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Title: Scientific American, Volume XXIV., No. 12, March 18, 1871

Author: Various

Release date: September 5, 2006 [EBook #19180]

Language: English

Credits: Produced by Lesley Halamek, Juliet Sutherland and the
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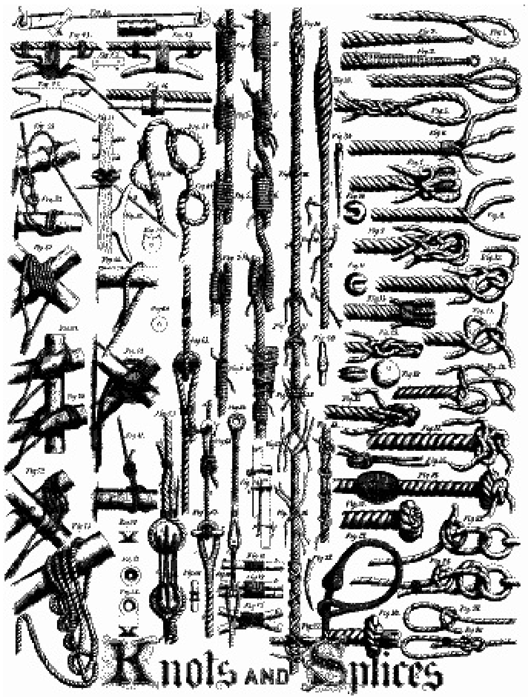
SCIENTIFIC AMERICAN

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

NEW YORK, MARCH 18, 1871.

Vol. XXIV.—No. 12. [NEW SERIES.]

$3 per Annum [IN ADVANCE.]



Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

O. D. MUNN. **S. H. WALES.** **A. E. BEACH.**

VOL. XXIV., NO. 12 ... [New Series.] ***Twenty-sixth Year***

NEW YORK, SATURDAY, MARCH 18, 1871.

Contents:

(Illustrated articles are marked with an asterisk.)

THE INFLUENCE OF INTENSE COLD ON STEEL AND IRON.

[Condensed from Nature.]

There has recently been a most interesting discussion at the Literary and Philosophical Society, Manchester, on the above subject.

The paper which gave rise to the discussion was by Mr. Brockbank, who detailed many experiments, and ended by stating his opinion that iron does become much weaker, both in its cast and wrought states, under the influence of low temperature; but Mr. Brockbank's paper was immediately followed by others by Sir W. Fairbairn, Dr. Joule, and Mr. Spence, which at once put an entirely new complexion on the matter.

Dr. Joule says:

"As is usual in a severe frost, we have recently heard of many severe accidents consequent upon the fracture of the tires of the wheels of railway carriages. The common-sense explanation of these accidents is, that the ground being harder than usual, the metal with which it is brought into contact is more severely tried than in ordinary circumstances. In order apparently to excuse certain railway companies, a pretence has been set up that iron and steel become brittle at a low temperature. This pretence, although put forth in defiance, not only of all we know, of the properties of materials, but also of the experience of everyday life, has yet obtained the credence of so many people that I thought it would be useful to make the following simple experiments:

"1st. A freezing mixture of salt and snow was placed on a table. Wires of steel and of iron were stretched, so that a part of them was in contact with the freezing mixture and another part out of it. In every case I tried the wire broke outside of the mixture, showing that it was weaker at 50° F., than at about 12° F.

"2d. I took twelve darning needles of good quality, 3 in. long, 1/24 in. thick. The ends of these were placed against steel props, 2⅛ in. asunder. In making an experiment, a wire was fastened to the middle of a needle, the other end being attached to a spring weighing-machine. This was then pulled until the needle gave way. Six of the needles, taken at random, were tried at a temperature of 55° F., and the remaining six in a freezing mixture which brought down their temperature to 12° F. The results were as follow:—

	Warm Needles.				Cold Needles.	
	64	ounces	broke		55	ounces	broke
	65	"	"		64	"	"
	55	"	"		72	"	"
	62	"	"		60	"	bent
	44	"	"		68	"	broke
	60	"	bent		40	"	"
	——				——		
Average,	58⅓			Average,	59⅚		

"I did not notice any perceptible difference in the perfection of elasticity in the two sets of needles. The result, as far as it goes, is in favor of the cold metal.

"3d. The above are doubtless decisive of the question at issue. But as it might be alleged that the violence to which a railway wheel is subjected is more akin to a blow than a steady pull; and as, moreover, the pretended brittleness is attributed more to cast iron than any other description of the metal, I have made yet another kind of experiment. I got a quantity of cast iron garden nails, an inch and a quarter long and ⅛ in. thick in the middle. These I weighed, and selected such as were nearly of the same weight. I then arranged matters so that by removing a prop I could cause the blunt edge of a steel chisel weighted to 4lb. 2oz., to fall from a given height upon the middle of the nail as it was supported from each end, 1 1/16 in. asunder. In order to secure the absolute fairness of the trials, the nails were taken at random, and an experiment with a cold nail was always alternated with one at the ordinary temperature. The nails to be cooled were placed in a mixture of salt and snow, from which they were removed and struck with the hammer in less than 5"."

The collective result of the experiments, the details of which need not be given, was that 21 cold nails broke and 20 warm ones.

Dr. Joule adds, "The experiments of Lavoisier and Laplace, of Smeaton, of Dulong and Petit, and of Troughton, conspire in giving a less expansion by heat to steel than iron, especially if the former be in an untempered state; but this, would in certain limits have the effect of strengthening rather than of weakening an iron wheel with a tire of steel.

"The general conclusion is this: Frost does *not* make either iron (cast or wrought), or steel, brittle.

Mr. Spence, in his experiments, decided on having some lengths of cast iron made of a uniform thickness of ½ in. square, from the same metal and the same mould.

He writes:—"Two of the four castings I got seemed to be good ones, and I got the surface taken off, and made them as regular a thickness as was practicable.

"I then fixed two knife-edged wedges upon the surface of a plank, at exactly nine inches distance from each other, with an opening in the plank in the intervening space, the bar being laid across the wedges, a knife-edged hook was hung in the middle of the suspended piece of the bar, and to the hook was hung a large scale on which to place weights.

"The bar was tried first at a temperature of 60° F.; to find the breaking weight I placed 56lb. weights one after another on the scale, and when the ninth was put on the bar snapped. This was the only unsatisfactory experiment, as 14 or 28lb. might have done it, but I include it among others. I now adopted another precaution, by placing the one end of the plank on a fixed point and the other end on to a screw-jack, by raising which I could, without any vibration, bring the weight to bear upon the bar. By this means, small weights up to 7lb. could be put on while hanging, but when these had to be taken off and a large weight put on, the scale was lowered to the rest, and again raised after the change was made. I may here state that a curious circumstance occurred twice, which seems to indicate that mere raising of the weight, without the slightest apparent vibration, was equal in effect to an additional weight. 3¾ cwts. were on the scale, a 14lb. weight was added, then 7lb., then 4lb., 2lb., 1lb., and 1lb., making 4cwts. and 1lb. This was allowed to act for from one to two minutes, and then lowered to take off the small weights, which were replaced by a 56lb. with the intention of adding small weights when suspended; the whole was then raised so imperceptibly by the screw, that the only way of ascertaining that it was suspended, was by looking under the scale to see that it was clear of the rest. As soon as it was half-an-inch clear it snapped, thus breaking at once with one pound less than it resisted for nearly two minutes.

"Six experiments were carefully conducted at 60° F., the parts of the bars being selected so as to give to each set of experiments similar portions of both bars; the results are marked on the pieces. My assistant now prepared a refrigerating mixture which stood at zero, the bars were immersed for some time in this, and we prepared for the breaking trials to be made as quickly as could be, consistently with accuracy; and to secure the low temperature, each bar, on being placed in the machine, had its surface at top covered with the freezing mixture. The bars at zero broke with more regularity than at 60°, but instead of the results confirming the general impression as to cold rendering iron more brittle, they are calculated to substantiate an exactly opposite idea, namely, that reduction of temperature, *cæteris paribus*, increases the strength of cast iron. The only doubtful experiment of the whole twelve is the first, and as it stands much the highest, the probability is that it should be lower; yet, even taking it as it stands, the average of the six experiments at 60° F., gives 4cwt. 4lb. as the breaking weight of the bar at that temperature, while the average of the six experiments at zero gives 4cwt 20lb. as the breaking weight of the bar at zero, being an increase of strength, from the reduction of temperature, equal to 3.5 per cent."

Sir W. Fairbairn states: "It has been asserted, in evidence given at the coroner's inquest, in a recent railway accident, that the breaking of the steel tire was occasioned by the intensity of the frost, which is supposed to have rendered the metal, of which this particular tire was composed, brittle. This is the opinion of most persons, but judging from my own experience such is not the fact. Some years since I endeavored to settle this question by a long and careful series of experiments on wrought iron, from which it was proved that the resistance to a tensile chain was as great at the temperature of zero as it was at 60° or upwards, until it attained a scarcely visible red heat."

The immense number of purposes to which both iron and steel are applied, and the changes of temperature to which they are exposed, renders the inquiry not only interesting in a scientific point of view, but absolutely necessary to a knowledge of their security under the various influences of those changes. It was for these reasons that the experiments in question were undertaken, and the summary of results is sufficiently conclusive to show that changes of temperature are not always the cause of failure. Sir W. Fairbairn adds: "The danger arising from broken tires does not, according to my opinion, arise so much from changes of temperature as from the practice of heating them to a dull red heat, and shrinking them on to the rim of the wheels. This, I believe, is the general practice, and the unequal, and in some cases, the severe strains to which they are subject, has a direct tendency to break the tires."

OAK GRAINING IN OIL COLORS.

Condensed from the Building News.

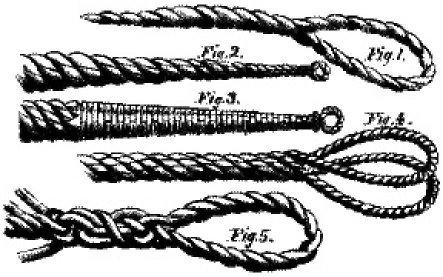
There is a charm and feeling about work executed by the hand, which gives it a value no mere machine work can possess. Machine work, from its very nature, necessitates a repetition of pattern, which cannot be avoided. Hand-work, on the contrary, can imitate every variety, and follow nature so closely that no two pieces need be alike. There is also in hand-work a wide scope for the inventive faculty and the exercise of good taste (both in form and color) and skillful workmanship. As a rule, strong contrasts between the ground and the graining color should be avoided. The figure and grain should of course be seen clearly, but only so clearly as to be distinct, without interfering with the general and uniform quietness of tone necessary to fulfil the conditions required by the laws of harmony and good taste. Violent contrasts and gaudy coloring are always vulgar, brilliancy and richness of color are not necessarily vulgar; it is the absence of the guiding power of knowledge and pure taste in their arrangement which degrades them to the rank of vulgarity. We have before spoken of the importance of good combing, and of the various kinds of combs used; we now proceed to describe how the work is done. The graining color is brushed over the work, in the ordinary manner, with a pound-brush, care being taken not to put too much color on, or else it is very liable to be dirty. A dry duster is now used to stipple with, which, if properly done, will distribute the color evenly; it is now ready for combing. In the real oak it will be found, as a rule, that the grain is invariably coarser on one side of the panel than on the other; this arises from the very nature of the growth of the tree; it is, therefore, well to imitate this pattern, and in order to do so we take first a medium or coarse cut gutta-percha comb, and draw it down one side of the panel; then use a finer one to complete it. This comb will leave the marks of the grain in clear unbroken lines from top to bottom of the panel. We now take a fine steel comb and go over the whole of the previous combing, moving it in a slanting or diagonal direction across the previous grain, or with a quick and short wavy motion or curl; both the former and the latter motion will break up the long lines, left by the gutta-percha comb, into short bits, which of course represent the pores or grains of the real wood. There are several other motions of the comb having the same end in view; and by using the gutta-percha or cork combs, in conjunction with the fine steel, an infinite variety of grain may be produced. Steel combs, with one or more folds of thin rag placed over the ends of the teeth are a style of comb which has nothing to recommend it. A natural variation in the grain may be produced by one comb alone, according to the manner in which it is held. For instance, if we take a coarse or broad-toothed gutta-percha comb, and commence at the top of a panel, with the comb, placed at its full width: if drawn down in this position it will leave a grain of the same width as the width of the teeth: but if we start with the full width, and gradually turn the comb or slightly incline it to one side—that is to say, on its edge, we thereby graduate the grain from coarse to fine at pleasure, and by holding the comb at a certain inclination we may actually make very fine the coarse comb. A very important point is the formation of the joints in the wood, as much of the effect of otherwise good work is lost in consequence of neglect in this respect. In looking at a real oak door, the joints of the stiles and rails are clearly and sharply defined, not by any defect of workmanship, but by the difference in the run of the grain, the stiles being perpendicular, and the rails horizontal. The rails being cut sharp off by the stiles, show a perfectly straight line. The light also acts differently upon the two, simply because the grain or fibre of the wood is exposed to its influence under different aspects. This also tends to produce a difference in the depth of the color of rails and stiles, and panels also. It will be evident that no imitations can be considered really good except they include these seemingly unimportant points.

It is a common practice for grainers to imitate a broad piece of heart or sap of oak, upon the back rail of almost every door they do, and many of them are not even content with that, but daub the stiles over from top to bottom with it also. There is nothing so vulgar or in such bad taste. It should only be done upon those parts of the work on which it would appear on a real oak door, namely, on the edges of the doors and on mouldings. There is a vulgar pretentiousness about what we may call the sappy style of work which is very undesirable. The figures cross the grain more or less abruptly and of course are of different shapes, sizes, and forms, a knowledge of which can only be acquired by study of the real wood. The figure may be wiped out with a piece of soft rag, held tight over the thumb nail. This should have two or three folds over the nail, the superfluous rag being held by the other hand to prevent it hanging down and smearing the grain; and every time a figure is wiped, the rag should be moved slightly, so that the same part of the rag will not be used twice, thus insuring clean work. It will often happen that the thumb-nail will get broken, or is too weak to stand the work; in these cases, or, in fact, in any case, a good substitute or artificial thumb-nail may be made of gutta-percha, thus: A piece of thin sheet gutta-percha is put into warm water, and, while soft, is wrapped around the end of the thumb up to the first joint. It is then pressed with the hand, so as to fit and take the shape of the thumb and nail. This cannot be done at one heating, but will have to be put into the hot water again, and the end pinched and squeezed into form to the shape of the nail, and to fit easily upon the thumb. When this gets hard, it may be trimmed into perfect form with a penknife. This artificial nail will answer the purpose admirably if properly made; and even when the natural nail is good, the gutta-percha will serve to save it from injury. Good figuring may also be done by using the blank end of the steel comb with a rag folded over its edge. We have also used a piece of gutta-percha to take out the lights. This should be square-ended, about one inch wide, and three or four inches long, and will do successful work of a certain class, but not of the best. Many grainers use a piece of thin horn, in shape something like a spatula, about three or four inches long and three quarters of an inch wide, with rounded ends, and quite flexible. With this tool the figure is cut or scooped out—a sort of quick, side-long motion, very difficult to describe, and requiring a very considerable amount of practice before it can be worked with any success. There is, however, the same objection to this tool as may be urged against the gutta-percha for figuring, namely, that neither of them take the color clean away, but leave an accumulation of color on the edge of the figure, which is fatal to good work; and therefore we cannot honestly recommend the use of any method but the wiping out with the thumb-nail or its substitute. When the figure is wiped out it will require to be softened. By softening, we mean the imitation of those half shades seen upon and about the figures in the real wood. Between and around the lights or figure in oak, there is always a lighter tint of color; this is imitated by doubling a piece of rag into a small roll, and with the side of this the grain is partially wiped away, but not to the extent of taking off the whole of the grain. A recent but most admirable system of graining oak, by means of over-combing, is worked exactly the reverse of any of the foregoing methods; that is to say, the figure is first wiped out, and the combing or grain is done afterwards, when the graining color is dry, in this wise: The graining color is mixed somewhat thinner than for ordinary graining, and is brushed over the work sparingly, leaving it just sufficiently strong to show a clear distinction between the ground and the color. The light or figure is then softened by drawing the end of a flat hog-hair fitch, or a small thin mottler, across each figure, and slightly softening with the badger-hair softener. The figure is broken up a little with fine lines across it in parts, such as may be seen in the real wood; but previous to wiping out the figure, streaks of light should be wiped out and softened on one side of the panel or across the stiles, in imitation of the reflective lights seen in oak. The color should also be partially wiped off the rails or stiles at their junction; this tends to define the joint. The color is now let to dry hard, when it will be ready for over-combing—that is, combing or graining over the figure (hence its name), and this will have to be done somewhat differently to the ordinary combing. As thus: The color is rubbed in as before, and combed solely with the gutta-percha combs, but these are specially cut for the purpose; they are best about 2 in. wide. The first must be cut with teeth about three-sixteenths of an inch in width, the next one-eighth, and the third about one-sixteenth. The broad-toothed comb is first used, and must be drawn down the panel, with a wavy motion, in short or long curls; either will answer our purpose now. The next size of comb is then drawn straight down—the straighter the better. This has the effect of breaking the wavy combing into short and long straight bits, similar to the pores or grain of the real wood. Both the first and second combing may be varied by holding the comb in a slanting direction, and may be fine or coarse, according to the width of the combs used; now take a soft rag folded, and with this partially clear off the grain which runs over the figure, leaving only a sufficient quantity crossing the light or figure, to be just distinguished, exactly as it appears upon the figure in real oak. The grain is also wiped off in parts on the plain spaces between the figure, in order to break it up and take away any formality. If this method be well and probably done, a thoroughly deceptive imitation may be produced; and except this end be kept in view, no really good work will result.

KNOTS AND SPLICES.

[*See Engraving on First Page.*]

1. Turn used in making up ropes.



2. End tapered for the purpose of passing it readily through a loop. To make this, we unlay the rope for the necessary length, reducing a rope diminishing in diameter towards the end, which is finished by interlacing the ends without cutting them, as it would weaken the work; it is lastly "whipped" with small twine.

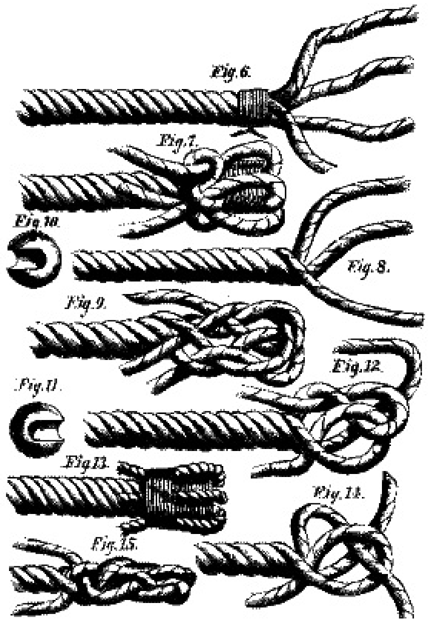
3. Tapered end, covered with interlaced cordage for the purpose of making it stronger. This is done with very small twine attached at one end to the small eye, and at the other to the strands of the rope, thus making a strong "webbing" around the end.

