tinware manufactured from tin mined in the United States has just been completed in that city. It is a case to contain the Pioneers' certificate of honorary membership presented to the Hon. Wm. H. Seward.

The Austrian Lloyds Steam Navigation Company's fleet, at the end of 1868, consisted of 69 steam vessels of an aggregate tunnage of 62,220, and of 15,800 horse power, and at the present time the total number of vessels has been increased to 73, with a tunnage of 70,000.

The car shops of the Lake Shore Railroad were destroyed by fire on the 17th of October. Passenger and freight cars, lumber, car material, and tools were entirely destroyed. The loss is over $300,000; fully insured. One hundred and fifty workmen were thrown out of employment.

The *Ironmonger* suggests the desirability of constructing trains almost wholly of iron. They might be so constructed of this material as to offer greater resistance in case of collision without materially increasing their weight, while the danger from fire would be almost nil. Durability and economy are other advantages claimed.

The proprietor of an extensive cotton factory near Stockholm, Sweden, has purchased 12,000 acres of land in Dunklin and Stoddard counties, Missouri, where he will build factories, mills, etc., establish colonies, and carry on the cultivation and manufacture of cotton. The enterprise will give employment to 1,300 families. Some of these are on the way from Sweden.

Within the city of Portland, Maine, and a circuit of ten miles around it, there are about twenty brick yards, which produce about 20,000,000 bricks per year. They are all operated in the old-fashioned way, except the steam works at Stroudwater. These works give employment to 30 hands, and turn out about 33,000 bricks per day, which bring in Boston $2 a thousand more than common bricks.

An important experiment is about to be tried at the South Kensington Museum, London, to promote the instruction of women in science. By the permission of the Lord President, Professors Huxley, Guthrie, and Oliver are about to commence a course of lectures on natural science in November. The fees are low, and many ladies of high position in society have expressed their willingness to assist in the experiment.

Professor Maillefert continues his blasting operations at Hell Gate with, so far, very encouraging success. He has raised and carried ashore 1,575 cubic yards of fragments of rock, besides a large quantity which has been washed away after being broken up. Since August 2, the date of commencing operations, 279 blasts have been made on Way's Reef, besides 44 on Shell Drake, and 15 on Pot Rock. The probability is that in a few months longer a depth of 25 feet at low water will have been obtained.

A modification of Thenard's process for the purification of lamp oil is proposed by M. Michaud. He blows air through the oil while sulphuric acid is caused to fall into it, in very finely divided streams, to the amount of 1 or 2 per cent. Agitation is thus produced, and the froth is skimmed off as long as it forms. When the froth ceases to appear the oil is purified, and has only to be washed by a current of steam, so arranged as to keep the liquid at a temperature of 100° Cent., for about half an hour.

Professor Morren states that the actinic rays of solar heat can be thoroughly arrested by a thin layer of a perfectly limpid solution of sulphate of quinine, not more than a few millimeters in thickness. He says that a useful application of this property would be to manufacture double panes of glass which could contain the solution, and replace by them the less efficacious yellow glass used by photographers in their dark room. They would thus be enabled to work in a light instead of a dark room.

Recent American and Foreign Patents.

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

Stove.—H. Stickney, Cleveland, Ohio.—This invention relates to improvements in magazine or base burning stoves, and consists in the combination with the same of a weight or follower to force the coal down and secure a uniform and reliable feeding of the same. It is well known that although these magazines are made larger at the bottom and gradually tapering to the top, yet where large lumps of coal, or bituminous coal of any size is used, they often fail to feed; in the case of the large coal by reason of the pieces becoming cramped and wedged together, and in the case of the soft coal by reason of the fusing of the parts into a mass, under the action of the heat. It is the object of this invention to overcome this clogging and secure a uniform feed.

Plow.—Wm. B. West, Utica, Wis.—The object of this invention is to provide an improved rotary mold-board attachment for plows, as a substitute for a part of the common mold-boards, whereby an anti-friction roller may be employed to receive the earth from the front part of the mold-board, and turn it over more easily and without packing as the plows do as now constructed.

Water Wheels.—S. H. Barnes, Lanesboro, Pa.—This invention relates to improvements in water wheels designed to provide certain improvements in the gates calculated to facilitate the operation thereof, also the delivery of the water upon the buckets in a manner to have the best effect.

Fruit Dryer.—B. H. Sipes and D. Deffbaugh, Bloody Run, Pa.—The object of this invention is to provide a cheap and economical drying apparatus for fruit and other articles. The invention consists in a peculiar arrangement within a case of a heating furnace, radiating apparatus, and drying pans.