4. Double turn used for making rope.

5. Eye splice. The strands of the cable are brought back over themselves, and

interlaced with their original turns, as in a splice.

6. Tie for the end of a four-strand rope.



7. The same completed; the strands are tied together, forming loops, laying one over the other.

8. Commencement for making the end by interlacing the strands.

9. Interlacing complete, but not fastened.

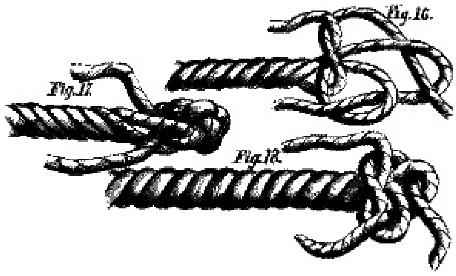
10 and 11. Shell in two views used in No. 65, showing the disposition of it at the throat. This joining is advantageous, as it does not strain the cords, and it prevents them from cutting each other; so that the rings pass one into the other and are joined outside the intermediate shell.

12. Interlacing in two directions.

13. Mode of finishing the end by several turns of the twine continued over the cable.

14. Interlacing commenced, in one direction.

15. Interlacing finished, the ends being worked under the strands, as in a splice.

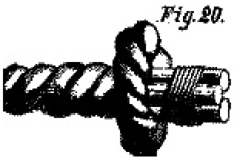


16. Pigtail commenced.

17. Interlacing fastened.

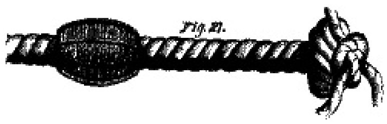
18. Pigtail with the strands taut.

19. Dead eye, shown in two views.

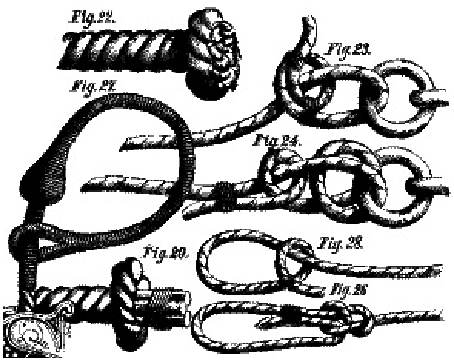


20. Pigtail finished. We pass the ends of the strands, one under the other, in the same way as if we were making a pudding splice: thus bringing it in a line with the rope, to which it is seized fast, and the ends cut off.

21. Scull pigtail; instead of holding the ends by a tie, we interlace them again, as in No. 16, the one under the other.



22. Pigtail, or "lark's nest." We make this to the "pennant" of a cable, which has several strands, by taking the requisite number of turns over the pudding, in such a manner that the strands shall lay under each other. This "pigtail" forms a knot at the end of the rope. It thus draws together two ropes, as shown in No. 32, forming a "shroud" knot. In these two pigtails, the strands are crossed before finishing the ends, so that the button, a, is made with the strands, a, and b, with those of the rope, b.



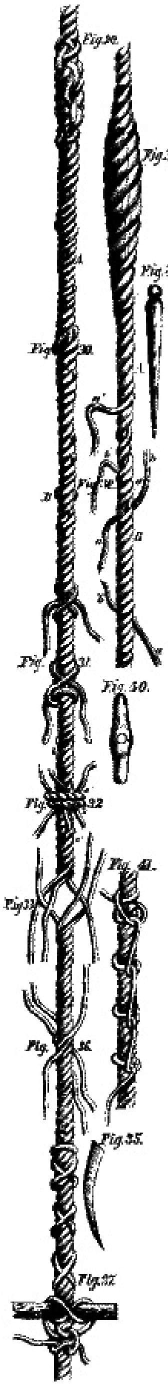
23. Slip clinch to sailors' knot.

24. Slip clinch, secured.

25. Ordinary knot upon a double rope.

26. Bowline knot for a man to sit in at his work.

27. Called a "short splice," as it is not of great length, and besides, can be made quickly.



30. Long splice. This extends from a to b. We unlay the strands of each of the ropes we intend to join, for about half the length that the splice will be, putting each strand of the one between two strands of the other.

31. Simple fastening on a rope.

32. A "shroud" knot.

33. The ends of the rope are prepared for making the splice (No. 29) in the same manner as for the "shroud" knot in No. 32. When the strands are untwisted, we put the ends of two cords together as close as possible, and place the ends of the one between the strands of the other, above and below alternately, so as to interlace them as in No. 29. This splice is not, however, very strong, and is only used when there is not time to make a long splice, which is much the best.

34 and 35. Marline spikes. Tools made of wood or iron, used to open out a rope to pass the strands of another through it.

36. Shows strands arranged as described in No. 30.

37. Fastening when a lever is used, and is employed when hauling upon large ropes, where the strength of several men are necessary.

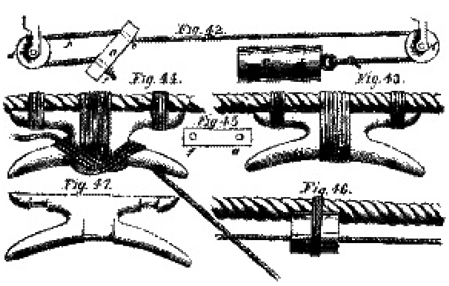
38. A "pudding splice." This is commenced, like the others, by placing the rope end to end, the turns of the one being passed between those of the other; having first swelled out the yarns by a "rat's-tail," we put them, two by two, one over the other, twisting them tightly, and opening a way for them with the marlinspike. The inconvenience of this splice is, that it is larger in diameter than the rope itself; but when made sufficiently long, by gradually reducing the size of the strands, it has great strength.

39. This shows two strands, a and b, of the ropes, A B, knotted together, being drawn as tight as possible; we unlay the strand, a', of the rope, A, for half the length of the splice, and twist the strand, b', of the rope, B, strongly in its place, tying a' and b' together tightly. The same process is again gone through on the rope, B, the strand, a", of the rope, A, being knotted to the strand, b", of the rope, B. When all the strands are thus knotted together, we interlace them with the strands of the cable. Thus the strands, a a' a", are interlocked by being passed alternately above and below the turns of the cord, B, the ends being also sometimes "whipped." In the same manner the strands, b b' b", pass alternately over and under the strands of the rope, A, and are in like manner "whipped." It is important that the several interlacings and knots should not meet at one point; we reduce the size of the strands towards the end, so that they loose themselves in the body of the splice, cutting off such parts as may project. This splice is employed for joining the ends of a rope when a chafed part has been cut out, and is quite as strong as the rope itself.

40. Belaying-pin opened to serve as a button; these are used where it is necessary to stop or check velocity.

41. Chain knot, or fastening.

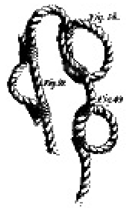
42. Variable or regulating lashing. By laying the piece, a f, horizontally, it can be slipped along the rope, b; by raising or lowering this, we shall raise or depress the weight, c, the cord, b, running over the two pulleys, d, from the piece, a f, in the direction shown in the figure. The friction of the cord, b, passing through the hole, e, sufficiently fixes the piece, a f, and holds the weight, c, securely.



43. Cleet, with three ties.

44. Cleet, showing the mode of belaying the cord.

45. The piece, a f, of No. 42.

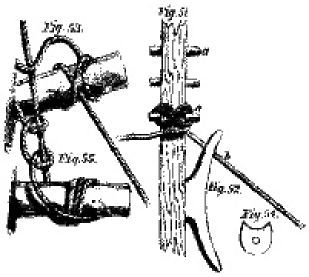


46. Fair leader.

47. Cleet to be fixed to a stay.

48. Loop for slipping other lines.

49. A "bend" which is only used for fear of the stoppers snapping.



50. Bastard loop, made on the end of the rope, and whipped with yarns.

51. Tie to pins: a, the pin; b, small cords fixed by a cross tie.

52. Cleet, fixed to the "rail," either with screws or nails, to which the lines are belayed.

53. Waterman's knot.

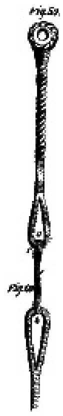
54. Fair leader.

55. Tie, or bend to pier.

56. Simple fastening to tie.

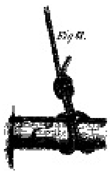
57. Fastening by a loop. This can be tied or untied without loosening the loop itself. It is made by following, towards the longer loop, the direction as numbered 1, 2, 3, 4, 5, and is terminated by the loop, 6, 7, 6, finally passing it over the head of the post, A. This knot holds itself, the turns being in opposite directions. To untie it, we slack the turns of the cable sufficiently to again pass the loop, 6, 7, 6, over the post, A, and turn the ends in the contrary direction to that in which they were made (as 5, 4, 3, 2, 1).

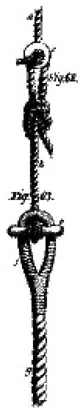
58. Iron "shell," in two views.



59 and 60. "Wedding" knots; a b, eyelets; c d, the join; e, the fastening.

61. Lark's-head fastening to running knot.





62. A round turn; the cord, a, is passed through the bight of the cord, b, over the button, c, where it is secured by an ordinary knot.

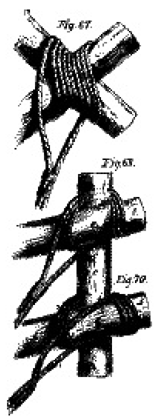
63. Belaying-pin splice. The cord, b, "stops" the pin, e, its end being spliced upon itself, and "served" with yarn; this rope, with its pin, is passed through the spliced eye, f of the line, g.

64. Round button.

65. Joint by a spherical shell, each loop, a and b, being made by ties and splices, and surrounding the shell, c.

66. Belaying-pin, shown separately, before being stoppered.

67. Fastening to shears.



68. Square mooring. When the cable is round the post, A, and the piece, c, without being crossed, it lays in the section 1, 2, 3, 4, 5, 6, 7, and the end is fastened by tying.

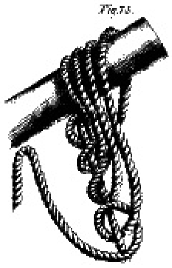
69. Wooden shell in section.

70. Crossed fastening. The turns of the cable, passing in front of the post, B, are crossed at the back of C, in the direction 1, 2, 3, 4, 5, 6, 7, 8, the end, 8, being secured to the cable.

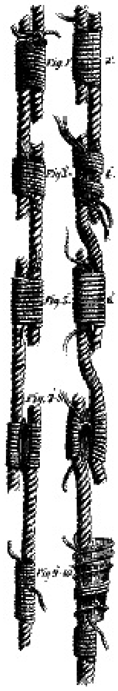
71. Wooden shell.

72. Double-chain fastening.

73. Lashing for "ram" block, or "dead-eye." The ram blocks, a and b, are strapped by the cords, e, which hold them; the small lanyards, d, pass through the holes to make the connection, and as they are tightened give the requisite tension to the cordage; the ends are fastened to the main rope. Usually one of these dead-eyes is held by an iron strap to the point where it is required to fix and strain the cordage, which is ordinarily a shroud.



74. Chain fastening.



1'. Simple band, showing the upper side.

2'. The same, showing the under side and the knot.

3'. Tie, with crossed ends, commenced; a turn is taken under the strands, to hold the ends of the cord.

4'. The same, completed.

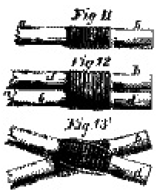
5'. Bend with crossed strands, commenced, the one end being looped over the other.

6'. The same, completed.

7'. Necklace tie, seen on the upper side.

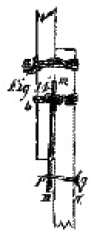
8'. The same, seen underneath. The greater the strain on the cords, the tighter the knot becomes.

9' and 10' are similar splices to 7' and 8' with slight modifications.



11' shows the commencement of 13', the legs in elevation; 12' being a front view. An ordinary band, made by several turns of a small rope, is lapped round them and hauled taut, and then interlaced at the ends. This done, the legs are shifted into the shape of a St. Andrew's cross. Thus the lashing is tightened, and, for further security, we pass the line several times over the tie and between the spars, knotting the ends.

13'. Portuguese knot. This is a lashing for shear legs, and must be tight enough to prevent the spars slipping on each other; the crossing of the two legs gives a means of securing the knot.



14'. For binding timbers; a, knot commenced. Take several turns round the timbers, and fasten the ends by passing them under the turns; b, knot completed. The end of a round stick, m n, termed a packing stick, should be passed under the knob, the cord being slack enough to allow of this. By turning the stick, the turns can be tightened to any extent; when tight, we fasten the longer arm of the lever to some fixed point, by a rope, p q, so that it cannot fly back. Care must be taken not to turn the stick too far, or the rope may be broken. As the timber dries and shrinks, the lever may be used to make all taut again.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in January, 1871:

During the month, there were 522 visits of inspection made, and 1,030 boilers examined—853 externally and 363 internally, while 106 have been tested by hydraulic pressure. Number of defects in all discovered, 431, of which 163 were regarded as dangerous. These defects were as follows: Furnaces out of shape, 24—3 dangerous; fractures, 47—25 dangerous; burned plates, 29—14 dangerous; blistered plates, 54—10 dangerous; cases of sediment and deposit, 97—18 dangerous; cases of incrustation and scale, 70—24 dangerous. To show how little attention is paid to the internal condition of boilers by incompetent engineers, we copy the following from a letter of one of our inspectors:

"In one tubular boiler I found sediment in the back end, eight inches deep, and extending forward more than four feet. It seemed to be an accumulation of fine scale cemented together, so that it was necessary to break it up with a hammer and chisel before it could be removed. The engineer said *he had cleaned the boilers only three days before*, and objected to my making another examination. This is one of the many cases we find, where the proprietor trusts everything about his boilers to his engineer, supposing him to be reliable."

With such accumulation of sediment and deposit, is it any wonder that sheets are burned? A careful engineer will understand, if the feed water be impure, that he must blow down two or three inches every day, or oftener, that the sediment may be removed as it accumulates, and then an internal examination once in two weeks, or once a month, will insure a clean boiler.

Cases of external corrosion, 26—10 dangerous; cases of internal corrosion, 17—5 dangerous; cases of internal grooving, 28—11 dangerous; water gages out of order, 50; blow-out apparatus out of order, 15—7 dangerous; safety valves overloaded, 40—12 dangerous; pressure gages out of order, 54—6 dangerous, varying from -15 to +8 pounds. (We have found several gages entirely ruined from being frozen). Boilers without gages, 4; cases of deficiency of water, 5—1 dangerous; broken braces and stays, 31—7 dangerous; boilers condemned, 2—both dangerous.

Two engineers were found drunk on duty, and promptly discharged. There were 9 serious explosions during the month, by which 99 persons were killed, and 6 wounded. Eighty-seven of the killed were passengers on the ill-fated steamer *H. R. Arthur*, on the Mississippi River. Many were drowned, and some burned, but the origin of the calamity was the bad quality of the boilers, which a careless management was unable to detect. The upper and fore part of the boat was blown away by the exploded boilers, and, to add to the horror, what remained took fire.

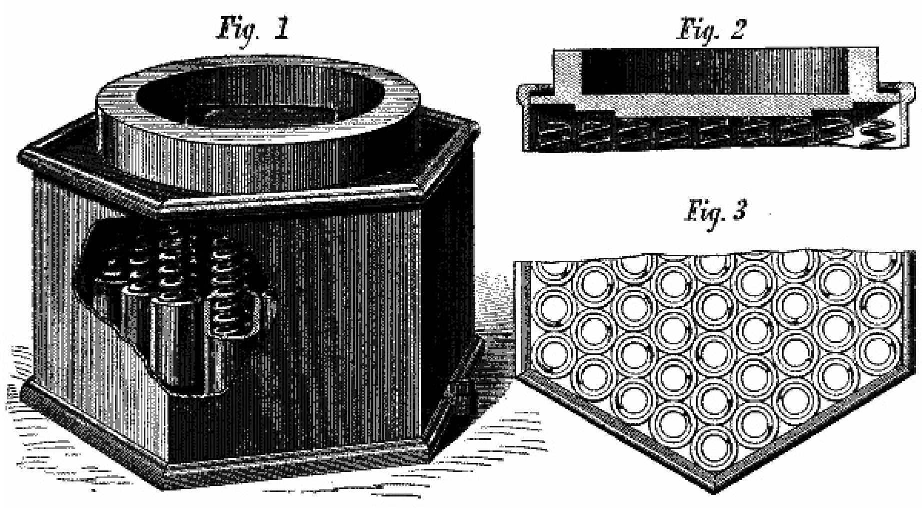
None of these exploded boilers were under the care of this company.

Five ore-roasting furnaces are in full blast in Nevada.

Improved Compound Spiral Car Spring for Railway Carriages.

Our engravings illustrate an improved compound car-spring, which appears to possess all the requisites of a first-class spring, combining in its construction extreme simplicity with great strength, and a feature whereby the power of the spring increases with increase of the load, and *vice versâ*, so that its flexibility remains nearly constant for all loads.

Fig. 1 is a perspective view of this spring, with a portion of the side of the case broken out to show the interior arrangement of the spiral springs. Fig. 2 is a section of the compressing plate. Fig. 3 is a plan view, showing the arrangement of the tubes which enclose the springs.



POTT'S' SPIRAL CAR SPRING FOR RAILWAY CARRIAGES.

The case is cast in two pieces. Its vertical wall is cast in a single piece, and has at the top a flange or bead extending inwardly, against which the compressing plate abuts when the spring is not compressed, as shown in Fig. 2. A bottom plate completes the case.

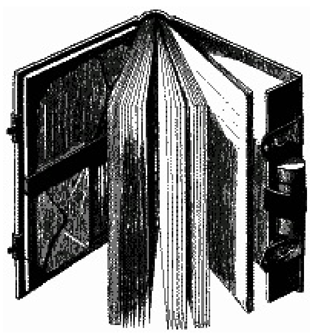
The spiral components of the spring are inclosed in tubes, as shown in Figs. 1 and 3. It is not deemed essential that these tubes should be seamless, or that their edges, brought together in bending, should be soldered, brazed, or welded. They act merely as guides to compel the component springs to expand or contract in vertical lines, and need only be strong enough for that purpose.

The compressing plate is formed with concentric steps or ledges, as shown in Fig. 2, so that with light loads, only a portion of the component spirals act. With a heavier load a new series of spirals is brought into action, and so on, till the spring is loaded to its full capacity. This feature is novel, and as important as novel, as it gives the spring a far more easy and flexible carriage, with light loads, than would be the case if all the spirals were permitted to act.

In putting the spring together, the vertical part of the case is inverted. The compressing plate is then placed within the case, resting upon the inner flange of the case above described. The tubes with their inclosed springs are then arranged in position, as shown in the plan view, Fig. 3. The bottom plate of the case is then placed in position, and held to its place by lugs and rivets, as shown in Fig. 1; the spring is then ready for use.

The employment of tubes in the manner described, enables springs of the greatest practical length to be used, without the sectional or division plates met with in other spiral car springs. A greater and easier movement is therefore obtained. These springs can, it is claimed, compete in price with any spring in market, and are guaranteed by the manufacturers. Patented through the Scientific American Patent Agency, December 27, 1870, by Albert Potts, whom address for further information, No. 490 North Third street, Philadelphia, Pa.

PORTABLE WRITING AND COPYING CASE.



This device is the invention of A. G. Buzby, of Philadelphia, Pa. It is a combined writing and copying case. Besides the usual recesses or chambers for pen, ink, paper, etc., it is provided with a book of copying paper, in which copies of important letters may be made, by damping the letters in the usual way, and pressing them between the leaves of the copying book; or the transfer paper may be used, so that the letter will be copied as it is written, if preferred.

How Walking Sticks are made.

Sticks are manufactured both from large timber of from two to six feet girth, and from small underwood of about the thickness of a man's thumb. The timber, which is chiefly beech, is first sawed into battens of about three feet in length and as many inches in width; and from each of these battens two square sticks, with square heads are afterwards cut in opposite directions, so that the middle portion is waste wood. The corners of each are afterwards rounded off by a planing process called "trapping," and the square head is reduced, by a small saw, to a curve or rectangular bend, so as to form a handle. When the sticks are brought in this way to the exact size and pattern, they are polished with great care, are finely varnished, and packed in boxes or bundles for the market. Many sawn sticks, however, are supplied with bone and horn handles, which are fastened on with glue; and then of course there is less wood waste, as a larger number of them may be cut from one batten.

A very different process takes place in the manufacture of sticks from small underwood, in which there is no sawing required. The rough unfashioned sticks, which are generally of hazel, ash, oak and thorn, are cut with a bill in the same way as kidney bean sticks, and are brought to the factory in large bavins or bundles, piled on a timber tug. There must of course, be some little care in their selection, yet it is evident that the woodmen are not very particular on this score, for they have in general an ungainly appearance; and many are so crooked and rough, that no drover or country boy would think it worth while to polish the like of them with his knife. Having arrived at this place, however, their numerous excrescences are soon pruned away, and their ugliness converted into elegance. When sufficiently seasoned and fit for working, they are first laid to soak in wet sand, and rendered more tough and pliable; a workman then takes them one by one, and securing them with an iron stock, bends them skillfully this way and that, so as to bring out their natural crooks, and render them at last all straight even rods. If they are not required to be knotted, they next go to the "trapper," who puts them through a kind of circular plane, which takes off knots, and renders them uniformly smooth and round. The most important process of all is that of giving them their elegantly curved handles, for which purpose they are passed over to the "crooker." Every child knows that if we bend a tough stick moderately when the pressure is discontinued, it will soon fly back, more or less, to its former position; and if we bend it very much, it will break. Now the crooker professes to accomplish the miracle of bending a stick as it might be an iron wire, so that it shall neither break nor "backen." To prevent the breaking, the wood is rendered pliant by further soaking in wet sand; and a flexible band of metal is clamped down firmly to that portion of the stick that will form the outside of the curve; the top end is then fitted into a grooved iron shoulder which determines the size of the crook, the other end being brought round so as to point in the opposite direction; the metal band during this process binding with increasing tightness against the stretching fibers of the wood, so that they cannot snap or give way under the strain. The crook having been made, the next thing is to fix it, or remove from the fibers the reaction of elasticity, which would otherwise, on the cessation of the bending force, cause it to backen more or less, and undo the work. In the old process of crooking by steam, as timber bending is effected, the stick was merely left till it was cold to acquire a permanent set; but in the new process, a more permanent set is given by turning the handle about briskly over a jet of gas. The sticks being now fashioned, it only remains to polish and stain or varnish them; and they are sometimes scorched or burned brown, and carved with foliage, animal heads and other devices.—*Chambers' Journal*.

Flowering of the Victoria Regia in the Open Air.—Joseph Mager, Esq., has succeeded in flowering the Victoria lily, in his pond in England. The pond is perfectly open, but the water is heated by hot water pipes coming from a boiler near the pond, carefully concealed. The seeds of the Victoria were planted in May last, and the first flower was produced Sept. 10th. Afterwards seven other flowers opened. The plant has eight leaves, of which the largest is five feet two inches in diameter. Mr. Mager has also succeeded in flowering a large number of other tropical lilies in his pond.

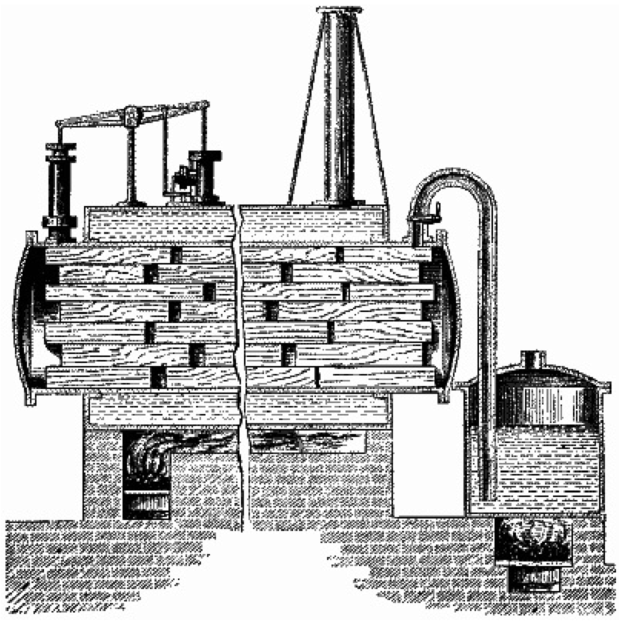
Jute, a material largely used in combination with hemp, for making cordage, sacking, mats, and carpets, is produced in India to the extent of 300,000 tuns per annum. The scarcity of fuel prevents its manufacture on the spot, except by the rudest and most primitive means, so that the bulk of the growth is sent to Great Britain.

Ventilation of the Liverpool Tunnel.

This tunnel, which forms an ascending incline of a mile and a quarter length from the terminal station in Lime-street London and N. W. Railroad, was worked until recently by a rope and stationary engine, to avoid fouling the air of the tunnel by the passage of locomotives; but the increase of the traffic having necessitated the abandonment of the rope and the substitution of locomotives for bringing the trains up through the tunnel, it became requisite to provide some efficient means of ventilation for clearing the tunnel speedily of the smoke and steam after the passage of each train. A large exhausting fan has been designed by Mr. John Ramsbottom for this purpose, which works in a chamber situated near the middle of the length of the tunnel, and draws the air in from the tunnel, through a cross drift; discharging it up a tapering chimney that extends to a considerable hight above the surface of the ground over the tunnel. The fan is about thirty feet diameter, and is made with straight radial vanes; it revolves on a horizontal shaft at a speed of about forty-five revolutions per minute, within a brick casing, built concentric with the fan for the first half of the circumference, and afterwards expanding gradually for discharging into the base of the chimney, the air from the tunnel being drawn in at the center of the fan at each side, and discharged from the circumference of the fan by the revolution of the vanes. The engine driving the fan is started by telegraph signal at each departure of a train from the terminal station, and the fan is kept running until the discharge from it becomes quite clear, showing that no steam or smoke remains in the tunnel; this is usually the case in about eight minutes after the time of the train entering the lower end of the tunnel, the passage of the train through the tunnel occupying about three minutes. The fan draws air in at both ends of the tunnel simultaneously, and begins to clear the lower end immediately upon the train entering; the clearing of the upper end commences as soon as the train has passed out of the tunnel, and as the fan is situated nearer the upper end of the tunnel than the lower, the clearing of both lengths is completed almost simultaneously. The fan is so constructed as to allow an uninterrupted passage through it, for the air, whilst the fan is standing still; and the natural ventilation thus obtained by means of the large chimney is found sufficient for clearing the tunnel during the night and some portion of the day, without the fan being worked at those times. This natural ventilation is aided by the engine exhaust and the boiler discharging into the chimney. The fan has now been in regular operation for three-quarters of a year, and has been found completely successful.

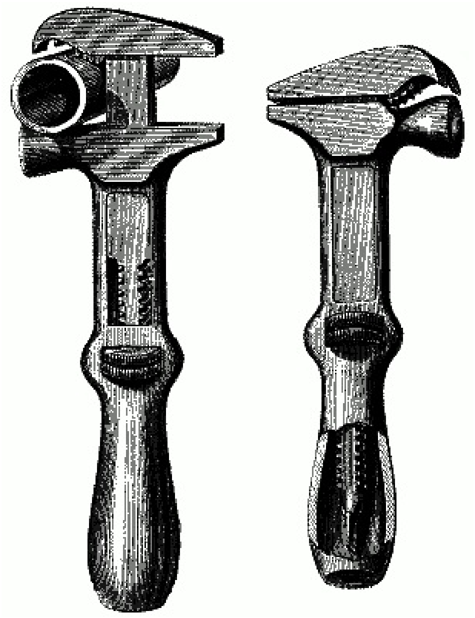
IMPREGNATING WOOD WITH TAR OR OTHER PRESERVING MATERIAL.

The preservation of wood is a problem which is attracting increased attention, as year by year diminishes the material supply of timber, and consequently gradually increases its price. Among other methods employed, the impregnation of wood by the vapors of tar, creosote, petroleum, etc., has been tried, and one of the practical difficulties met with has been the obtaining of suitable apparatus for the purpose.



The engraving annexed is an invention intended to supply this want. The wood is inclosed, in a tank kept hot by a steam jacket which surrounds it, as shown. A boiler at one end is used to heat the substance with which it is desired to impregnate the wood. An air pump is also employed to remove the steam, generated in the heated timber, and the air from the tank. The pores of the wood being thus rendered vacuous, the hot liquid or vapors from the heating tank readily penetrate the entire substance, and thoroughly impregnate it. This apparatus is the invention of George Pustkuchen, of Hoboken, N. J.

BOARDMAN'S COMBINED TOOL.



This tool, of which our engraving is a good representation, comprises a screw wrench, a pipe wrench, a hammer, a nail claw, a screw-driver, and a bit handle, or socket wrench.

The bit handle is the entire tool, the square socket or opening being made in the end of the handle, in which the shanks of bits may be inserted.

The screw driver is formed on the end of the screw bar, attached to the outer jaw of the wrench, and is taken out from the hollow of the handle when required for use.

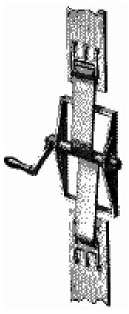
The use of the other parts of the tool will be apparent from the engraving.

The tool is very compact, and has this advantage over the ordinary screw wrench, that its leverage increases as it is opened to receive nuts of larger size.

This invention is protected by two patents, dated respectively, May 30, 1865, and July 10, 1866.

For further information address B. Boardman & Co., Norwich, Conn.

BELT TIGHTENER.



This instrument will be found of great service in bringing together the ends of belts, the weight of which is so great that they cannot be held together by the hand while lacing. A strap engages with holes made in the belt, at the back of the holes punched for lacing, the tightening strap being provided with claws or hooks, as shown. A winch axle and ratchet, adjusted in a frame as shown, are then employed to pull the ends of the belt together and hold them firmly till the lacing is completed.

This is the invention of T. G. Stansberry, of Medora, Ill. Patented in September, 1867.

Some Things I don't want in the Building Trades.

I don't want my house put in repair, or rather out of repair, by a master who employs "Jacks of all Trades."

I don't want my foreman to tell me too much at one time about the faults of the workmen under him, as I may forget asking him about himself.

I don't want a builder or carpenter to give a coat of paint to any joinery work he may be doing for me, until I have examined first the material and workmanship.

I don't want any jobbing carpenter or joiner, whom I may employ, to bring a lump of putty in his tool basket. I prefer leave the use of putty to the painters.

I don't want jobbing plumbers to spend three days upon the roof, soldering up a crack in the gutter, and, when done, leaving fresher cracks behind them. The practice is something akin to "cut and come again."

I don't want a contractor to undertake a job at a price that he knows will not pay, and then throw the fault of his bankruptcy on "that blackguard building."

I don't want any more hodmen to be carrying up the weight of themselves in their hod, as well as their bricks; I would much prefer seeing the poor human machines tempering the mortar or wheeling the barrow, while the donkey engine, the hydraulic lift, or the old gray horse, worked the pulley.

I don't want house doors to be made badly, hung badly, or composed of green and unseasoned timber.

I don't want houses built first and designed afterwards, or, rather, wedged into shape, and braced into form.

I don't want to be compelled to pay any workman a fair day's wages for a half day's work.

I don't want an employer to act towards his workmen as if he thought their sinews and thews were of iron, instead of flesh and blood.

I don't want any kind of old rubbish of brick and stone to be bundled into walls and partitions, and then plastered over "hurry-skurry." Trade infamy, like murder, will out, sooner or later.

I don't want men to wear flesh and bone, and waste sweat and blood, in forms of labor to which machinery can be applied, and by which valuable human life and labor can be better and more profitably utilized.

Correspondence.

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

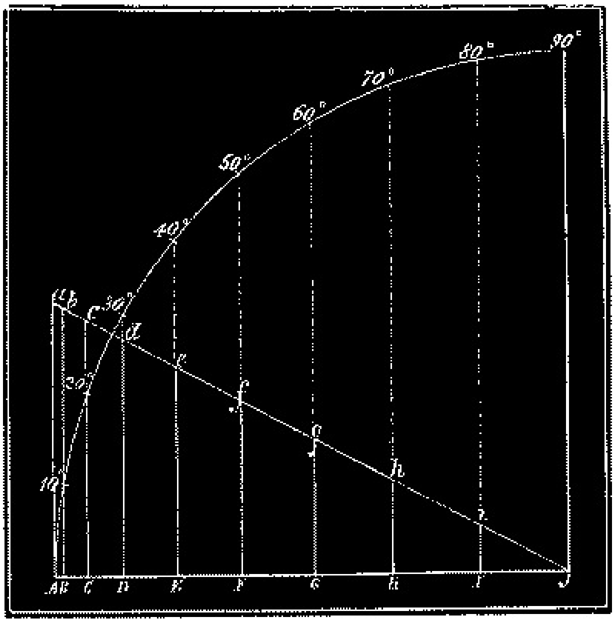
Action of the Reciprocating Parts of Steam Engines.

Messrs. Editors:—I have hesitated about the propriety of replying to the criticisms of your correspondent, J. E. Hendricks, upon my paper, on the action of the reciprocating parts of steam engines. It is not to be expected that a truth so opposed to commonly received notions—the reception of which requires so much to be unlearned—should at once receive the assent of every one. Some odd fancies on the subject are likely to be ventilated first.

But your correspondent touches the root of the matter, and perhaps the fact questioned by him should be more clearly placed beyond dispute.

I will dismiss the introductory part of his letter, merely observing that his "logical inference" is quite gratuitous and unwarranted. He says himself that its absurdity is obvious, in which I quite agree with him.

The real question is this: What is the figure representing the acceleration of the motion of a piston, controlled by a crank which revolves with a uniform velocity? I stated it to be a right-angled triangle, and indicated, as I supposed, clearly enough, a simple method by which this could be shown. Your correspondent claims that the calculation, according to my own rule, gives a figure of a totally different form, and one that shows the acceleration, as well as the motion, to be reduced to zero at the commencement of the stroke. Let us see. Let the straight line, *AJ*, in the following figure, represent half the stroke of the piston, and let the distances, *AB, AC*, etc., on this line, represent the versed sines of 10°, 20°, etc., up to 90°, or the motion of the piston while the crank is moving through these arcs. At the points *A, B, C*, etc., erect the perpendiculars, *Aa, Bb, Cc*, etc., and let the length of each of these ordinates represent the acceleration imparted in a given time at that point of the stroke. Then will *AJ* be to *Aa* as *IJ* is to *Ii*, as *HJ* is to *Hh*, etc., showing that the straight line, *aJ*, connects the extremities of all the ordinates, and that the triangle, *AJa*, represents the acceleration of the motion of the piston, from the commencement to the middle of the stroke.



The following table will enable any one to make the calculations proving the truth of the above proposition:

Degrees.	Versed sine.		Motion for 10°		Acceleration during 1°.	
0°		.			*Aa*	.0003046
10°	*AB*	.0151922	*AB*	.0151922	*Bb*	.0003001
20°	*AC*	.0603074	*BC*	.0451152	*Cc*	.0002862
30°	*AD*	.1339746	*CD*	.0736672	*Dd*	.0002638
40°	*AE*	.2339556	*DE*	.0999810	*Ee*	.0002332
50°	*AF*	.3572124	*EF*	.1232568	*Ff*	.0001958
60°	*AG*	.5000000	*FG*	.1427876	*Gg*	.0001523
70°	*AH*	.6579799	*GH*	.1579799	*Hh*	.0001041
80°	*AI*	.8263518	*HI*	.1683719	*Ii*	.0000529
90°	*AJ*	1.0000000	*IJ*	.1736482	*Jj*	.0000000

The method of obtaining the decimals representing the acceleration for 1°, at any point, was fully explained in the paper, and compared with the similar method of showing the uniform acceleration of a body acted on by a constant force. The ordinary tables in the hand-books, going only to five places of decimals, are of no use for these computations.

I would suggest a practical experiment. Let any one having an engine running at a good speed, loosen the crank pin brasses a little, so that, at starting, it will thump heavily. Let the engine be lightly loaded, so that only a small portion of the boiler pressure will need to be admitted to the cylinder. As its speed increases, the thump will die away; and, if at its full speed, the pressure of the steam admitted is not so great as to overcome the centrifugal strain of the reciprocating parts on the crank, as it passes the centers, the engine will revolve in silence. Any one can ascertain, by the rule given in the note to the paper, just what pressure can be admitted without causing a thump, or this can be found by a little experimenting. I am running an engine which does not thump with loose crank pin brasses, under eighty pounds pressure, admitted sharply on the centers.

Charles T. Porter.

Answer to Practical Problem.

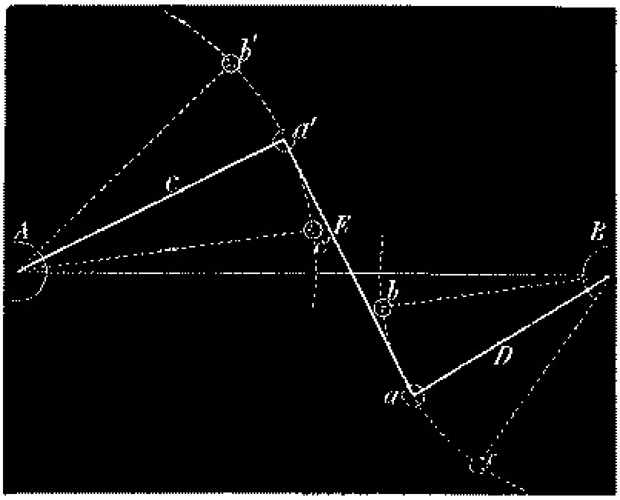
Messrs. Editors;—I submit the following solution of "Practical Problem" on page 147:

Given AB, arm, C, arm, D, chord of half angle of oscillation of arm, D, and angles of arms, with line AB.