Improved Brick Machine.—John Whiteford, Pond City, Kansas.—This invention has for its object to furnish a simple, convenient, and effective machine for molding brick and distributing them through the yard.

Mowing Machine.—Joel V. Strait, Litchfield, Ohio.—This invention has for its especial object to improve the construction of the gearing of mowing machines so that a faster or slower movement may be given to the cutters at the will of the operator, and which may also be applied with advantage to other gearing where a different rate of movement is sometimes required.

Railroad Chair and Coupling.—Frederick Nicklin, Troy, N. Y.—This invention has for its object to furnish a simple, convenient, safe, and reliable chair for coupling the ends of railroad rails.

Flour Bolt.—Wm. H. Allen and William Stoddard, Winona, Minn.—This invention relates to the knockers, so-called, of the flour bolts of grist mills.

Slack Belt Attachment for Cotton Gins.—J. W. Howard, Greenville, Ala.—This invention has for its object to furnish an improved attachment for cotton gins, to be interposed between the pulley of the gin and the driving wheel to bring the belt together and into proper position before it passes to the pulley, and which shall, at the same time, be simple in construction, easily adjusted, and effective in use.

Combined Plow and Harrow.—Albert Moore and Friederick Wendell, Chillicothe, Ohio.—This invention has for its object to improve the construction of plows, so as to make them more convenient and effective in operation, enabling them to harrow the furrow as it is turned, and enabling them to be adjusted to run deeper or shallower in the ground, even when at work.

Tool for Sharping Horseshoes.—Butler, Dunham & Wann, Marshalltown, Iowa.—This invention relates to the sharping of the calks of horseshoes. The invention cannot be here well described without the aid of an engraving.

Box Opener.—Henry C. Van Giesen, Paterson, N. J.—This invention relates to a new and useful improvement in an instrument for opening wooden boxes, as, for instance, dry-goods boxes.

Washing Machine.—Wm. Leighty, Ebensburg, Pa.—This invention relates to new and useful improvements in machines for washing clothes, and consists in the construction and general arrangement of parts.

Rotating Cultivator.—Theodor Uehling, Logan, Nebraska.—This invention consists in forming on a central eye and rotating on a central pivot a number of arms with cultivator teeth, either formed on or attached to their ends.

Pumping Engine.—Robert Allison, Port Carbon, Pa.—This invention consists in so operating the valve gear of the engine, that the jar produced by concussion, which has heretofore proved so destructive to pumping engines, is avoided.

Peat Machine.—John S. Kelly, New York city.—This invention has for its object to furnish a simple, convenient, and effective machine for scarping, or scarifying condensing, and partially drying peat upon the bed and without removing it therefrom, thereby enabling the peat to be prepared for market at trifling expense, by cutting the peat, compressing it, and forcing out the water from the porous, fibrous mass, while still in mass upon the peat bed.

Steam Heating Apparatus.—John H. Clark and John B. Clark, Providence, R. I.—This invention relates to a new apparatus for heating houses of all kinds, and has for its object, first, and chiefly, economy in the use of fuel and in the first cost of the apparatus; also to secure the most efficient heating and radiating surface in a compact and cheap form, as well as safety from accident.

Sugar-Cane Press.—William Aiken and William Bennett, Louisville Ky.—This invention relates to certain improvements in sugar-cane mills, and has for its object to simplify the construction of the whole apparatus, and especially to provide adjustable and good bearings for the rollers and facilities for lubricating and repairing the same.

Sewing Machine.—J. H. Butterworth, Dover, N. J.—This invention relates to certain new and useful improvements in the construction of sewing machines and their shuttles, and has for its object to provide a simple means of operating the shuttle, an adjustable and reliable tension apparatus for the needle thread, and a shuttle in which the thread cannot break or become spoiled when drawn from one end of the bobbin.

Slide Valve.—John F. Allen, Tremont, N. Y.—This invention relates to a new equilibrium slide valve, which is so arranged that it forms four openings for the steam inlet, those on top conducting the steam through the body of the valve. The invention consists in the application of a flat valve, which is vertically perforated through the middle, and which rests on an elevated plane of the steam chest, and under a grooved or recessed cap, so as to admit steam at both ends both from top and bottom.