To find angles, BA*c'*, AB*b*, and length of link, E.

1. As the length of arm, D, is to the chord of arc, *ab*, divided by 2, so is the radius to the sine angle oscillation of arm, D, divided by 4.

2. 360° is to the whole circumference as the angle *b*B*a* is to the length of arc *ab*.



3. Now arc *ab* is equal to arc *a'c'*.

4. The whole circumference is to 360° as the length of arc *a'e'* is to the angle oscillation of C divided by 2.

5. Half angle oscillation, C, taken from angle BA*a'* is equal to angle BA*c'*.

6. Half angle oscillation, D, taken from angle AB*a* is equal to angle AB*b*.

7. The diagonal of the rectangle formed by the (sum of the sines of the angles of the arms with AB) into (AB—sum of cosines of same) will be the length of link, E.

G. R. Nash, Civil Engineer.
North Adams, Mass.

[We have received other solutions of this problem, but as this covers the ground in a very simple manner, we think it will be sufficient. Those forwarding the solutions not published will accept our thanks and assurances that it is not because they lack merit that they are declined.—Eds.

Reciprocating Parts of Steam Engines.

Messrs. Editors:—In one of the late numbers of your journal, you publish a paper, read by Mr. Porter before some learned society in New York, on something about the possibility or practicability of running a steam engine at a high rate of speed, and claiming to give a scientific explanation of the why and wherefore. Now, scientifically, I know nothing about a steam engine; practically, I know how to stop and start one. Therefore, you will understand that what I say is not as coming from one who claims to be wise above what is written, but as simply being a statement of the case, as it appears to one who wants to learn, and takes this way to draw out the truth. A scientific theory, invested with all its sines, coefficients, and other paraphernalia, is a very pretty thing to look at, no doubt, for those who understand it, and, when properly applied, is invaluable; but when, as in this case, a practical question is to be decided, by the aid of a scientific demonstration, it will not do to throw aside the main elements of the problem, or any, in fact, of the minor points, no matter how trivial they may appear.

Mr. Porter's labors were strictly of a scientific nature. He starts out with the proposition that what he is about to explain is very simple, and very likely it is; but, for one, I can't see it, and I want more light. He says that it takes a certain number of pounds to overcome the inertia of the reciprocating parts of a certain weight, to give it a certain speed. What is inertia? He says, "we will not take into account the friction of parts." Now, my understanding of this point is, that friction is practically one of the main elements in the problem. How can we hope to obtain a correct solution when he rubs out one of the terms of the equation? What is friction doing all the time, while he is theoretically having his reciprocating parts storing up power and then giving it out again, just at the right time, and in the right quantity?

What an immense amount of iron has been wasted by being cast into fly wheels, when a fraction of the amount, if only put into cross heads, would render fly wheels unnecessary!

Mr. Porter stops short in his discussion. He should have added a table giving the proportionate length of stroke, weight of parts, and number of revolutions required to produce the effect of an engine running at a high speed, without the least fraction of inequality in the strain on the crank, and then the sun would have fairly risen in the "dawn of a new era for the steam engine." But, as it is so very simple, we can all figure it out for ourselves.

In the diagram Mr. Porter gives, to illustrate the travel of the piston, he wets his finger and draws it over another term in the equation (a method of elimination not taught by Hutton, Davies, and other mathematicians). It is a quick way, but is it correct? He says, "the distance traveled by the piston is the versed sine of an angle formed by a line from the center of the crank pin, in any part of its stroke to the center of the circle described by the crank pin, leaving out of the calculation the angular vibration of the connecting rod." What he means by the "angular vibration," I do not know. He is wrong in the statement. If he will think of it he will see it. If he meant to say that the piston's travel was measured by the versed sine of the angle formed by the connecting rod and the line of horizontal centers, he is wrong again, yet nearer the truth than before, just as the proportion between the length of the connecting rod and the half diameter of the circle described by the crank pin. This can quickly be seen by supposing the connecting rod to be detached, and allowed to fall down on the center line, at any part of the stroke. If he understood this (as no doubt he did), he should not ignore the facts.

What I am aiming at is this. When a man attempts to demonstrate a thing mathematically, he must take into his calculation everything essentially connected with the problem, just exactly as it is, and not as he would have it; otherwise, he cannot, by any possibility, attain a correct result. When he claims, as now, the practicability of running engines at a high speed, I think he is claiming too much. Build an engine of proper materials, make it strong, and fit everything as it should be, balance crank and fly wheel to a nicety, keep everything snugly in its place, and the terrors of a quick stroke vanish.

S. W. H.

Test for White Lead.

Messrs. Editors:—I have read, with much interest, Dr. Chandler's colorimetric test of the purity of white lead, as published in the Scientific American sometime ago. I enclose another test, which, though not new, is of value to all using white lead on account of its simplicity and effectiveness. It has been in use here for nearly two years, and has been found reliable. Having never seen it in print, I have tried to put it in as simple words as possible.

Felix McArdle, Analytical Chemist.
St. Louis, Mo.

Take a piece of firm, close grained charcoal, and, near one end of it, scoop out a cavity about half an inch in diameter and a quarter of an inch in depth. Place in the cavity a sample, of the lead to be tested, about the size of a small pea, and apply to it continuously the blue or hottest part of the flame of the blow pipe; if the sample be strictly pure, it will in a very short time, say in two minutes, be reduced to metallic lead, leaving no residue; but if it be adulterated to the extent of ten per cent. only, with oxide of zinc, sulphate of baryta, whiting or any other carbonate of lime, (which substances are now the only adulterations used), or if it be composed entirely of these materials, as is sometimes the case with cheap lead, it cannot be reduced, but will remain on the charcoal an infusible mass.

Dry white lead, (carbonate of lead) is composed of metallic lead, oxygen and carbonic acid, and, when ground with linseed oil, forms the white lead of commerce. When it is subjected to the above treatment, the oil is first burned off, and then at a certain degree of heat, the oxygen and carbonic acid are set free, leaving only the metallic lead from which it was manufactured. If, however, there be present in the sample any of the above mentioned adulterations, they cannot of course be reduced to metallic lead, and cannot be reduced, by any heat of the blow pipe flame, to their own metallic bases; and being intimately incorporated and ground with the carbonate of lead, they prevent it from being reduced.

It is well, after blowing upon the sample, say for half a minute, by which time the oil will be burned off, to loosen the sample from the charcoal, with a knife blade or spatula, in order that the flame may pass under as well as over and against it. With proper care the lead will run into one button, instead of scattering over the charcoal, and this is the reason why the cavity above mentioned is necessary. A common star candle or a lard oil lamp furnishes the best flame for use of the blow pipe; a coal oil lamp should not be used.

By the above test, after a little practice, so small an adulteration as one or two per cent. can be detected; it is, however, only a test of the purity or impurity of a lead, and if found adulterated, the degree or percentage of adulteration cannot be well ascertained by it.

Jewellers usually have all the necessary apparatus for making the test, and any one of them can readily make it by observing the above directions, and from them can be obtained a blow pipe at small cost.

If you have no open package of the lead to be tested, a sample can most easily be obtained by boring into the side or top of a keg with a gimlet, and with it taking out the required quantity; care should be used to free it entirely from the borings or particles of wood, and it should not be larger than the size mentioned; a larger quantity can be reduced, but of course more time will be required, and the experiment cannot be so neatly performed.

How to Build a Chimney.

Messrs. Editors:—I am satisfied that a great many fires originate through poorly constructed chimneys; and, although not a bricklayer by trade, I would offer a few hints how to construct a fire-proof chimney. Let the bed be laid of brick and mortar, iron, or stone; then the workman should take a brick in his left hand, and with the trowel, draw the mortar upon the end of the brick, from the under side, and not from the outside edge, as is usual. Then, by pressing the brick against the next one, the whole space between the two bricks will be filled with mortar; and so he should point up the inside as perfectly as the outside, as he proceeds.

By drawing the mortar on the edge of the brick, the space between the ends will not always be entirely filled, and will make (where the inside pointing is not attended to) a leaky and unsafe chimney, which, if not kept clear of soot, will, in burning out, stand a good chance of setting the building on fire. The best thing that I know of, to put the fire out in a burning chimney is salt; but the matter of first importance, after having a chimney properly constructed, is to keep it clean.

Austin B. Culver.
Westfield, N. Y.

Crystallized Honey.

Messrs. Editors:—Please allow me to say to the querist who, through your columns, asks what to do with crystalline honey, that if he will "doctor" it with almost any artificial honey of the day, it will not become like lard in cold weather, which change is a natural proof that it is pure. For almost any purpose, pure honey is preferable to that which has been adulterated, but purity is a minor consideration with many.

Next we shall hear of some fastidious customer who objects to pure lard, because it looks white when cold. To such we would recommend lard oil as a great improvement, especially for cooking purposes.

A. M. B.
Louisville, Ky.

[For the Scientific American.]

RAMBLES FOR RELICS.

NUMBER II.

At a depth of fifteen feet, we were about to suspend our labors, supposing from the nature and uniformly dark color of the earth, that we had reached the surface of the alluvium, when a sign of the inevitable wood and bark layer was seen in a crevice. An excavation, five or six feet, into the wall, revealed the skeleton of a man laid at length, having an extra coverlid of wooden material. Eighteen large oblong beads, an ax of polished green stone, eleven arrow points, and five implements of bone (to be described) were deposited on the left side; and a few small beads, an ornamental shell pin, two small hatchets, and a sharp-pointed flint knife or lance, eight inches long, having a neck or projection at the base, suitable for a handle, or for insertion in a shaft, on the right side. The earth behind the skull being removed, three enormous conch shells presented their open mouths. One of my assistants started back as if the ghost of the departed had come to claim the treasure preserved, in accordance with superstitious notions, for its journey to the "happy lands." The alarm seemed to be a warning, for at the moment the embankment, overloaded on one side, caved in, nearly burying three workmen, myself, and a spectator. Our tools being at the bottom of the heap, and the wall on the other side, shaken by the falling earth, giving tokens of a change of base, our prospects of a ready deliverance were not very hopeful. The bystanders, however, went to work with their hands, and we were soon relieved, not without casualty, the spectator having the worst of it. Struggling to extricate himself, instead of abiding his time, he dragged one leg out of the pile shorter than the other.

The occurrence of marine shells in a burial depository, especially of the varieties pyrula and oliva, four or five hundred miles from the Gulf and that portion of the Southern coast where the mollusks exist, bears upon the question of migration and tribal intercourse, and the commercial value of these articles. Obtained from a distance and regarded as precious commodities, they were used in exchange, for the material of ornaments, and for choice utensils. Only two or three of these shells have been found in a perfect condition, but defective ones are frequent, with fragments, "cuttings," and various trinkets made out of them—such as ornamental pins, needles, crosses, buttons, amulets, engraved plates, and beads. From one of the specimens recovered from the mound sepulchre, the spire and columella had been removed, leaving a hollow utensil. It would have been suitable for a water vessel, but for a hole in the bottom, which had furnished a button-shaped ornament, or piece of money, which was found with the relic, and exactly corresponded to the orifice. The twirled end of the shell, however, had been improved for a handle by shallow cavities, one on the inside slanting from the middle longitudinal line, and one crossing that line at right angles on the convex side, so as to be fitted to the thumb and fore finger of the left hand, suggesting a use of the implement as a shield, or a mask held before the face. Adair speaks of large shells in use by the Indians of his time (1735), suspended about the neck for shields, and regarded as badges of priestly dignity.

A trench was dug on the east side of the mound, nearly corresponding in dimensions to the one on the west side, making the length of the whole excavation, including the central cavity, thirty-two feet.

In the last opening, eight skeletons were exhumed; the mode of burial was the same throughout. The only article of value recovered was a curiously wrought pipe of stone, having a "figure head" representing the human face, which I have put down in a list of "articles stolen," and which the thief can describe better than the writer. After filling up all the gaps, and levelling the surface to suit the taste of the proprietor, we closed our labors on the mound in the Bent.

Of the skulls collected, it is sufficient to say that they belong to the "short heads," the length and breadth having a comparative medium proportion, a common form of cranium in the mounds of Tennessee.

Of stone implements I specify an ax of serpentine, ten inches long, two thick, and four broad, having plain sides and a straight edge ground down on both of the flat faces; hatchets ("tomahawks") of green stone, flint, and diorite, from five to eight inches long, with rounded faces and sides, contracted to an edge at one end, and to a flat heel at the other; a wedge of black slate, seven inches long and half an inch thick, of a square finish on the faces and sides and at the heel, which was diminished two inches, as compared with the length of the edge; hatchets with a serrated edge at each end, plane on both sides, convex on one face and flat on the other.

With one skeleton was deposited a "set of tools," eight in number, of the species of rock before mentioned, varying in length from two to eight inches. Their peculiarity consists in a variety of shapes—no two being precisely alike—and in their fitness to various uses, such as carving, hacking, paring, and grooving. The smallest of them, having a square finish, was held by the thumb and two fingers, and is suitable for cutting lines and figures in wood and shells. Specimens of this art were furnished from the mound. The largest number might serve for hatchets, chisels, and gouges. One had been ground in the form of a cylinder five inches long and an inch thick, and then cut an inch on two sides to an edge, and worked into a handle with a round bead, from the center of the elliptical faces. It might be used for chipping wood and stone. One answered the purpose of a cold chisel; another was somewhat similar, but had a hollow face reduced to a curved edge for grooving. These polished instruments, wrought with much care, seemed intended for use by the hand rather than for insertion in a handle or socket, or attachment to a shaft by means of a strap or withe. Only one was perforated. The drilling through granite, quartz, and diorite, without the use of metal, was a severe labor, even for savage patience. A long knife of silex, with a wrought handle, lance heads, leaf shaped, of the same material, of beautiful workmanship, arrow points of fine finish, furnished, with others before mentioned, an assortment of arms. Several flint points, though only an inch long, were curved like a cimeter, and used probably as flaying instruments. True disks, of various mineral substances, from an inch to five inches in diameter, having convex faces, complete the list of stone implements. Those of bone comprise several like hollow chisels, sharpened at one end, and pierced through one face, near the other extremity, so as to be fastened to a handle; these were used for dressing skins. One was formed like a poniard, with a worked hilt. With these may be connected arrow heads and sharp pointed weapons of the worked antlers of the stag, and tusks of the wild boar.

Of ornaments, I noticed pins used for dressing the hair, made of the columns of large sea shells. The head is generally round, sometimes oval, from an eighth to a half of an inch in diameter, retaining the diagonal groove of the pillar from which it is made. The stems vary in length from one to six inches. It would be tedious even to classify ornamental beads and buttons of shell work, such as are usually found in the mounds. These trinkets are perforated, and, in addition to their being articles of dress, were used probably as "wampum," the currency of the recent Indians.

A miscellaneous collection includes a hematite stone, wrought in the shape of a cup weighing half a pound; when rubbed or ground it furnished the war paint of the savages; also the extremity of a copper tube, two inches long; needles in bone and shell, from an inch to six inches long, with grooves round the head, to serve the purpose of eyes; and plates of mica. The use of mica plates, which are found of large size in some of the Western mounds, has excited some inquiry. Of a certain thickness, they make good mirrors. Beside their use for ornamental purposes, they were probably looking-glasses of the beauties of the stone age. There was also found a pipe of soap stone, having a stem five inches long, and a bowl with a broad brim, like a Quaker's hat.

Of earthenware, there was an endless variety of fragments of the usual black, grey, or red compressed clay, mixed with pulverized shells or stones. One kind I have never seen described. The sherds had a red coating on both sides, an eighth of an inch in thickness, evidently not a paint or a glaze. The red coloring might have come from the pottery being burnt in the open air, instead of baked in a furnace, were not the layer of uniform thickness and of homogeneous paste, unlike the material of the vessel, which was a gray mixture of clay and particles of shells.

I give the above memoranda to the general fund of information, touching a subject that invites inquiry on account of its novelty and ethnological importance. Every examination of the monumental remains of the ancient Americans brings to light some new feature in structure or type of rudimental art. And since archæology has become a science, investigators, for half a century, may be looking about for facts to complete the system auspiciously introduced by the antiquarians of Northern Europe, and advanced in our own country by the researches of Caleb Atwater (*Archæologia Americana*) and by those of the Smithsonian contributors to knowledge, especially Squier and Davis. RAMBLER.

A SMALL WATER WHEEL.—There is in the town of Meriden, Conn., a Leffel double turbine wheel, running under 240 feet fall and driving a manufactory. It uses only about one-half of a square inch of water, and runs at the marvelous speed of 3,000 revolutions per minute, or 50 revolutions per second, which is by far the most rapid rate of motion ever imparted to a water wheel. This is, also, beyond comparison the greatest fall applied to the propulsion of a wheel in America. The wheel at Meriden is of the most diminutive size, scarcely exceeding in dimensions the old-fashioned "turnip" watches which our grandfathers used to carry in their capacious vest pockets. The complete success of this wheel has attracted much attention and affords further evidence of the wide range of adaptability of the Leffel turbine.

[For the Scientific American.]

SILK CULTURE.

BY W. V. ANDREWS.

A vague notion that silk culture ought to form one of the industrial pursuits of the American people seems to be prevalent enough; but it does not take practical hold upon anybody. The nearest approach to anything practical which we have seen, in late years—excepting, of course, what has been done in California—occurred in New York in July last, when a number of gentlemen pledged themselves, according to a report given in the *Tribune* of July 30, "to promote the native silk trade."

The gentlemen present at the meeting represented the most prominent silk manufacturing and importing houses in this country. What these gentlemen have since done towards promoting the native silk trade, I do not know, but, having pledged themselves, it is presumed they have done something.

At the meeting, of which the *Tribune* article is a report, dags, and other things, manufactured from California silk, were exhibited; and the report goes on to say that "Mr. Warren also exhibited samples of native and foreign cocoons, and of raw and thrown silk, together with the common *Cecropia* and *Bombyx Cynthia*, species of silkworms which feed upon oak leaves. * * Also the *Bombyx Yamamai* which feeds upon mulberry leaves; also the *Bombynx Pernyi*, of which the cocoons are early as good as the cocoons of worms fed upon mulberry leaves."