Cut-off Nozzle for Cans.—John McLeod Murphy, New York city.—This invention consists of the application to the vertical nozzles commonly applied to the cans at the top, and provided with screw caps, which are removed both for filling and pouring the contents out of a laterally projecting tube or spout, arranged to rotate on the said nozzle to be brought into coincidence with a hole in the side thereof for pouring the contents out through the said spout, or for turning it away and closing the said hole by a ring encircling the nozzle, and to which the spout is connected, the the same being arranged to operate without removing the screw cap, and especially adapted for pouring from the cans when inclosed in packing cases of wood, a slot being made in the side of the case below the cover, from which the spout may project when coincident with the hole in the nozzle

Milking Apparatus.—Eugene Spedden, Astoria, Oregon.—This invention consists in the attachment to the milking pail by a flexible tube of a funnel provided with flexible wristlets or straps for buckling around the wrists for holding the funnel close up to the udder to receive the milk and ensure the delivery in the pail.

Pneumatic Pump.—J. A. Bailey, Detroit, Mich.—This invention relates to improvements in pumps, such as are actuated by the force of compressed air, and adapted more particularly for use in mining shafts, the object of which is to dispense with the employment of connecting rods of great length or other connecting mechanism, such as has been heretofore necessary to apply the power from the surface of the earth to the pumps located in deep shafts, also to facilitate the location of the pumps in any part of the shaft without reference to the conditions required when connecting rods are used, with respect to the placing and securing the said connecting rods.

Weather Strip.—David H. Horner, Battle Ground, Ind.—This invention consists in an improved arrangements of suspending bracket arm-spring devices in combination with a hinged strip for closing it down over the door sill when the door is shut, and for raising it up to pass over the sill when the door is opened.

Canal Tugs.—Stephen R. Kirby, New York city.—This invention relates, in part, to that class of tugs used in drawing canal boats, and, in part, to tugs for general traction purposes, and the first part of the invention is applicable only to tugs that have stern or central wells, in which the propeller wheels are placed.

Snap Catch for Breech-loading Fire-arms.—Wm. Golcher, St. Paul, Minn.—The object of this invention is to provide a simple, convenient, and effective means for fastening down the breech of guns of the class above named, it being so constructed, that it occupies but little space, is cheap, easily applied and operated, and not liable to break or get out of order.

Can Opener.—Wm. M. Bleakley, Verplank, N.Y.—This invention relates to a new implement for opening sheet metal cans, and is arranged to cut out larger or smaller pieces, as may be desired. The invention will, in a short time, be illustrated and fully described in the Scientific American.

Apparatus for Cutting and Dressing Millstones.—John Hine, Cockermouth, England.—This invention relates to a new apparatus for facilitating the cutting or dressing of millstones by means of diamonds, or other hard stones or cutters, and consists in a novel arrangement and combination of parts for producing an adjustable and effective apparatus.

Spring Eye Glasses.—Louis Black, Detroit, Mich.—This invention consists in connecting the springs to the projections, by means of clamps, either pivoted to the said projections, and provided with eccentric clamping pawls, or with rivets, arranged to be tightened by wedging against wedge-shaped projections, widest at the outer ends, toward which the clamps, when connected around the narrower parts, are drawn, the ends of the springs, in all cases, being placed between the projections and the clamps, and provided with locking devices to prevent sliding out between the clamps and projections.

Water Wheel.—J. J. Kimball, Naperville, Ill.—The object of this invention is to provide an improved construction of water wheels, calculated to utilize the power of the water to a greater extent than is done by the wheels now in use, and, also, for more ready and economical application of the said wheels to the flume or pen stocks.

Fruit Dryer.—J. Harvey, Martinsville, Ind.—This invention consists in an arrangement, in a rectangular-shaped sheet-metal case, of heating flues and ventilating passages, also, fruit-holding shelves.

Saw Filing Machine.—Henry C. Bell, Emporia, Kansas.—This invention relates to improvements in saw filing apparatus, whereby it is designed to provide a simple, portable machine, which may be readily attached to any saw for filing the same.

Musical Panorama.—Franz Friederich Kullrich, Berlin, Prussia.—This invention relates to a new combination with a music box, of an apparatus for displaying, through a suitable opening, a series of pictures in succession so that, whenever the music is played, the panorama will be in motion.

Water Wheel.—José Tort, Mexico, Mexico.—This invention relates to improvements in water wheels, having for its object to utilize both the direct and reacting forces of the water.

Water Wheel.—A. J. Jack and D. E. Brand, Des Moines, Iowa.—This invention comprises an arrangement of buckets, whereby they serve the function of gates also, thereby dispensing with the cost of the same. It also comprises a peculiar form of the buckets whereby better results are attained, and, also, an arrangement of operating devices for working the buckets to open or close them whether the wheel is running or not.

Clothes-drying Frame.—J. C. Longshore, Mansfield, Ohio.—This invention consists in an arrangement of parallel extensible and contractible frames of "lazy tongs" construction, united by transverse bars, and provided with supports capable of supporting the same when extended horizontally or vertically.

Water-drawing Apparatus.—L. Taylor, Jordan, Wis., and J. C. Richardson, Prairie du Chien, Wis.—This invention relates to improvements in apparatus for drawing water in buckets from springs or wells situated at long distances from where the water is to be delivered. The object of the invention is to provide simple and efficient apparatus, to be automatically operated by the turning of a crank to draw the water, convey it to the place for delivery, and to deliver it.

Straw Cutter.—Wilson Elder, Mill Hall, Pa.—This invention relates to improvements in straw cutters, whereby it is designed to provide more durable and efficient cutters of that class, in which a vibrating knife is worked by hand, than now in use. The invention has reference mainly to the arrangment of the fulcrum pin to prevent the nut from working loose, and the bearings around the fulcrum, whereby the cutter lever and cutter are maintained snugly against the metallic end plate of the box upon the bottom part of which the straw is cut.

Animal Trap.—Joel Manchester, New York city.—This invention relates to new and useful improvements in traps for killing or destroying noxious animals.

Pipe Coupling.—Levi Abbott, Lewiston, Me.—This invention relates to a new and useful improvement in the mode of coupling pipes of lead, rubber, other material.

Lamp Filler.—Henry W. Staples, Saco, Me.—This invention relates to a new and useful improvement in vessels for filling lamps, and consists in an air tube attached thereto.

Stable Horse Tie.—E. D. Cramer, Hackettstown, N. J.—This invention relates to a new and useful improvement in a safety device for hitching horses in stables and in other places.

Combination Bran Stock Bit.—J. S. Zerbe, Delaware, Ohio.—This invention relates to a new and useful improvement in arranging bitts, and other tools and implements, for boring and performing other operations in wood and metal.

Clothes-line Holder.—Albert Cooper, Harrisburgh, Pa.—This invention relates to a new and useful device for holding clothes lines, and consists in arranging two circular disk wheels on a center piece, and pressing the line between two rigid surfaces, and thereby holding it by means of double reversed inclined planes on the face of the disks.

Sound and Strain Diminishing Machine.—Frederick Kohler and A. J. Alsing, New York city.—This invention has for its object to provide a simple mechanism for preventing the noise produced by machinery, or by the splitting of wood, chopping of meat, and other pounding devices, as well as for reducing the strain produced by the striking or pounding process.

Saw.—Hermann Cramer, Sonora, Cal.—This invention relates to a new manner of constructing the blade and handle of a hand saw, so that the same may be employed as a square bevel gage compass and measure as well as for sawing purposes, and also as a spirit level and plumb.

Boat-detaching Apparatus.—Daniel S. Brown, Astoria, Oregon.—This invention relates to a new device for facilitating the instantaneous detachment of boats from their davits, and consists in such a new combination of retaining jaws, with rods, levers, and catch, that the simultaneous detachment of both ends will be certain, and accidents on account of improper operation impossible.

Device for Propelling Vessels.—G. A. Milani, Frankfort, Ind.—This invention relates to a new mechanism for propelling small boats, flat boats, and other small vessels, and consists in the general arrangement of machinery, connected with an oscillating lever, that is worked by persons seated upon its ends. The motion imparted to the lever by the see-sawing process is transmitted to a pair of shafts which are geared together with the paddle wheel shafts.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

☞ *All reference to back numbers should be by volume and page.*

J. S. B., of Md., asks an explanation for the stoppage of an exhaust steam pipe only three inches from the valve, occurring about four years after it had been in use. The deposit was as hard to chip as the iron itself and resisted the action of acids. We have not met with precisely a case of this kind, but presume it was a gradual accumulation of scale until the exhaust became reduced so much as to interfere with the working of the engine when it was discovered. It is a mistake to suppose such deposits may not be formed in the exhaust. Boilers which prime and carry wet steam into the cylinder, are liable to form a scale in the exhaust pipe, or even to throw out a fine floury deposit from the mouth of the exhaust pipe, consisting of an impalpable powder of carbonate of lime. See article on "Formation of Deposits in Steam Boilers," page 282, current volume.

W. C., of Mass.—Perfect exhaustion ought to reduce the pressure on the exhaust side of a piston to atmospheric pressure in a non-condensing engine, worked non-expansively, or to about fifteen pounds per square inch, during the greater part of the stroke. Practically however, there are circumstances connected with the working of steam engines, which make the mean pressure throughout the stroke on the exhaust side somewhat more than than this. It takes time for the steam to escape sufficiently to reduce the pressure to this point, and when compression is used by closing the exhaust before the completion of the stroke; or, when lead is used, the pressure will be increased at the latter part of the stroke. To compute the mean pressure, therefore requires the knowledge of many data, none of which you supply, and which you probably cannot obtain in the case specified.