I have given this extract, word for word, as it stands in the columns of the *Tribune*, because it contains more blunders of one kind or another than I remember ever to have seen in so many words. *Cecropia* is certainly not very particular as to its food, but it is not an oak feeder. *Cynthia* will thrive on nothing except ailanthus, though it will eat one or two other things, but not oak. The *Yamamai*, on the other hand, will eat oak, indeed it is its natural food; but Mr. Warren errs greatly when he says that it will feed on mulberry. The last clause of the sentence, which says that cocoons of *Pernyi* are nearly as good as those of worms fed on mulberry leaves, must be a sort of entomological joke, of which the point is not discoverable by me, so I pass it over.

I do not, however, notice this report on account of its grammatical and entomological mistakes. It is because of the evil effects it may, and probably will, have on amateur silk culturists, that I notice it; for most assuredly, failure will be the result of all attempts to produce silk cocoons by feeding the caterpillars of the different moths on the food prescribed by Mr. Warren. Any patriotic, money making farmer, who believes in the *Tribune*, purchasing *Yamamai* eggs and setting his worms to feed upon mulberry, which they refuse to eat, and consequently, all die, will probably give up silk culture as being nothing more or less than a humbug. And thus the cause is injured.

For several years past, I have made some experiments in the rearing of the silkworms, giving the result of my experience in the first year in Vol. II., page 311, of the *American Naturalist*; and of a subsequent year in the *Entomologist*, for November, 1869.

The paper in the *Naturalist* is devoted to my experiments with the ailanthus silkworm, *Samia Cynthia* (G. & R.), a naturalized species from the East. In that paper, I have said all that is necessary to say at present, on that species, except perhaps that I am further convinced, from the inspection of samples of sewing and other silks, made from the cocoons of *Cynthia*, that one day it will be reared very extensively in the United States. It is perfectly hardy, is double brooded, and may be reared by any one possessed of a few acres of land, which may be good enough for growing ailanthus trees, but not good enough to grow any thing else. The labor of a few old men, or women, or even children, is sufficient for the purpose. The cost is therefore trifling.

The objection to the cultivation of *Cynthia* is that the cocoon cannot be reeled. But it can be carded, and if the Chinese can make excellent silk goods from it, why cannot we? I suspect, too, that *Cynthia* silk can be worked in with cotton, or, perhaps, woolen goods, adding to their beauty and durability (for it is indestructible in wear), and thus open up branches of manufacture hitherto unknown.

For manufacturers of coarse goods, I have no doubt that the silk from our native silk moths, *Cecropia* and *Polyphemus*, may be used. Indeed, I believe that M. Trouvelot is of opinion that *Polyphemus* may fairly enter into competition with *Bombyx mori*, the ordinary mulberry silkworm. The worm, however, is rather difficult to rear.

In reference, however, to *Bombyx mori*, it is well known that the silk crop in France and Italy has been reduced greatly, and the price of silk goods consequently enhanced, by prevalence of disease among the worms. So much is this the case, that silk breeders have been obliged to look around for some silk-producing moths whose products may, at any rate, supplement the deficient crop. *Cynthia*, as already mentioned as one of these, and two others mentioned by Warren in the *Tribune* reports above adverted to, are at present the subjects of experiment.

My article mentioned before as appearing in the *American Entomologist* is mainly devoted to my experiments, and those of my correspondents, with *Yamamai*, which, as I said before, is an oak feeder. In Japan, which is its native country, it feeds, in its wild state, on *Quercus serrata*. Whether that oak be found in America, I do not know, but it is of little importance, as the worm will feed on almost any species of oak, although I think that it prefers white oak. The importance of acclimatizing new species of silk moths is of so much prospective importance, that I shall devote the remainder of this article to the consideration of whether *Yamamai* and *Pernyi* may not be naturalized here. Any one, who happens to have the number of the *Entomologist* containing the article above alluded to, may find it worth while to read it, but as many persons may not be able to obtain that number, I will here repeat the substance of my remarks, adding as much new matter as subsequent experience has afforded.

The silk from the *Yamamai* being considered superior to that produced by any other of the substitute silk moths, great efforts have been made in Europe to acclimatize it; but, it must be confessed, hitherto with but slight success. There are exceptions, however, particularly among amateurs in Germany, sufficient to show that success is possible. The Baron de Bretton raises about 27,000 cocoons annually.

In this country but little has been done, or attempted, and that little has not been very successful.

The fact is, that *Yamamai* is a difficult moth to rear in a country like this, where in early spring the temperature varies so much; but that success is possible, I am convinced.

The moth emerges from the cocoon in the latter part of the summer, copulates, lays its eggs, and of course dies. And now the trouble commences; that is, with eggs laid, say in Japan, from whence we mainly get our supplies.

As soon as the egg is laid, the young larva commences its formation, which in a short time (about one month) is perfected. It lies in the egg in a quiescent state till early spring. If the egg remain in the country where it is laid, and is kept at a pretty even temperature, and free from damp, the caterpillar emerges in a healthy condition. But if it be removed some thousands of miles, passing in the transit from heat to cold, and back to heat again: and if, in addition, it be closely confined in a damp place, with little or no circulation of air, the egg is attacked by a fungus which sometimes prevents the worm from emerging at all; or, if it emerge, it is in a sickly condition. That these conditions obtain in the transit of eggs, from Japan to Europe, and thence to America, is evident enough; and it may, therefore, require the efforts of many persons, continued for a long time, to enable us to acclimatize the *Yamamai*. But this is all that is required, and I feel confident that ultimate success is certain.

On hatching out, the worm is of a brimstone yellow, and thinly covered with strong hairs; after the second month it is greenish, with black, longitudinal streaks, and the thread a dull coral red color. After the third month it becomes of a fine apple green, with yellow tubercles on each segment, from which issue a few black hairs. The head and legs are chocolate brown, the prolegs reddish, and the first segment edged with pinkish color. The greatest care is necessary, as the spring advances, to prevent the eggs from hatching before the oak buds are ready for them, and the temperature must be regulated with the greatest nicety. If the eggs can be kept somewhere about 50 deg. Fah., it would be quite safe; higher than that the mercury should not be allowed to rise, till you are quite ready for the worms, and, on the other hand, the eggs should not be allowed to freeze.

On emerging from the eggs, the worms should be allowed either to crawl to the oak branches, or rather to sprigs obtained for that purpose, the end of which should be placed in a jar, or bottle, of water, or the worms may be placed on gently with a camel-hair brush. The leaves should be well sprinkled with clean water that the caterpillars may drink.

From some cause, not well understood, the young caterpillars have a tendency to wander; and if care be not taken many may be lost. To prevent this, it is well to cover the branches with a gauze bag, tied tightly around the stems, and close to the bottle. Care must also be taken that the caterpillars do not find their way into the water, which they assuredly will if they have the opportunity, committing suicide in the most reckless manner. If the number of caterpillars be few, it is a good plan to place them at the outset with their food, in a wide-mouthed bottle, covering the mouth with gauze. The branches, particularly if the weather be warm, must still be occasionally sprinkled, so that the caterpillars may have the opportunity of drinking. It must be remembered that experiment is necessary in rearing *Yamamai*, but one thing is ascertained, and that is, that the worms must not be exposed to direct sunshine, at least not after seven or eight in the morning. If the spring be warm, I am inclined to think that a northeastern exposure is the best, and we may sum up by saying, that comparatively cool and moist seasons are more favorable to success that hot, dry weather. In America the worms suffer in the early spring, from the rapid changes of temperature, 40° at 9 A.M. increasing to 70° in the afternoon and falling off to freezing point during the night. The worms cannot stand this. They become torpid, refuse to eat, and consequently die. To prevent this, if the nights be cold, they must be placed where no such change of temperature can occur.

It is scarcely necessary to say that an ample supply of fresh food must be always supplied, but it may not be amiss to say that it is well, when supplying fresh branches, to remove the worms from the old to the new. The best way of doing this is to clip off the branch, or leaf, on which the worm is resting, and tie, pin, or in some way affix the same to the new branches. If this be not done, they will continue to eat the old leaf, even if it be withered, and this induces disease. If the worm has fastened itself for the purpose of moulting, the best way is to remove the entire branch, clipping off all the dried leaves before so removing it. These remarks apply, in general, to the treatment of all silkworms, except *Bombyx mori*.

The results of numerous experiments with *Yamamai* go to show that it is, as I said before, a difficult worm to rear; but it has been reared near New York to the extent of eight hundred cocoons out of sixteen hundred eggs, and this, although not a remunerative result, is encouraging.

The Chinese silk moth, *Aulterea Pernyi*, also an oak feeder, has been successfully raised by me and by others, for several years. Eggs have been sold to persons in States widely separated, and the results show that this worm is perfectly hardy.

The moth winters in the cocoon, emerges early in May, if the weather be warm, pairs readily, and lays from 150 to 200 eggs. These hatch out in about fourteen days, and like *Yamamai*, always about 5 or 6 o'clock in the morning. It is necessary to be on the alert to catch them on hatching only, and to remember that they are vagabonds, even to a greater extent than *Yamamai*. Consequently similar precautions must be taken.

The worm on emerging from the egg is large, and of a chocolate-brown color. After the first month it becomes of a yellowish green; head, pale brown; feet and prolegs of nearly the same color. The body has numerous reddish tubercles, from which issue a few reddish hairs. At the base of some of the tubercles on the anterior segments are silvery patches.

The *Pernyi* worm is much more easily reared than that of *Yamamai*, but still great care is needed; fresh food of course is essential, and a slight sprinkling of the branches and worms in very warm weather is advisable; although it is not so necessary as with *Yamamai*. It is remarkable that *Pernyi* worms, fed in the open air, on oak trees, do not, at present, thrive so well as those fed in-doors, but this, doubtless, is a question of acclimation. I advise white oak (*Quercus alba*) as food, if it can be readily obtained, but failing that, pin oak (*Quercus palustris*) will do; and I have no doubt that they will feed on any kind of oak. They will, indeed, feed on birch, and on sweet gum (*Liquidambar*), but oak is the proper food. It is worthy of remark that *Pernyi* bears a strong resemblance to our *Polyphemus*, but it is more easily reared in confinement, and double brooded; an important fact for the silk culturist. From American reared eggs, I obtained cocoons as early as July 4th, the perfect insect emerging on July 31. Copulation immediately ensued, and the resulting eggs hatched only on August 12, ten days only from the time of laying; and as the worm feeds up in about four or five weeks, this affords plenty of time for rearing the second brood. It must be remembered that on the quantity and quality of food, much depends, not only with *Pernyi* but with all caterpillars. By furnishing food sparingly the time of feeding would be much prolonged.

I have already said that both *Yamamai* and *Pernyi* should be fed under shelter for the reasons given, but there is another reason of less importance. The young worms are liable to be attacked by spiders and wasps, and even after the second month, they are not safe from these enemies. I have seen a wasp bite a large caterpillar in two, carry off the anterior section and return for the posterior, which had held on by its prolegs. Did the wasp anticipate this fact, and therefore carry off the anterior part first? As to the spiders, they form a series of pulleys and hoist the caterpillar off its legs, sucking its juices at leisure.

And now I must devote a few words to the advisability of silk culture from a pecuniary point of view. *Bombyx mori*, or the ordinary mulberry silkworm, is, of course, the best to rear, if you can obtain healthy eggs. But this is the difficulty, and thence arises the necessity of cultivating other silk-producing species. I imagine that silk can be produced in most of the States of the Union, and manufactured from the cocoon at a large profit; but for the present, we will leave the manufacture out of the question, and consider only, whether it will not pay to rear eggs and cocoons for sale? It must be remembered that European manufacturers are at this moment largely dependent on foreign countries for the supply of both eggs and cocoons; and this, because of the general prevalence of disease among all the races of *Bombyx mori*. And now, to what extent does the reader suppose this dependence exists? Of cocoons I have no returns at hand, but, of raw silk, European manufacturers purchase, annually, not less than $160,000,000 worth; and of eggs (*Bombyx mori*) to the value of $10,000,000. This, then, is a business of no trifling amount. California seems to be alive to the fact, and, I am informed, raised, this last season, $3,000,000 cocoons; and, for sale, about 4,000 ounces of eggs, worth at least $4 per ounce, wholesale. Now, there is no earthly reason why California should monopolize this business. Why are not companies formed in other States for this purpose? or if private individuals lack the enterprise or the means, why do not the legislatures, of those States most favorably located, do something by way of starting the business? A few thousand dollars loaned, or even donated, may prove to be a valuable investment for the people at large, and, even supposing a failure, would not be a very great loss to any body.

So far as farmers are concerned, it may interest them to know that one man in England, Capt. Mason, clears $50 per acre by rearing silkworms (*Bombyx mori* in this case), and I much doubt whether any crop raised here pays as well.

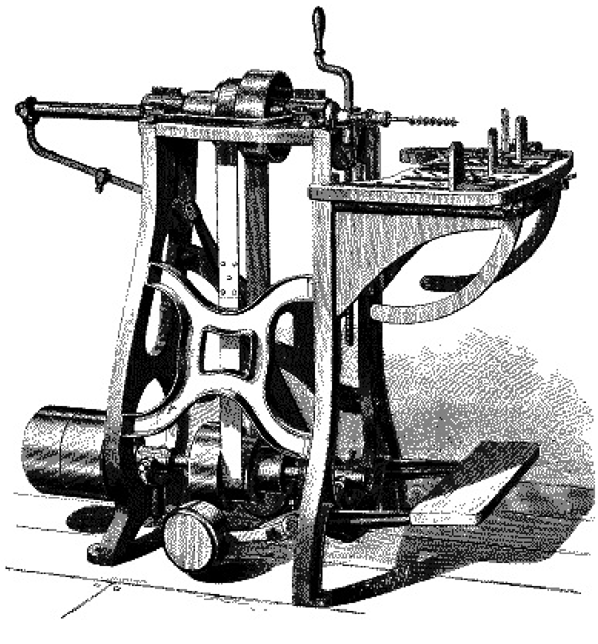
By way of commencement, then, let everybody that has sufficient leisure set to work, and rear as many silkworms, of the above-named species, as he possibly can; and if the process be not remunerative in a pecuniary sense, it most assuredly will be in the amount of pleasure and knowledge obtained.

One caution I must give to those who cultivate *Bombyx mori*. Although *Yamamai* requires sprinkled branches, *Bombyx mori* does not; nor must the leaves be furnished to them while wet with rain or dew.

Effect of Cold upon Iron.—The article upon this subject, giving experiments of Fairbairn and others, referred to in our editorial upon the same subject, in our last issue, was crowded out by press of matter. The reader will find it in the present number.

Universal Boring Machine.

Our readers will recollect an illustrated description of an universal wood-working machine, published on page 79, Vol. XIII. of the Scientific American. The machine herewith illustrated is manufactured by the same firm, and is a valuable addition to the many excellent wood-working machines now in use. A boring machine, though one of the simplest, is by no means an unimportant adjunct to a full outfit of wood-working machines. The one shown in our engraving is one of the most complete ever brought to our notice, and the great variety of work it is capable of performing, renders the name chosen for it peculiarly applicable. It is called the "Universal Boring Machine" because the most prominent feature of its construction is its power to bore a hole in any desired angle with the axis of the bit.



McBETH, BENTEL, & MARGEDANT'S UNIVERSAL BORING MACHINE.

Any sized bit required is inserted into the chuck, which is adjustable to fit large and small shanks. The mandrel which carries the chuck is made to traverse by a foot lever, so as to bore any depth up to twelve inches. The mandrel is driven by belt from a cone pulley of three faces, which gives the proper speeds for different sized bits.

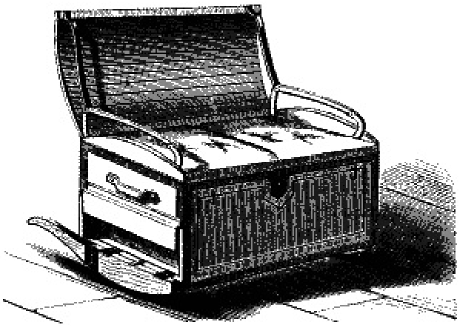
Slots and stops upon the table enable the work to be set at any desired angle on the horizontal plane, while the table can be set on an incline to any angle not exceeding forty-five degrees. The table is twenty-one inches wide, with fifteen inches slide, and it can be raised or lowered fifteen inches.

The countershaft rests in self-adjusting boxes, and has a tight and a loose pulley eight inches in diameter. The traversing mandrel is of the best quality of steel, and the machine is otherwise made of iron in a substantial manner.

The several adjustments enable the operator to do all kinds of light and heavy boring, with ease and with great rapidity.

This machine was awarded the first premium at the Cincinnati Industrial Exposition, in October, 1870, and was patented through the Scientific American Patent Agency, Aug. 16, 1870. It is manufactured by McBeth, Bentel and Margedant, of Hamilton, Ohio, whom address for machines rights to manufacture, or other information.

COMBINED TRUNK AND ROCKING CHAIR.

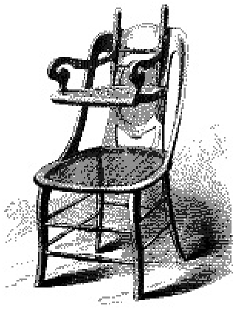


A unique invention, calculated to increase the comforts of travellers on steamboats, ships, and in crowded rooms of hotels, is illustrated in the engraving published herewith. It is the invention of T. Nye, of Westbrook, Me., and was patented by him, June 18, 1867. It is a combined trunk and rocking chair. The rockers are made to fold into recesses, where they are retained by suitable appliances till wanted. The trunk being opened, as shown, forms a back to the seat, which is held by metallic braces. When closed, the whole presents the appearance of an ordinary trunk.

Cosmetics.

The extensive use of preparations for hiding nature's bloom on the human countenance, and presenting to our view a sort of metallic plaster, suggests the inquiry, "how are these pigments made?" Without going into an unnecessary analysis of the "Bloom of Youth," the "Rejuvenator," the "Corpse Decorator," or the other inventions for destroying the skin, with which the druggists' stores abound, we may state again the fact, always unheeded, that all the detestable compounds are injurious. They are nearly all metallic poisons, and, if there be any that are innocent of this charge, they are in every instance harmful to the health. The color and surface of the skin cannot be changed by any application which does not close the pores; the pores, which are so exquisitely fine that there are millions of them to the square inch, and which must be kept open if a healthy and cleanly body is to be preserved. There is more breathing done through the pores of a healthy person than through the lungs; and we need not remind our readers of a ghastly piece of cruelty once enacted in Paris (that of gilding the body of a child, for a triumphal procession, which killed the subject in two hours), to show that the stoppage, in any degree, of the natural functions of so important an organ as the skin, is injurious. The immediate effect of the use of such compounds is to destroy the vitality of the skin, and to render it, in appearance, a piece of shriveled parchment. We must warn our readers that a temporary and meretricious "bloom" can only be attained at the cost of future freshness and lively appearance, so that a year or two of "looking like paint" is followed by a long period of "looking like dilapidation."

SMITH'S INFANT DINING CHAIR.



The accompanying engraving illustrates a convenient and cheap infant dining chair, which can be attached to any of the ordinary chairs in common use.