W. E. S., of Conn.—The oxide of lead is, as explained in the paragraph referred to, litharge, or protoxide of lead. We do not know the proportion in which this is mixed with concentrated glycerin to make the cement referred to on page 285, current volume, but we presume it need only be mixed to give the proper consistence. If you make a trial of this cement, we should be glad to learn how it succeeds with you.

B. R., of ——. We do not credit the assertion made by teamsters, that wagons with wooden axles—all other things being equal—have a lighter draft through mud, sand, or up an inclined plain. It will be time enough to look for a reason when the fact has become established by accurate experiment.

E. R. K., of Ill.—We are informed that shellac dissolved in alcohol will stick paper labels to tin and hold them, and we see no reason to doubt the statement. We think, however, the cans ought to be warm when the labels are applied, to speedily evaporate the alcohol, still the latter is only an opinion.

H. C., of Pa.—If the description of the art of graining on paper from the natural wood, given on page 309, Vol. XX, does not give you a sufficient idea of the process, it must be obvious to you that no "recipe" will enable you to apply it.

W. R. T., of Miss.—You can make a beautiful mirror, which will withstand a high degree of heat without injury, of platinum. It is the only thing we can recommend you for the purpose you specify. It is quite malleable, and from your evident skill in working metals you will have no difficulty in making it for yourself.

F. A. B., of Ill.—We have already discussed the irregularity of piston movement on crank engines *ad nauseam*. You will find the whole thing explained in back numbers, or in Auchincloss' "Link and Valve Motions," published by D. Van Nostrand, 23 Murray street, New York.

J. T. S., of Pa.—The front flue sheet ought to be taken into account in determining the heating surface of your boiler.

T. J. B., of Wis.—There is no possible danger ot bursting in the pipe which supplies your factory with water, from the great head used. It will stand at least twice that head. A cast iron pipe, fifteen inches in diameter and three quarters of an inch thick, will sustain 600 feet head if the iron be of best quality.

C. L. M., of Texas.—Sand is the best material for molding for brass casting. You will not succeed with plaster-of-Paris. It is not sufficiently porous to allow the gases to escape.

H. C., of Ca.—Unless the peculiar exigencies of the case require it, experience has shown a direct connection of crank and piston to be better than intermediate gearing. We cannot here enter into a discussion of the reasons for this, but you will find the subject fully treated in various works on steam engineering.—Fine paper may be made impervious to air by coating it with gums. So may cloth. Whether either of these will "answer your purpose," we cannot say, as you forgot to mention what that purpose was.

S. and C., of Mass.—We can see no reason why the cemente ..oor of one part of a cellar should be wet, while another part, made more recently, should be dry, unless it be that the composition of the older portion is different. It probably contains something which attracts moisture. The sand employed might have been beach sand not properly washed to free it from salt.

G. W., of Md.—To prevent the formation of dandruff on a healthy scalp, wash the head daily in pure cold water, and weekly with water containing a little borax in solution, and use as little oil in dressing the hair as possible. Above all, keep the general health good by proper diet and exercise, avoid late hours, and you will have little trouble either from dandruff or dyspepsia.

C. S. K., of Pa.—No septum, solid, fluid, or gaseous, has yet been discovered that, placed between a magnet and its armature, will overcome the attraction of the former for the latter. It has been long sought by would-be inventors of electro-magnetic motor engines, and we receive very often queries similar to yours. There is no such substance.

Business and Personal.

The Charge for Insertion under this head is One Dollar a Line. If the Notices exceed Four Lines, One Dollar and a Half per line will be charged.

Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING OCT. 19, 1869.

Reported Officially for the Scientific American

SCHEDULE OF PATENT OFFICE FEES:

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A sketch from the model or drawing, relating to such portion of a machine as the Claim covers, from ... $1 *upward, but usually at the price above-named.*

The full Specification of any patent issued since Nov. 20, 1866, at which time the Patent Office commenced printing them ... $1·25

Official Copies of Drawings of any patent issued since 1836, we can supply at a reasonable cost, the price depending upon the amount of labor involved and the number of views.