It consists of a chair without legs, suspended by the posts of the back, as shown, on pins engaging with hooked bars, which are placed upon the back of an ordinary chair. The details of the device will be seen by a glance at the engraving. The chair is adjusted in hight by placing the pins in the proper holes in the posts made for this purpose.

For further information, address Smith, Hollenbeck & Co., Toledo, Ohio.

The Medicines of the Ancients.

At the recent commencement of the Homeopathic College in this city, Mr. S. H. Wales, of the SCIENTIFIC AMERICAN addressed the graduating class, and from his remarks, we quote the following:

"Many writers of our time persist in regarding this, above all others, as the best period in the history of our race; and, doubtless, it is true in many important respects. But I cannot forbear the suggestion at this moment that there was a time in the history of the world when the science of medicine was unknown, when people lived to the incredible age of many centuries; and, even after the span of life had been reduced to threescore and ten, sickness was comparatively unknown. In ancient times, it was looked upon as a calamity, that had overtaken a tribe or people, when one of its members prematurely sickened and died.

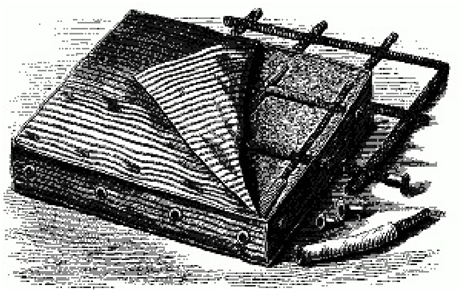
"Other arts and sciences flourished in Rome long before medicine was thought of; and the historian tells us that the first doctor who settled in Rome, some two hundred years before Christ, was banished on account of his poor success and the very severe treatment applied to his patients; and it was a hundred years before the next one came. He rose to great popularity, simply because he allowed his patients to drink all the wine they wanted, and to eat their favorite dishes. Some writer on hygiene has made the statement that the whole code of medical ethics presented by Moses consisted simply in bathing, purification, and diet. This simplicity of life was not confined to the wandering tribes who settled in the land of Canaan, but was the universal custom of all nations of which history gives us any account. This simple arrangement for health was considered enough in those primitive times, when the human system had not been worn out and exhausted by depletive medicines. The luxuries of public baths, athletic sports and games were deemed ample, both to educate the physical perceptions and to prevent disease.

"All this wisdom, which had its origin in ancient games and sports of the field, led to the erection of extensive bath-houses, and the adoption of other healthful luxuries to which all the people could resort to recreate their wasted powers."

BARNES' VENTILATOR FOR MATTRESSES, ETC.

Many diseases are caused by the use of beds not properly aired; and it is difficult, if not impossible, to properly air, or ventilate, a mattress, made in the usual manner. If this could be done more thoroughly than it generally is, much sickness would be avoided.

To secure this object cheaply and efficiently is the design of the invention herewith illustrated. By it a complete circulation of air through the mattress is secured, which carries off all dampness arising from constant use. Thus the mattress becomes more healthy for sleeping purposes, more durable and better fitted for the sick room. The ventilators consist of coiled wire, covered with coarse cloth (to prevent the stuffing closing up the tube), running through the mattress in all directions. The ends of the coils are secured to the ticking by means of metal thimbles, inside of which are pieces of wire gauze, to prevent insects getting in, but which admit air freely. The cost of the ventilators is small, and they will last as long as any mattress. They can be applied to any bed at small expense.



This invention was patented through the Scientific American Patent Agency, January 10, 1871. The right to manufacture will be disposed of in any part of the country. Further information can be obtained by addressing the proprietors, Barnes & Allen, Hoosick Falls, N. Y.

THE third annual exhibition of the National Photographic Association takes place at Horticultural Hall, Philadelphia, June 6, 1871. Prof. Morton is to deliver two lectures on Light.

A SCIENTIFIC AND TECHNICAL AWAKENING.

Our English cotemporary, *Engineering*, appears to have seriously exercised itself in the perusal of our good-natured article on "English and American Scientific and Mechanical Engineering Journalism," which appeared in the SCIENTIFIC AMERICAN, February 4th; at least, we so judge from the tenor of an article in response thereto, covering a full page of that journal. The article in question is a curiosity in literature. It deserves a much wider circulation than *Engineering* can give it, and we would gladly transfer it to our columns, but for its exceeding length—a serious fault generally, not only with *Engineering's* articles, but most other technical journals published in England. It would scarcely do for them to be brief in their discussions, and above all other things, spice and piquancy must always be excluded. *Engineering* evidently labors under the conviction that the heavier it can make its discussions, the more profoundly will it be able to impress its readers. Hence, we are equally astonished and gratified to find a gleam of humor flashing out from the ordinary sober-sided composition of our learned contemporary. The article came to us just as we were laboring under an attack of dyspepsia, and its reading fairly shook our atrabilious *corpus*. We said to ourselves, "can it be possible that *Engineering* is about to experience the new birth, to undergo regeneration, and a baptism of fire?" The article is really worth reading, and we begin to indulge the hope that at least one English technical is going to try to make itself not only useful, but readable and interesting. And what is most perplexingly novel in this new manifestation, is the display of a considerable amount of egotism, which we had always supposed to be a sinful and naughty thing in technical journalism. And, as if to magnify this self-complaisance, it actually alludes to its "*own extensive and ever-increasing circulation in America*." Now to show how small a thing can impart comfort to the soul of our cotemporary, we venture to say that the circulation of *Engineering* in this country cannot much exceed three hundred copies per week.

It evidently amazes our English cotemporary that a journal like the SCIENTIFIC AMERICAN, which, according to its own notions, is chiefly the work of "scissors and paste," should circulate so widely; and it even belittles our weekly circulation by several thousand copies, in order to give point to its very amusing, and, we will also add, generally just criticism.

The writer in *Engineering*, whoever he may be, appears to be a sort of literary Rip Van Winkle, just waking out of a long sleep; and he cannot get the idea through his head that it is possible that a technical journal can become a vehicle of popular information to the mass of mankind, instead of being the organ of a small clique of professional engineers or wealthy manufacturers, such as seems to hold control of the columns of *Engineering*, and who use it either to ventilate their own pet schemes and theories, or to advertise, by illustration and otherwise, in the reading columns, a repetition of lathes, axle-boxes brakes, cars, and other trade specialities, which can lay little or no claim to novelty. It is, furthermore, a crying sin in the estimation of our English critic that American technical journals do not separate their advertisements from the subject matter; and he thinks that when Yankee editors learn that trade announcements are out of place in the body of a journal, they will see how to make their journals pay by making them higher priced. Now we venture to say, without intending to give offence, that Yankee editors understand their business quite as well as do English editors; and it is presumable, at least, that they know what suits their readers on this side, much better than do English editors. We venture to suggest—modestly, of course—that journalism in the two countries is not the same, and should the editor of *Engineering* undertake to transfer his system of intellectual labor to this side of the Atlantic, he would not be long in making the discovery that those wandering Bohemian engineers, who, he tells us, are in sorrow and heaviness over the short-comings of American technical journals, would turn out after all to be slender props for him to lean upon. We think it probable, however, that with a little more snap, a journal like *Engineering* might possibly attain a circulation, in this country, of 500 or 1000 copies weekly.

Why, American engineers have scarcely yet been able to organize themselves into an association for mutual advancement in their profession, much less to give the reading public the benefit of their experience and labors! This fact alone ought, of itself, to satisfy *Engineering* that no such journal could profitably exist in this country. Whenever our American engineers are ready to support such a journal, there will be no difficulty in finding a publisher.

Engineering, in its casual reference to the various technical journals of America, omits to name our leading scientific monthly, but introduces with just commendation a venerable cotemporary, now upwards of three score years of age. Now, it is no disparagement of this really modest monthly to say, that perhaps there are not sixty hundred people in the States who know it, even by name; and so far as the use of "scissors and paste" are made available in our technical journals, we venture the assertion that the editorial staff expenses of the Scientific American are as great, if not greater, than those of *Engineering*. The question, however, is not so much one of original outlay, but which of the two journals gives most for the money. In this very essential particular, and with no intention to depreciate the value of *Engineering*, we assert, with becoming modesty, that the Scientific American occupies a position which *Engineering* will never be able to attain.

THE SHERMAN PROCESS.

When people boast of extraordinary successes in processes the details of which are kept profoundly hidden from public scrutiny, and when the evidences of success are presented in the doubtful form of specimens which the public has no means of tracing directly to the process, the public is apt to be skeptical, and to express skepticism often in not very complimentary terms.

For a considerable time, the public has been treated to highly-colored accounts of a wonderful metallurgic process whereby the best iron and steel were said to be made, from the very worst materials, almost in the twinkling of an eye. This process has been called after its assumed inventor, or discoverer, the "Sherman Process." The details of the process are still withheld, but we last week gave an extract from an English contemporary, which throws a little light upon the subject.

The agent relied upon to effect the remarkable transformation claimed, is iodine, used preferably in the form of iodide of potassium, and very little of it is said to produce a most marvellous change in the character of the metal.

A very feeble attempt at explaining the rationale of this effect has been made, in one or two English journals, which we opine will not prove very satisfactory to chemists and scientific metallurgists. The *Engineer* has published two three-column articles upon the subject, the first containing very little information, and the second a great number of unnecessary paragraphs, but which gives the proportion of the iodide used, in the extremely scientific and accurate formula expressed in the terms "a small quantity."

Assertions of remarkable success have also been given. Nothing, however, was said of remarkable failures, of which there have doubtless been some. A series of continued successes would, we should think, by this time, have sufficed for the parturition of this metallurgic process, and the discovery would ere this have been introduced to the world, had there not been some drawbacks.

We are not prepared to deny *in toto* that the process is all that is claimed for it; but the way in which it has been managed is certainly one not likely to encourage faith in it.

The very name of "process" implies a system perfected, and if it be still so far back in the experimental stage that nothing definite in the way of results can be relied upon, it is not yet a process. If, in the use of iodine, in some instances, fine grades of iron or steel are produced, and in as many other experiments, with the same material, failures result, it is just as fair to attribute the failures to the iodine, as the successes. A process worthy the name is one that acts with approximate uniformity, and when, in its use, results vary widely from what is usual, the variation may be traced to important differences in the conditions of its application.

On the whole, we are inclined to believe Mr. Sherman's experiments have not yet developed a definite process, and we shall receive with much allowance the glowing statements published in regard to it, until such time as it can face the world and defy unbelief.

The patents obtained by Mr. Sherman seem to cover the use of iodine, rather than the manner of using it, and throw no light upon the rationale of the process.

A patent was granted by the United States Patent Office, Sept. 13, 1870, to J. C. Atwood, in which the inventor claims the use of iodide of potassium in connection with the carbons and fluxes used in making and refining iron. In his specification he states that he uses about *fifteen grains* of this salt to eighty pounds of the metal. This is about $\frac{1}{373}$ of one per cent. He uses in connection with this exceedingly small proportion of iodide of potassium, about two ounces of lampblack, or charcoal, and four ounces of manganese, and asserts that steel made with these materials will be superior in quality to that made by the old method. These claims we are inclined to discredit. Certainly, we see no chemical reason why this small amount of iodide should produce such an effect, and the specification itself throws no light upon our darkness.

If the experiments in these so-called processes have no better basis than is apparent from such information as at present can be gathered respecting them, it is probable we shall wait some time before the promised revolution in iron and steel manufacture is accomplished through their use.

RUBBER TIRES FOR TRACTION ENGINES.

When it was first discovered that a smooth-faced driving wheel, running on a smooth-faced rail, would "bite," the era of iron railways and locomotive engines may be said to have fairly commenced. The correction of a single radical error was, in this case, the dawn of a new system of travel, so extensive in its growth and marvelous in its results, that even the wildest dreamer could not, at that time, have imagined the consequences of so simple a discovery.

A popular and somewhat similar error regarding the bite of wheels on rough and uneven surfaces, has also prevailed. We say popular error, because engineers have not shared it, and it has obtained, to any notable extent, only among those unfamiliar with mechanical science. The error in question is, that hard-surfaced wheels will not bite on a moderately rough surface, sufficiently to give an efficient tractile power. It seems strange that this error should have diffused itself very extensively, when it is remembered that a certain degree of roughness is essential to frictional resistance. The smoothness of the ordinary railway track is roughness compared to that of an oiled or unctuous metallic surface; and it has been amply demonstrated that the resistance of friction, of two bearing surfaces depends, not upon their extent, but upon the pressure with which they are forced together. A traction wheel, of given weight, resting upon two square inches of hard earth or rock, would develop the same tractile power as though it had a bearing surface of two square feet of similar material.

On very rough and stony ways, however, another element practically of no importance on moderately rough ways, like a macadam surface or a concrete road, where the prominences are nearly of uniform hight, and so near together as to admit between their summits only very small arcs of the circumference of the wheel; comes into action. This element is the constantly recurring lifting of the superincumbent weight of the machine. Even this would not result in loss of power, could the power developed in falling be wholly applied to useful work in the direction of the advance of the engine. The fact is, however, that it is not so applied, and in any method of propulsion at present known to engineering science, cannot be so applied. Above a certain point where friction enough is developed to prevent slip, the more uneven the road surface is, the greater the power demanded for the propulsion of the locomotive. And this will hold good for both hard and soft-tired wheels.

What then is the advantage, if any, of rubber-tired wheels? The advantages claimed may be enumerated as follows: increased tractile power, with a given weight, secured without damage to roadways; ease of carriage to the supported machinery, whereby it—the machinery—is saved from stress and wear; and economy of the power, expended in moving the extra weight required by rigid-tired wheels, to secure the required frictional resistance. The last-mentioned claim depends upon the first, and must stand or fall with it. The saving of roadway, ease of carriage, and its favorable result upon the machinery, are generally conceded.

A denial of the first claim has been made, by those interested in the manufacture of rigid-tired traction engines and others, in so far as the rubber tires are employed on comparatively smooth surfaces; although the increased tractile power on quite *rough* pavements and roads is acknowledged.

This denial is based upon results of experiments performed on the streets of Rochester, England, between the 9th October and the 2nd November, 1870, by a committee of the Royal Engineers (British Army), with a view to determine accurately the point in question.

Care was taken to make the circumstances, under which the trials took place, exactly alike for both the rubber and the iron tires. The experiments were performed with an Aveling and Porter six-horse power road engine, built in the Royal Engineers' establishment. The weight of the engine, without rubber tires, was 11,225 pounds; with rubber tires, it weighed 12,025 pounds. Without rubber tires it drew 2.813 times its own weight up a gradient of 1 in [missing]; with rubber tires, it drew up the same incline 2.763 times the weight of engine, with the weight of rubber tires added; showing that, although it drew a little over 2,200 pounds more than it could do without the rubber tires, the increase of traction was only that which might be expected from the additional weight.

It is claimed, moreover, that the additional traction power and superior ease of carriage on rough roads, secured with rubber tires, is dearly bought at the very great increase in cost, of an engine fitted with them, over one not so fitted.

This is a point we regard as not fully settled, though it will not long remain in doubt. There are enough of both types of wheels now in use to soon answer practically any question there may be of durability (upon which the point of economy hinges), so far as the interest on the increased cost due to rubber tires, is offset against the greater wear and tear of iron rimmed wheels. It is stated, on good authority that a rubber tired engine, started at work in Aberdeen, Scotland, wore out its tires between April and September, inclusive, and when it is taken into consideration, that the cost of these tires is about half that of other engines, made with solid iron rimmed driving wheels, it will be seen that, unless very much greater durability than this can be shown for the rubber, the advantages of such tires are very nearly, if not more than, balanced by their disadvantages.

The fact that one set of tires wore out so soon does not prove a rule. There may have been causes at work which do not affect such tires generally, and it would be, we think, quite premature to form favorable or unfavorable judgment, of relative economy from such data as have been yet furnished.

The difference in the current expenses of running the two most prominent types of engines, with hard and soft tires, now in use, does not affect the question of rubber tires, unless it can be shown that these tires necessitate, *per se*, such a form of engine as requires a greater consumption of fuel, and greater cost of attendance, to perform a given amount of work.

CENTRAL SHAFT OF THE HOOSAC TUNNEL.

As many of our readers have evinced much interest and ingenuity on the question of the propriety of placing reliance upon the accuracy of dropping a perpendicular from the top to the bottom of a shaft 1,030 feet in depth, by means of an ordinary plummet, we take the earliest opportunity of settling the matter beyond dispute, by reporting the results lately obtained, through a series of experiments by the engineers in charge, for the ultimate purpose of laying down the correct line for the tunnel.

The perpendicular line has, of course, been dropped many times, and the main result taken. The plummet used is made of steel, properly balanced and polished, in shape something like a pineapple, and of about the same size, weighing fifteen pounds. It was suspended, with the large end downwards, by a thin copper wire, one fortieth of an inch in diameter, immersed in water; and, after careful steadying with the hand, occupied about an hour in assuming its final position or motion, which, contrary to the expectation and theories of many, resulted in a circular motion around a fixed point, the diameter of the circle being a mean of one quarter of an inch. The suspending wire in these operations was not quite the entire length of the shaft, being only 900 feet; and before the plummet had settled, the wire had stretched nearly twenty feet.

The suspension of the plummet in water was not considered necessary for any other reason than that water was continually trickling down the wire, and dropping on the plummet. The experiments so far have not been of the perfect character it is determined to attain, when the final alignment is made, as, until the headings east and west of the shaft have advanced to a considerable distance, any slight error would be of no account.

A neat and ingenious instrument has been constructed for determining the variation of the plummet, and will be used when great accuracy is desired; the plummet will also be suspended in oil.

The bearing of the tunnel is about S. 81° E.; but, independently of its near approach to the line of revolution described by the earth, it is not considered necessary to take into account any motion it may derive from this cause. In fact, the opinion is, that the motion of the earth will not practically have any effect.

On the whole, after the still imperfect experiments which have been made, enough is established to show there is no difficulty to be encountered, other than the accurate and delicate manipulation of the plummet and its attachments.

The shaft headings are progressing favorably. The rock is not so hard or varied as that met with at the west end markings. Already nearly 300 feet have been taken out, and with the proved energy of the contractors, this great task will doubtless be prosecuted steadily and surely to completion, within the contract time expiring March 1, 1874.

A MUSEUM OF ART AND NATURAL HISTORY.

Our recent articles on "Scientific Destitution in New York" and "The Scientific Value of the Central Park," have called forth numerous letters from correspondents, and have been extensively noticed by the press. We now learn that the legislature of the State has taken the matter in hand, and there is some prospect, with an honest administration of the appropriations, of something being done to relieve our city of the opprobrium that rests upon it. A bill is pending, before the Senate, authorizing the Park Commissioners to build, equip, and furnish, on Manhattan Square, or any other public square or park, suitable fire-proof buildings, at a cost not exceeding $500,000 for each corporation, for the purpose of establishing a museum of art, by the Metropolitan Museum of Art, and of a museum of natural history, by the American Museum of Natural History, two societies recently incorporated by the Legislature. This is a million dollars to begin with, and an ample site, without cost, to the aforementioned corporations.

Manhattan Square extends from Seventy-seventh to Eighty-first streets, and from Eighth to Ninth avenues, and spans about eighteen acres. Until it was set apart by the state Board of Commissioners, for the purposes of a Zoological Garden, it was proposed, by a number of enlightened citizens of New York, to devote it to the uses of four of our existing corporations, giving to each one a corner, and an equal share in the allotment of space. The societies were, "the Academy of Design," for art, "the Historical Society," for public records and libraries, "the Lyceum of Natural History," for science, and "the American Institute," for technology. These have been incorporated for many years, and are known to include the leading artists, men of letters, science, and the arts, of the city, on their lists of members. The committee went so far as to have plans of the building drawn by competent architects; but, like many other well-meant schemes, want of money compelled the originators of the plan to abandon any further attempts. In the meantime, the Legislature chartered the American Botanical and Zoological Society, and gave the Commissioners of the Park authority to set apart a portion of it, not exceeding sixty acres, for the use of the Society, for the establishment of a zoological and botanical garden. This society was duly organized under the act, and Mr. Hamilton Fish was made its president, and considerable sums of money were subscribed. But, according to the sixth annual report of the Board of Commissioners, "the society never manifested its desire for an allotment of ground." It appears to have died, and made no sign. Some of our citizens, fearing that the Central Park would go the way of every other public work in the city, made strenuous effort to revive the Zoological Society, for the purpose of obtaining a perpetual lease of a suitable site, on which to establish a zoological garden, similar to those in London, Paris, Amsterdam, and Cologne. Their object was to remove this part of the Park beyond the reach of political intrigue. Subsequent events have shown that the fears of these gentlemen were well founded. The Legislature of the State, on the 25th of March, 1862, gave ample powers to the New York Historical Society to establish a Museum of Antiquity and Science, and a Gallery of Art, in the Central Park. They have submitted designs for a building, but, for some reason, no decisive steps have been taken towards its construction.

The Lyceum of Natural History was also negotiating with the Commissioners, for the use of the upper rooms of the arsenal for its collections, and there is no doubt that an arrangement to this effect would have been made, if a fire had not destroyed the entire collections of the Lyceum. The Lyceum made great effort to raise money to purchase a new collection, but without avail; and, although this is the oldest scientific society in New York, and has inrolled in its list of members, nearly every professional scientist of the city, it is probably the poorest, in income and resources, of any academy of sciences in the world. We do not know that the Academy of Design has ever applied for a home in the Central Park; and we cannot speak for the American Institute, nor for the Geographical Society, in this particular. As we stated in our former article, the old Board of Commissioners appears to have become weary of the unsuccessful attempts on the part of numerous societies to divide up and apportion the Central Park, and they applied to the Legislature for authority to conduct matters in their own way. An act was duly passed, authorizing the Board "to erect, establish, conduct, and maintain, on the Central Park, a Meteorological and Astronomical Observatory, a Museum of Natural History, and a Gallery of Art, and the buildings therefor, and to provide the necessary instruments, furniture, and equipments for the same."

Here would seem to be ample power for the establishment of museums of science and art, but nothing is said about the manner of raising the money. One would suppose, however, that, by means of the "Central Park Improvement Fund," abundant means could have been raised. The bill now before the Legislature puts matters in a new light. If it does not conflict with previous enactments, nor destroy vested rights, it has the appearance of being a thoroughly practical way of solving the question of art and science for the city. The Metropolitan Museum of Art and the American Museum of Natural History are in the hands of the most respectable citizens of New York. It would not be possible to find a body of men of more unimpeachable integrity and greater worth, than the gentlemen who have founded these two societies. It is impossible that they should lend their names to anything that will not bear the closest scrutiny; hence the proposition, now before the Legislature, to put up buildings for them, at a cost of a million dollars, must attract unusual attention. If the State would appropriate the money to these corporations, giving them the control of its expenditure, we should have considerably more confidence in its honest administration than, we are grieved to say, we can feel under the present circumstances; and if we knew what other institutions are to have the remaining portions of Manhattan Square, it would be a great relief to our minds.

"We fear the Greeks bringing gifts," but are willing to accept the gifts, if the officers of the two organizations are certain that it is all right.

The need of a Museum of Natural History, and of a Gallery of Art, in New York, is so pressing that there is some danger of our accepting the appropriations without a proper regard to consequences. The Court House is not yet finished, and the foundations of the Post-office are scarcely laid.

REPORT OF THE JUDGES OF GROUP 1, DEPARTMENT V. OF THE EXHIBITION OF THE AMERICAN INSTITUTE FOR 1870. THE ALLEN ENGINE.

The labors of the judges in this department were much lighter in the last exhibition than in the preceding one, and we are happy to say, were, in our opinion, so far as the award of premiums is concerned, much more fairly performed. The award of two first premiums to two competing engines could scarcely be repeated this time, as there was in reality no competition. The Allen engine was the only important one entered, and of course received the first premium. The engine is, however, one that evidently could have competed favorably with those previously exhibited.

We are in receipt of advanced sheets of the judges' report pertaining to the critical examination of this engine, being a record and account of experiments performed under the supervision of Washington Lee, C. E. The experiments were very comprehensive, and comprised approved tests, of each important detail, usually made by expert engineers.

The report is too voluminous for reprint or even for condensation in our columns. In looking it through, we are satisfied that the experiments were accurately made, and that the engine exhibited great working efficiency and economy.

As the engine has been recently illustrated and described in our columns, we deem it unnecessary to dwell upon the details of its construction. The water test of the previous exhibition was employed, the water being this time measured, with indisputable accuracy, in a tank, instead of by a meter as before.

The voluminous comparison of this engine with those previously exhibited, seems unnecessary, and we think not in good taste in such a report, however much it may possess of scientific interest. Moreover, the circumstances under which the trials were respectively performed, render the comparison difficult, if not unfair.

Mr. Lee concludes his report with a thorough endorsement of the theory of Mr. Porter upon the action of the reciprocating parts of engines, as set forth by the last named gentleman in recent articles in this journal. He says:

"Under the resistance of 128.375 horse powers at the brake, the motion of the engine was remarkably uniform; not the least diminution of speed in passing the centers could be detected, illustrating very satisfactorily the value, in this respect, of the speed employed, and of the action of the reciprocating parts of the engine in equalizing the rotative pressure on the crank through the stroke. The governor was, during the trials and through the exhibition, nearly motionless, while the load remained constant, and instantaneous in its action on changes of resistance, maintaining a steadiness of running which left nothing to be desired."

The judges—Prof. F. A. P. Barnard, Thos. J. Sloan, and Robert Weir—speak in their report as follows:

"The performance of this engine has exceeded that of the two fine engines which were on trial here last year. The results seem to be without precedent in such engines. The engine ran from 11 to 12 hours repeatedly without showing a sign of a warm bearing, displaying thorough perfection in all its parts. In all respects the engine is first-class, and from the fact of its presenting weight with speed, as a requisite for perfection in steam engines, it has opened a new era in this necessary branch—its economy having been clearly demonstrated in the careful trials, which ought to be published in full."

LYCEUM OF NATURAL HISTORY.

There was an unusually large attendance of members at the meeting of the Lyceum of Natural History, on Monday evening, the 6th inst., to listen to an address by Professor B. Waterhouse Hawkins, on the progress of the work of the restoration of the forms of extinct animals in the Central Park. Mr. Hawkins gave an account of the difficulties he encountered at the outset, in finding any skeletons of animals in New York, with which to make comparisons, and he was finally compelled to go to Boston and Philadelphia for this purpose. After much study and many delays, the casts of the *Hadrosaurus* were completed, and numerous smaller skeletons prepared. At this stage of the proceedings an entire change in the administration of the Park took place, and the newly appointed Commissioners decided to suspend the work upon the Palæozoic Museum, and they dismissed Mr. Hawkins from their service.

The announcement that an end had thus been summarily put to one of the most important educational projects ever started in this country, was received by the Lyceum with profound surprise. For a few minutes after the close of Mr. Hawkins' report, no one felt disposed to make any comment, but as the truth of the great damage became apparent, there was considerable disposition manifested to have the Society give expression to its sense of the value of Mr. Hawkins' services in the cause of education, and their regret that so important a work should be suspended at this critical period. Remarks were made by Dr. Newbery, Professor Joy, Mr. Andrew H. Green, Professor Seely, Dr. Walz, Mr. Squier, and others, and the following resolutions E. G. were unanimously adopted:

> *Resolved*, That the Lyceum of Natural History, in the city of New York, has learned with deep regret of the temporary suspension of the work of restoration of the forms of extinct animals, as hitherto prosecuted in the Central Park, under the able superintendence of Professor Waterhouse Hawkins.
>
> *Resolved*, That the Society considers the proposed palæozoic museum not only a valuable acquisition to the scientific treasures and resources of the city, but also as a most important adjunct and complement to our great system of public education.

WARMING AND VENTILATION OF RAILROAD CARS.

There has been enough of denunciation against the present general method of warming and ventilating railway cars. It produces no effect on the corporations who could, if they would, adopt appliances that would not burn people to death in cases of accident, nor regularly and persistently poison them with bad air.

There is no lack of ways and means; the problem is simple and easily solved; nay—a not very extensive search through the Patent Office records will show that it has been solved already; perhaps not in the most practical and perfect manner, but still solved so well, as, were it not for corporation cupidity, would greatly add to the comfort and safety of passengers.

The real problem is how to compel corporations to recognize the fact that the public has rights they are bound to respect. It is the disregard of these rights that fills our cars with smoke, dust, and exhalations, and puts box stoves full of hot coals in the corners, ready to cook the human stew whenever a frisky car shall take a notion to turn a somersault. The invention needed is a conscience for corporations—an invention, by the way, scarcely less difficult than the one advertised for in our last issue, namely, a plan for preventing the sale of intoxicating liquors and tobacco in New Jersey.

The *Railroad Gazette*, imitating the English ideal of prolixity in discussion, for which *Engineering* has recently patted it on the back approvingly, treats us, in its issue of February 11th, to a page article, to be continued, under the title of "Warming and Ventilation of Railroad Cars." In this article the writer takes the ground that people in general are ignorant of the effects of pure air, and not being able to "see the foulness," they "therefore do not believe it exists." It is quite possible they may not be able to see the foulness, but if in the majority of railroad cars run in this country, they are not able to feel it in gritty, grimy accumulations on skin and linen, and smell it in suffocating stenches which serve, with sneeze-provoking dust, to stifle anything like comfort, their skin must be thicker, their linen more neglected, and their noses less sensitive than those of the majority of fellow travellers it has been our fortune to be cooped up with for a day's railroad journey.

The *Railroad Gazette* makes this wholesale charge of ignorance and insensibility the excuse for an essay on the physiology of respiration, mostly extracted from Huxley's "Elementary Lessons in Physiology," and therefore excellent in its way, though having a somewhat remote bearing upon the subject as announced in the title of the article. We trust that before this journal concludes its series of articles thus commenced, it will tell how to breathe into the breasts of the corporations which choke us in their human packing boxes, something resembling the soul which they are universally acknowledged to be destitute of. When this is done, carbonic acid, ammoniacal smells, organic exhalations, smoke, and dust, will be invited to shun the interiors of railway cars, and comparative comfort will descend upon the peregrinating public.

THE MINERAL RESOURCES OF MISSOURI.

The incalculable wealth, which lies hid in the bosom of Mother Earth, in our vast possessions of the West, is undoubtedly centered in the State of Missouri; and the development of this fund of riches must add to the national prosperity, not only by its immeasurable intrinsic value, but by its affording occupation to armies of laborers, the latter being the highest and most important consideration.

In 1852-3, a geological survey of the State was wisely decided upon, and a liberal provision for its execution made. Two valuable reports, by Professor Swallow, have been printed, in the year 1855, but the notes of his subsequent investigations have not been made public.

In the session of 1869-70, further action, in this important public work, was taken by the State legislature, and arrangements made for a still more accurate and detailed examination, under the direction of Professor A. D. Hager, of Vermont.

The distribution of metals all over the State will be seen in the following figures, taken from the St. Louis *Journal of Commerce*, which show the number of counties in which the various ores are found: Iron in 46 counties, lead in 43, coal in 36, copper in 24, marble in 11, zinc in 27, fire clay in 16, barytes in 10, nickel in 6, granite in 4, tin in 4, plumbago in 2, gypsum in 2, alum in 1, antimony in 4.

There is probably no country in the world so endowed as this. Of iron alone, according to the State geologist's report for 1855, there is ore of the best quality, sufficient to furnish 200,000,000 tuns of iron; and this quantity lies in a small space, in the vicinity of Pilot Knob and Iron Mountain, and within 100 miles of St. Louis.

The quality of the iron is highly spoken of by the manufacturers, and the capacity of the smelting appliances has reached to over 150,000 tuns per annum. The coal is well suited for reduction of ores, either by hot or cold blast treatment. The Scotia Iron Co. commenced operations in January, 1870; and, although the materials for building blast furnaces had to be carried 80 miles into a desert, the first furnace was blown into blast in August, 1870. This furnace will run about 24 tuns per day. The company procures ore from a hill, near the furnace, in which there is an apparently inexhaustible supply of red oxide and brown specular. This ore yields 60 per cent of pure metal. The erection of mills for making wrought iron is contemplated, and the high quality and prodigious quantity of the raw material will justify and reward any outlay of capital in this direction.

The shipment of ore to other States goes on constantly, the last year's account showing that 246,555 tuns were dispersed over Indiana, Ohio, and others. The furnaces at Kingsland, South St. Louis, Lewis Iron Co.'s Works, Carondelet, and Maramec are all well situated as to coal and limestone, the Maramec Works having a most valuable water-power. These latter works also ship about 40,000 tuns red hematite ore yearly.

SCIENTIFIC INTELLIGENCE.

According to *Petermann's Mittheilungen*, the new German empire, including Alsatia and Lorraine, will embrace 9,901 square miles, with 40,148,209 inhabitants. Russia alone will exceed it in extent and population, for Russia in Europe has 100,285 square miles with a population of 69,379,500. France, after the loss of Alsatia and Lorraine, will have 9,588 square miles of territory, with 36,428,548 inhabitants. Austria will number 35,943,592 inhabitants spread over a larger extent of country, namely, 10,980 square miles. Great Britain and Ireland has 5,732 square miles, with 30,838,210 inhabitants; and Italy, including Rome, has 5,376 square miles, with 26,470,000 inhabitants. In the order of population, the Governments will stand: Russia, Germany, France, Austria, and England; but in military power, the first position must henceforth be accorded to Germany.

AMERICAN INSTITUTE OF MINING ENGINEERS.

A circular has been issued by several mining engineers, proposing a meeting at Wilkes-Barre, some time in April or May next, of all persons interested in the general subjects of mining and metallurgy, for the purpose of establishing an association, to be called "The American Institute of Mining Engineers." The Institute will hold meetings periodically "in the great mining and metallurgical centers, when works of interest, such as mines, machine shops, furnaces, and other metallurgical works, can be inspected, and the members exchange their views, and consult, for mutual advantage, upon the difficulties encountered by each." There will be the usual publication of "Transactions" and "Proceedings."

The idea of forming an association of persons thus mutually interested in each other's occupations, is an excellent one; but it has been suggested by a number of scientific gentlemen that the American Association for the Advancement of Science offers every facility for the accomplishment of the objects set forth in the circular, while it affords the very great advantage of an assemblage of men learned in all departments of knowledge, whose acquaintance mining engineers would do well to make, and from whom they could learn much, while at the same time imparting of their own knowledge.

As a section of the American Association, the mining engineers would have more influence before the country, and it would perhaps be well for them to stop and consider before establishing a separate institute.

CONSUMPTION OF SUGAR, COFFEE, AND TEA.

E. Behm gives in his geographical year book, for 1870, the following estimate of the consumption of sugar, coffee, and tea, *per capita*, in various countries:

COUNTRIES.	Sugar, lbs.	Coffee, lbs.	Tea, lbs.
Great Britain	35.96	0.90	3.190
United States	24.63	5.68	. . . .
Holland	14.86	7.03	0.800
France	14.30	2.32	0.018
Norway	11.04	6.92	0.060
Sweden	9.80	0.80	0.060
Switzerland	9.60	5.28	. . . .
Germany	9.42	4.03	0.035
Denmark	9.00	3.40	0.400
Belgium	7.18	8.59	0.018
Portugal	6.33	0.69	0.040
Italy	5.20	0.90	0.020
Austria	4.93	1.30	0.012
Spain	4.23	0.01	0.040
Russia	2.40	0.007	0.160

The entire consumption of sugar in Europe has averaged, during the last few years, three thousand four hundred and ten million pounds (3,410,000 pounds), and for the whole world it is set down at nearly twice that amount. It is estimated that three fourths of the sugar is made from cane, and one fourth from the beet.

The consumption of coffee has doubled in most countries during the last twenty years.

Unpleasant Discovery in the Patent Office—Levying Black Mail.

"The Patent Office has been, during the past week, in a high state of excitement, occasioned by the discovery of the operations of E. W. W. Griffin, clerk in charge of the draftsmen's division, who, it appears, has been levying black mail on the lady employés of the office, for nearly two years. During the administration of Colonel Fisher, late Commissioner of Patents, a large number of ladies were employed, for the purpose of recopying drawings, when ordered by the inventors, of patents already on file.

"These ladies were placed under charge of Griffin, with power to retain them in office so long as their services were satisfactory. It has been proved that Griffin hired the ladies at regular salaries of $1,000 per annum, the most of whom he blackmailed to the amount of $400 per year each. It is estimated that he has made $1,000 per month for the past two years.

"The matter was brought to the notice of Commissioner Duncan, and an investigation ordered, which resulted in the dismissal of Griffin.

"It is thought that there are other cases of this kind, and the Commissioner expresses his determination to ferret them all out, and make a clean sweep of all parties in his department engaged in swindling operations, against the government or against individuals.

"The Patent Office has for a long time been considered a rich field for operations of this kind, and investigations have often been suggested, but passed unheeded by the proper authorities.

"It is openly stated that an investigation into the relations existing between certain examiners of patents and certain patent agents, would disclose a more fearful state of blackmailing than exists in all the other government departments combined."

[We find the above sensational paragraph among the recent Washington items of the *Evening Mail*. We are in a position to say that "the high state of excitement" alluded to has existed only in the brain of the newspaper correspondent. The facts, in brief, are these: In July, 1869, a lady, and wife of one of the clerks in the draftsmen's room, made application to Commissioner Fisher for a position in the copying division of the same department; and, upon the urgent solicitation and recommendation of Mr. E. W. W. Griffin, chief of the division, she was appointed, and has held the position from that time until now, receiving as salary $1,000 per annum, which, with the full knowledge of her husband, she has divided with Griffin, in consideration of his services in procuring for her the appointment. About a month ago, one of the lady's friends got hold of the matter, and reported it to the Court, which resulted in an investigation and the subsequent dismissal of Griffin. This is the only case of the kind that we have heard of, and we have no reason to believe that there is any other, or that corruption exists in the Examining Corps, as alleged.