Full information, as to price of drawings, in each case, may be had by addressing MUNN & CO., *Patent Solicitors, No. 37 Park Row, New York.*

95,868.—Steam Engine Slide Valve.—John F. Allen, Tremont, N. Y.
95,869.—Saw Swage.—Emanuel Andrews, Williamsport, Pa.
95,870.—Lamp Burner.—Henry M. Beidler, Philadelphia, Pa.
95,871.—Saw-filing Machine.—Henry C. Bell, Emporia, Kansas. Antedated October 13, 1869.
95,872.—Spring Eye Glass.—Louis Black, Detroit, Mich.
95,873.—Can Opener.—Wm. M. Bleakley, Verplank, N. Y.
95,874.—Tucking Attachment for Sewing Machines.—H. E. Bodwell, jr., South Norwalk, Conn.
95,875.—Hay Spreader.—Milton Bowker, Newark, N. J. Antedated October 9, 1869.
95,876.—Adding Machine.—Benjamin B. Brown, Delaware, Ohio.
95,877.—Boat-detaching Apparatus.—Daniel S. Brown, Astoria, Oregon.
95,878.—Driven Well Points.—Augustus O. Brummel, Memphis, Tenn.
95,879.—Hay Stacker.—T. N. Bunnell, Reynolds, Ind.
95,880.—Spring Bed Bottom.—W. Newton Cook, Grand Rapids, Mich.
95,881.—Clothes-line Holder.—Albert Cooper, Harrisburg, Pa.
95,882.—Manufacture and Preservation of Metals.—John Corson (assignor to himself and Danies Breed), Washington, D. C.
95,883.—Stable Horse Tie.—E. D. Cramer, Hackettstown, N. J.
95,884.—Saw.—Hermann Cramer, Sonora, Cal.
95,885.—Car Spring.—Mitchell R. Dand, Philadelphia, Pa.
95,886.—Shaft Coupling.—Hiram Dodge, Beaver Dam, Wis.
95,887.—Straw Cutter.—Wilson Elder, Mill Hall, Pa.
95,888.—Machine for Sawing Lath.—Ervin H. Ewell, St. Louis, Mich.
95,889.—Circular Saw Mill.—Wm. M. Ferry, Grand Haven, Mich.
95,890.—Nut Lock.—J. Hyde Fisher, Chicago, Ill. Antedated April 19, 1869.
95,891.—Sausage Stuffer.—John J. Flansburgh, Berne, N. Y.
95,892.—Photographic Printing.—Egbert Guy Fowx, Baltimore, Md.
95,893.—Animal Trap.—Calvin G. Frushour, La Gro, Ind.
95,894.—Box Toe for Boots and Shoes.—Horace W. George, Danvers, Mass., assignor to John H. Young and John A. Greene.
95,895.—Harness Saddle.—Algernon Gilliam, Pittsburgh, Pa.
95,896.—Potato Digger.—Dennis Gorman, Hornellsville, N. Y.
95,897.—Lock Nut.—Merritt W. Griswold, New York city.
95,898.—Ruler.—Joseph D. Hall, Trenton, N. J.
95,899.—Rose for Door Knobs.—Wm Hall, Boston, Mass., assignor to himself and Samuel Peck & Co., New Haven, Conn.
95,900.—Fruit Dryer.—John Harvey, Martinsville, Ind.
95,901.—Machine for Dressing Millstones.—John Hine, Cockermouth, England.
95,902.—Weather Strip.—David H. Horner, Battle Ground, Ind.
95,903.—Slack-belt Attachment for Machinery.—J. W. Howard, Greenville, Ala.
95,904.—Head-block of Saw Mills.—Joseph Hubbell, Zanesville, Ohio.
95,905.—Water Wheel.—A. J. Jack and D. E. Brand, Des Moines, Iowa.
95,906.—Corn Planter and Cultivator.—Jesse Jenkins (assignor for one-half to Abram Dobbs), Andrew county, Mo.
95,907.—Sleigh and Sled Runner.—C. H. Johnson, Chelsea, Mass., assignor to himself and Charles Libbey, Whitefield, N. H.
95,908.—Wash Pave Key Handle.—William H. Johnson, Philadelphia, Pa. Antedated October 5, 1869.
95,909.—Broiler.—Wm. J. Johnson, Newton, and Henry A. Hildreth, Lowell, Mass.
95,910.—Water Wheel.—John J. Kimball, Naperville, Ill.
95,911.—Lubricator for Loose Pulleys.—Chas. A. King, Springfield, Mass.
95,912.—Lubricator for Loose Pulleys.—Chas. A. King, Springfield, Mass.
95,913.—Rotary Vegetable Grater.—Wm. E. Knight, Shrewsbury, assignor to Darius A. Martin, Mount Holly, Vt.
95,914.—Spring Pounding and Chopping Block.—Frederick Kohler and A. J. Alsing, New York city.
95,915.—Picture Case.—Franz Friederich Kullrich, Berlin, Prussia.
95,916.—Washing Machine.—William Leighty, Ebensburg, Pa.
95,917.—Clothes Dryer.—J. C. Longshore, Mansfield, Ohio.
95,918.—Machine for Making Wire Ferules.—Henry O. Lothrop, Milford, Mass.
95,919.—Core-box for Car Wheels.—Thos. Maher, Cleveland, Ohio.
95,920.—Animal Trap.—Joel Manchester, New York city.
95,921.—Stovepipe.—Horace A. Mears, Pecatonica, Ill.
95,922.—Propelling Vessel.—George A. Milani, Frankfort, Ind.
95,923.—Wagon Stake.—Edward Milner, Marquette, Mich.
95,924.—Apparatus for Decanting Liquids.—Titus Molinier, New Orleans, La.
95,925.—Combined Plow and Harrow.—Albert Moore and Friederich Wendel, Chillicothe, Ohio.
95,926.—Soap-cutting Machine.—Charles S. Murphy and Donald McGregor, Detroit, Mich.
95,927.—Cut-off Nozzle for Cans.—John McLeod Murphy (assignor to James Lorimer Graham), New York city.
95,928.—Railway-rail Chair.—Frederick Nicklin (assignor to himself and Reuben Willis), Troy, N. Y.
95,929.—Ice Cream Server.—Jorge Oyarzabal, Malaga, Spain.
95,930.—Wind-wheel Pump.—L. D. Parsons, Tremont, N. Y.
95,931.—Process for Amalgamating Gold and Silver.—Almarin B. Paul, San Francisco, and J. L. Wood, Independence, Cal.
95,932.—Fence Stake.—James N. Pease, Panama, N. Y.
95,933.—Manufacture of Iron and Steel.—John Player, Philadelphia, Pa.
95,934.—Steam Generator.—Wm. J. Reed, West Middlesex, assignor to himself, John M. Clapp, and Warner Pearson, Newcastle, Pa.
95,935.—Machine for Making Horseshoes.—Andrew J. Roberts, Boston, Mass.
95,936.—Hooks and Eyes.—Edward P. Roche, Bath, Me.
95,937.—Butter Package.—Theodore W. Ryding, Tully N.Y.
95,938.—Railroad Car Ventilator.—Albert G. Safford Boston, Mass.
95,939.—Preserving Dead Bodies.—George W. Scollay St. Louis, Mo. Antedated October 5, 1869.
95,940.—Soil Pulverizer.—Warren Shumard, Richmond Ind. Antedated Oct. 5, 1869.
95,941.—Manufacture of Illuminating Gas.—Benj. Silliman, New Haven, Conn.
95,942.—Fruit Dryer.—R. H. Sipes and D. Defibaugh, Bloody Run, Pa.
95,943.—Pump.—Anthony Sluthoin, Cleveland, Ohio.
95,944.—Traveling Bag.—J. R. Smith, Chicago, Ill., assignor to Cornelius Walsh, Newark, N. J.
95,945.—Bed Bottom.—W. C. Smith, Warrensburg, Mo.
95,946.—Wagon Brake.—D. T. Snelbaker (assignor to Alexander Delorac), Cincinnati, Ohio.
95,947.—Milking Apparatus.—Eugene Spedden, Astoria Oregon.
95,948.—Lamp Filler.—H. W. Staples, Saco, Me.
95,949.—Coal Stove.—H. Stickney, Cleveland, Ohio.
95,950.—Mowing Machine.—J. V. Strait, Litchfield, Ohio.
95,951.—Boot Pattern.—William Swarts, Pent Water, Mich.
95,952.—Air Hoist.—Lewis Taws and J. M. Hartman (assignors to Louis Taws and J. M. Hartman), Philadelphia, Pa.
95,953.—Water Elevator.—L. Taylor, Jordan, and J. C Richardson, Prairie-du-Chien, Wis.
95,954.—Water Wheel.—Jose Tort, Mexico, Mexico.
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95,960.—Plow.—Wm. B. West, Utica, Wis.
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95,998.—Breech-loading Fire-arm.—William Golcher, St. Paul, Minn.
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96,053.—Lantern Globe.—Michael Sweeney (assignor to Sweeney, Bell, and Co.), Wheeling, West Va.
96,054.—Cotton-Seed Separator and Planter.—S. W. Thompson, Oswego, Ohio, assignor to himself, Wm. L. Ward, and Wm. D. Whitecar, Philadelphia, Pa. Antedated October 16, 1869.
96,055.—Flour Sifter.—C. J. Tripp, Wallingford, Conn.
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96,069.—Tesselated Floor.—J. F. Worth (assignor to himself, I. W. Gregory, and Alfred Gregory), Brooklyn, N. Y.
96,070.—Railway Car Coupling.—J. S. Merriken (assignor to himself and William Colton), Baltimore, Md.

REISSUES.

93,685.—Door Latch.—Dated August 17, 1869; reissue 3,675.—F. W. Dean, Tremont, Ill.
55,764.—Brush.—Dated June 19, 1866; reissue 3,676.—Florence Manufacturing Company, Florence, Mass., assignee, by mesne assignment, of A. C. Estabrook.
90,160.—Manufacture of Glue.—Dated May 18, 1869; reissue 3,677.—W. A. Fleck, Philadelphia, Pa., assignee of Hugo Fleck.
80,179.—Machine for Drying and Scouring Sheet-Metal.—Dated July 21, 1868; reissue 3,678.—C. E. L. Holmes, New York city.
92,457.—Dumping Car.—Dated July 13, 1869; reissue 3,679.—Isaac Keith, H. T. Keith, and I. N. Keith, West Sandwich, Mass., assignees of Isaac Keith.
88,730.—Breech-Loading Fire-Arm.—Dated April 6, 1869; reissue 3,680.—J. D. S. Newell, Tensas parish, and A. G. Brice, E. Tomatis, and Thomas Pickles, New Orleans, La., assignees of J. D. S. Newell.
67,213.—Lock.—Dated July 30, 1867; reissue 3,681.—Nicolas Petre, New York city.
22,990.—Mop-Head.—Dated Feb. 15, 1859; reissue 3,192; dated Nov. 10, 1868; reissue 3,2 5, dated Nov. 24, 1868; reissue 3,682.—Luke Taylor, Springfield, Vt.
35,355.—Means of Attaching Rubber to Pencils.—Dated May 20, 1862; reissue 3,683.—W. C. Vosburgh and W. A. Ludden (assignors to J. J. Merritt), Brooklyn, N. Y., assignor to Rubber-Tip Pencil Company, New York city.
80,125.—Broiler.—Dated July 21, 1868; reissue 3,684.—The American Broiler Company, Elmira, N. Y., assignee of Sylvester Bowers.

DESIGNS.

3,713 and 3,714.—Tack Head.—O. L. Bassett (assignor to the Taunton Tack Company), Taunton, Mass. Two patents.
3,715.—Tack Head.—T. R. Bearse (assignor to the Taunton Tack Company), Taunton, Mass.
3,716.—Ornamenting Glass Ware.—John Bryce, East Birmingham, Pa.
3,717 and 3,718.—Carpet Pattern.—Jonathan Crabtree (assignor to James Bromley & Brothers), Philadelphia, Pa. Two patents.
3,719.—Stove.—D. K. Innes and W. W. Magill, Cincinnati, Ohio.
3,720.—Range Front.—J. L. Mott, Mott Haven, N. Y.
3,721.—Iron Wash-Stand Slab.—J. L. Mott, Mott Haven, N. Y.
3,722.—Shutter-Hook or Bar.—Emery Parker (assignor to the Russell and Erwin Manufacturing Company), New Britain, Conn.
3,723.—Combined Inkstand and Penrack.—Henry Whitney, East Cambridge, Mass.

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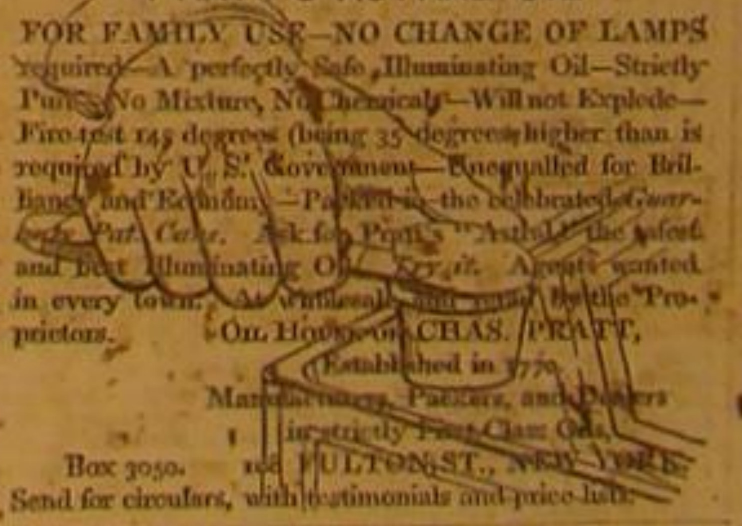

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