—Eds.

A method of testing the purity of samples of water, by watching the rapidity of its action on soap and similar compounds, has been introduced by the French *savants*, MM. Boutron and Boudet. The experiment tests, at the same time, the purity of the soap. Dissolved in water in which lime is held in solution, the soap is precipitated in hard white flakes. If the quantity of soap put in the lime water be noted, it will be found that the smaller the quantity producing precipitation, the purer the soap. The *Journal de Pharmacie et de Chemie* (of Paris) reports some experiments, on this subject, by M. F. Schulze.

Louisiana State Fair.—The fifth State fair of the Mechanics, and Agricultural Fair Association of Louisiana will commence in the city of New Orleans, on Saturday, April 8, 1871, and continue nine days. Over $20,000 in premiums are offered. Rules, regulations, and schedule of premiums may be obtained of the Secretary and Treasurer, Luther Homes, Esq., New Orleans, La.

Knitted Goods.—John Kent advertises, in this paper, valuable machinery for the manufacture of knitted goods, to which we invite the attention of all who are interested in this branch of industry. Mr. Kent has devoted many years to the perfection of these machines.

Kaolin, a white clay, used largely in the adulteration of flour, starch, and candles, is found near Augusta, Ga., and is sent to the Northern States in large quantities.

We are indebted to James Vick, practical florist, Rochester, N. Y., for a choice variety of flower seeds.

NEW BOOKS AND PUBLICATIONS.

A Complete Guide for Coach Painters. Translated from the French of M. Arlot, Coach Painter, for Eleven Years Foreman of Painting to M. Eherler, Coach Maker, Paris. By A. A. Fesquet, Chemist and Engineer. To which is added an Appendix, containing Information respecting the Materials and the Practice of Coach and Car Painting and Varnishing, in the United States and Great Britain. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street. London: Sampson Low, Son & Marston, Crown Buildings, 188 Fleet street. 1871. Price, by mail, to any part of the United States, $1.25.

> This is another of the large number of practical works and industrial treatises issued from the press of Mr. Baird. It is intended as a practical manual for the use of coach painters, and we must say, upon examination of its contents, that we think it admirably adapted to meet the wants of that class of artisans for which it has been prepared. There is perhaps no department of decorative art in which there is greater room for the display of skill and taste than in coach painting. This work, however, does not deal with the subject of art, to any great extent. Its aim is to give information in regard to colors, varnishes, etc., and their management in carriage painting in the plainest manner, and in this way it thoroughly fulfils the intention of the author.

On the Generation of Species. By St. George Mivart, F.R.S. London: Macmillan & Co. 1871.

> The Darwinian theory of the Origin of Species, has, perhaps, aroused more attention, excited more dispute, and won more converts in a shorter time among scientific and unscientific men, than any other of equal importance promulgated in the 19th century. It seems to be the rule either to swallow the theory whole, or reject it as unworthy of belief, and as conflicting with orthodoxy. The author of the work before us has, however, taken a middle ground, from which we opine it will be difficult to dislodge him, though it is within full range of the batteries of both the contending parties. While he admits the truth of Darwin's views regarding the operation of natural selection as a cause of the origin of species, he denies that it is the sole cause, yet maintains that if it could be demonstrated to be the sole cause, it would in no manner conflict with orthodox belief in the Scriptures as the revelation of God to mankind. The perfect candor of the author is one of the marked features of the discussion, and his style is a model of pure terse English writing, seldom, if ever, excelled by any scientific writer. The work is an octavo, most beautifully printed on tinted paper, and illustrated by many fine wood engravings.

The Architect's and Builder's Pocket Companion and Price Book, Consisting of a Short but Comprehensive Epitome of Decimals, Duodecimals, Geometry and Mensuration; with Tables of U. S. Measures, Sizes, Weights, Strengths, etc., of Iron, Wood, Stone, and Various Other Materials; Quantities of Materials in Given Sizes and Dimensions of Wood, Brick, and Stone; and a Full and Complete Bill of Prices for Carpenter's Work; also Rules for Computing and Valuing Brick and Brick Work, Stone Work, Painting, Plastering, etc. By Frank W. Vogdes Architect. Philadelphia: Henry Carey Baird, Publisher, 406 Walnut street. Price by mail, postpaid, $2.

> This is a small work, but printed in small type, and containing a large amount of useful matter, thoroughly indexed for reference; bound in morocco; and provided with a clasp, so as to be conveniently carried in the pocket.

Gas Superintendent's Pocket Companion for the year 1871. By Harris & Brother, Gas Meter Manufacturers, Nos. 1115 and 1117 Cherry street, Philadelphia. Philadelphia: Henry Carey Baird, Industrial Publisher, 406 Walnut street.

> We find in this pocket-book much of interest to gas consumers, as well as to gas makers. The subject of meters is fully discussed. The work is bound in pocket-book style, in flexible morocco binding. Price, by mail, postpaid, $2.

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.

all sizes. Address H. W. Knight, Seneca Falls, N. Y.

Improved mode of Graining Wood, pat. July 5, '70, by J. J. Callow, Cleveland, O. See illustrated S. A., Dec. 17, '70. Send stamp for circular.

Can a round, spring-steel rod be drawn to any desired length, with a true taper to a point, with equal elasticity the whole length, and rolled temper? What is the price per hundred pounds, and where can they be procured? Answer "Sportsman," Malone, N. Y.

Manufacturers of Foot Lathes and other light machinery please address Geo. B. Kirkham, 167 E. 33d st., N. Y. city. Business of importance!

Safety Kerosene Lamps (Perkins & House's Patent). Explosion or breaking impossible; light equal to gas, and no odor. Families supplied and canvassers appointed, by Montgomery & Co., 42 Barclay st., New York, or Cleveland, O.

All parties wanting a water wheel will learn something of interest by addressing P. H. Wait, Sandy Hill, N. Y., for a free circular of his Hudson River Champion Turbine.

Ashcroft's Low Water Detector, $15; thousands in use; 17 year's experience. Can be applied for $1. Send for circular. E. H. Ashcroft, Boston, Mass.

Wanted.—Machines for manufacturing Pails, Tubs, and Matches. Also, competent man to superintend construction of buildings, and manage all parts of business when complete. Address, with descriptive circulars, price, etc., No. 266 Lexington avenue, New York.

Turbine Water Wheels, Portable and Stationary Engines, Gang and Circular Saw Mills, Rolling Mill Machinery, and Machinery for Axe Manufacturers, manufactured by Wm. P. Duncan, Bellefonte, Pa.

For best Power Picket Header in use, apply to Wm. P. Duncan, Bellefonte, Pa.

New Blind Wirer and Rod Cutter. B. C. Davis & Co., Binghamton, N. Y.

Self-testing Steam Gage. There's a difference between a chronometer watch and a "bull's eye." Same difference between a self-tester and common steam gage. Send for Circular. E. H. Ashcroft, Boston, Mass.

See advertisement of L. & J. W. Feuchtwanger, Chemists, N. Y.

$3.50. Stephens' Patent Combination Rule, Level, Square, Plumb, Bevel, etc. See advertisement in another column. Agents wanted.

American Boiler Powder Co., Box 315, Pittsburgh, Pa., make the only safe, sure, and cheap remedy for "Scaly Boilers." Orders solicited.

Belting that is Belting.—Always send for the Best Philadelphia Oak-Tanned, to C. W. Arny, Manufacturer, 301 Cherry st., Phil'a.

E. Howard & Co., Boston, make the best Stem-winding Watch in the country. Ask for it at all the dealers. Office 15 Maiden Lane, N. Y.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

The best place to get Working Models and parts is at T. B. Jeffery's, 160 South Water st., Chicago.

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

Improved Foot Lathes. Many a reader of this paper has one of them. Selling in all parts of the country, Canada, Europe, etc. Catalogue free. N. H. Baldwin, Laconia, N. H.

Peteler Portable R. R. Co. contractors, graders. See adv'ment.

E. P. Peacock, Manufacturer of Cutting Dies, Press Work. Patent Articles in Metals, etc. 55 Franklin st., Chicago.

Peck's Patent Drop Press. Milo Peck & Co., New Haven, Ct.

Millstone Dressing Diamond Machine—Simple, effective, durable. For description of the above see Scientific American, Nov. 27th, 1869. Also, Glazier's Diamonds. John Dickinson, 64 Nassau st., N. Y.

Steel name stamps, figures, etc. E. H. Payn, M'f'r, Burlington, Vt.

Cold Rolled-Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

Keuffel & Esser 116 Fulton st., N. Y., the best place to get 1st-class Drawing Materials, Swiss instruments, and Rubber Triangles and Curves.

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

For the best Self-regulating Windmill in the world, to pump water for residences, farms, city buildings, drainage, and irrigation, address Con. Windmill Co., 5 College Place, New York.

The Merriman Bolt Cutter—the best made. Send for circulars. H. B. Brown & Co., Fair Haven, Conn.

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Vital Force: How Wasted and How Preserved; or, Abuses of the Sexual Function, their Causes Effects and Means of Cure. By E. P. Miller M.D. Paper, 50cts. Address Miller, Haynes & Co., 41 West Twenty-sixth st., New York city.

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 advertisements at 1.00 a line, under the head of "Business and Personal."

All reference to back numbers must be by volume and page.

Mixing Metals.—All the hard gray American charcoal iron, of which car wheels and all such work are made, requires more heat and a longer time to melt than soft iron, especially Scotch pig, which is the most fluid and the easiest to melt of any iron. Consequently, unless the melter exercises good judgment in charging, the Scotch pig will melt and run off before the car-wheel iron is melted. If G. H. P. be particular in the quality and strength of his iron, he will make better results by using soft American charcoal pig, with old car-wheel iron. It will make stronger castings, mix better, and melt more uniformly; but he should always recollect in charging his furnace that soft iron will melt before hard in the same position, in the cupola. I also think he had better use a larger proportion of soft pig, as every time cast iron is melted it becomes harder, so much so that iron which can be filed and turned with ease, when re-cast will often be found too hard to work.—J. T., of N. Y.

Hardening Tallow.—If E. H. H. will use one pound of alum for every five pounds of tallow, his candles will be as hard and white as wax. The alum must be dissolved in water, then put in the tallow, and stirred until they are both melted together, and run in molds.—F. O. H.

L. L., of N. Y.—According to Ure, strass is made as follows: 8 ounces of pure rock crystal or flint, in powder, mixed with 4 ounces of salt of tartar, are to be baked and left to cool. The mixture is then poured into hot water, and treated with dilute nitric acid till it ceases to effervesce, and the "frit" is then washed in water till the water comes off tasteless. The frit is then dried, and mixed with 12 ounces of white lead, and this last mixture reduced to fine powder, and washed with distilled water; 1 ounce of calcined borax is now added to every 12 ounces of the mixture, the whole rubbed together in a porcelain mortar, melted in a clean crucible, and poured out into pure cold water. This melting and pouring into water must be done three times, using a clean, new crucible each time. The third frit is pulverized, five drachms of niter added, and then melted for the last time, when a clean, beautiful white crystal mass results.

C. M. S., of Wis.—There are no precise proportions observed in making the coal-tar and gravel walks of which you speak. The aim is to saturate the gravel with the hot tar without surplus. The interstices of the gravel are simply to be filled, and the amount required to do this depends wholly upon the coarseness or fineness of the gravel employed.

W. P. T., of Ohio.—Two teams of horses, of equal strength, pulling against each other, by means of a rope, would create the same tension in the rope, as one of the teams drawing against an immovable object.

W. H. B., of Va.—Ice can be made by compressing air, and, after it has radiated its heat, allowing it to extract the heat of water with which it is brought into contact. The temperature of air at 59° Fah., would be raised, by compressing the air to one fourth its original volume, to 317° Fah; and the air would radiate and absorb again, in expanding, about 190 units of heat.

E. T. H., of Ga.—The friable sandstone, a specimen of which you send us, may, we think, be rendered firmer by soaking it in a solution of silicate of soda, and allowing it to stand till dry.

J. A. V., of Ohio.—The use of steam expansively, by means of cut-off appliances, enables the expansive force of the steam to be utilized, which cannot be done when the pressure is maintained at one standard, and steam admitted through the fall stroke. It takes no more power to do a given amount of work in one case than in the other, but more boiler capacity, and more fuel, as the working power of the steam is more economically applied when the cut-off is used.

Geo. F. R., of Ohio.—Type metal is composed of 3 parts lead and 1 part antimony for smallest, hardest, and most brittle types; 4 of lead and 1 of antimony for next grade; 5 of lead and 1 of antimony for medium sizes; 6 of lead and 1 of antimony for larger types; and 7 of lead and 1 of antimony for the largest.

E. J. M., of Texas.—The term "power of a boiler" means its evaporating power, and in that sense is proper. If its evaporative power be sufficient to perform a given amount of work, it is proper to estimate that work in horse power. Water can not be pumped out of a pipe from which atmospheric air is excluded. A pipe driven into a soil impervious to air, can never yield water unless the water is forced up by hydraulic power, as in the artesian system.

A. P. Y., of N. Y.—You will find descriptions of iron enamelling processes, on pages 297 and 408, Vol. XII. of this journal. It can be done in colors. See Ure's "Dictionary of Arts and Manufactures."

H. C., of Pa.—We do not think increasing the size of the journals of your car axles from 2½ inches to 6 inches diameter, would make them run lighter.

H. H. A., of N. Y.—The lining up of a beam engine, in a vessel, is a process for which no definite mode of procedure is exclusively applicable. It is an operation to which common sense and judgment must be brought, and for which each engineer must be a law unto himself.

J. S., of Va.—The use of horizontal propellers to force balloons up or down is not a new suggestion. It has been tried, but, we believe, without much practical success.

J. T .S., of N. Y.—You will find further information on the subject of transmitting power by compressed air, in our editorial columns of last week.

APPLICATIONS FOR EXTENSION OF PATENTS.

Harvesters.—William T. B. Read, Chicago, Ill., has petitioned for an extension of the above patent. Day of hearing, May 17, 1871.

Mode of Fastening Sheet Metal on Roofs, etc.—Asa Johnson, Brooklyn, N. Y., has petitioned for an extension of the above patent. Day of hearing, May 3, 1871.

Method of Printing in Colors.—Rosalie Croome, Brooklyn, N. Y., has petitioned for an extension of the above patent. Day of hearing, May 3, 1871.

Machinery for Compressing Gaseous Bodies.—William A. Royce, Newburgh, N. Y., has petitioned for an extension of the above patent. Day of hearing, May 10, 1871.

Plows.—John S. Hall, Pittsburgh, Pa., has petitioned for an extension of the above patent. Day of hearing, May 17, 1871.

Carriage Wheels.—James D. Sarven, New Haven, Conn., has petitioned for an extension of the above patent. Day of hearing May 24, 1871.

New Patent Law of 1870.

INSTRUCTIONS

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FOR

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Recent American and Foreign Patents.

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

Self-Acting Shackle and Car Brake.—Lyman Alphonzo Russell, Shrewsbury, Vt.—This invention relates to improvements in self-acting shackles and car brakes, and consists in an improved connection of the brakes with the shackle, for automatic operation, whereby the connection may be readily so adjusted that the brakes will not be set in action as when required to back up the train.

Feed Bags for Horses.—W. A. Hough, South Butler, N. Y.—This invention relates to a new and useful improvement in feed bags for horses, and consists in making the bag self-supplying, by means of one or more reservoirs, the discharge orifices of which reservoirs are closed by a valve or valves.

Truss.—Adam Hinoult, Montgomery, N. Y.—This invention has for its object to furnish an improved truss, which shall be so constructed as to yield freely to the various movements of the body of the wearer, while holding the rupture securely in place.

Governor for Steam Engines.—Charles A. Conde, Indianapolis, Ind.—This invention relates to a new method of regulating the movement of the balls of a steam governor, with a view of adjusting the same in proportion to the increased or diminished centrifugal force.

Circular Saw Guard.—G. W. Shipman, Ischua, N. Y.—This invention relates to a new and useful improvement in means for protecting the operator and others, near running circular saws, from injury, and it consists in a movable guard, operated by means of the saw carriage, in such a manner that, during the period of danger (when the saw is not cutting), the guard covers the saw, and is thrown back from the saw when the latter is in actual use.

Carpet-cleaning Machine.—J. C. Craft, Baltimore, Md.—This invention relates to a machine, through which a carpet may be passed, and so beaten and brushed, during its passage, as to come out of the machine thoroughly cleansed. The invention consists in the peculiar construction and arrangement of beaters and brushes for effecting this result.

Combined Cotton and Corn Planter.—L. A. Perrault, Natchez, Miss.—This invention relates to improvements in machinery for planting seed, and consists in a combination, in one machine, of a seed-dropping apparatus, adapted for corn, and another adapted for cotton, in a manner to utilize one running gear for the two kinds of seed, and thereby save the expense of separate gear for each.

Lime Kiln.—T. A. Kirk, Kansas City, Mo.—This invention has for its object to furnish an improved lime kiln, which shall be so constructed as to enable the kiln to be worked from the front, in firing and in drawing the lime and ashes, which will not allow cold or unburnt rock to pass through, and which will consume its own smoke.

Car Brake.—S. D. Tripp, Lynn, and Luther Hill, Stoneham, Mass.—This invention relates to improvements in railroad car brakes, and consists in an arrangement, on the locomotive or tender, of a steam cylinder and piston, and the arrangement, on the cars, in connection with the brakes, of sliding rods, so that the rod of the car next to the engine or tender, being moved backwards by the piston rod of the above cylinder, will bring the brakes of the rear wheels down upon them, as well as the brakes of the tender, and slacken the speed thereby, so that the rear projecting end of the brake rod will come in contact with the rod of the next car, and set its brakes in action in like manner, and so on, throughout the train. The arrangement of the said brake actuating rods is such that no matter which end of the car is foremost, the wheels of one track will be acted on by the brakes.

Combined Ruler, Blotter, and Paper Cutter.—Hugh S. Ball, Spartanburgh, S. C.—This invention relates to a new and useful improvement in a combined ruler, blotter, and paper cutter, three articles indispensable for the desk, combined in one.

Reed for Organs and Melodeons.—Augustus Newell, Chicago, Ill.—The object of this invention is to so construct the tongue-butts, or shanks, of musical reeds, that the same cannot, during the vibratory motion of the tongues, be raised from their seats.

Anti-Friction Compound.—Victory Purdy, Poughkeepsie, N. Y.—This invention relates to a new and useful compound for lubricating railroad car axle journals, and other journal bearings.

Queries.

[*We present herewith a series of inquiries embracing a variety of topics of greater or less general interest. The questions are simple, it is true, but we prefer to elicit practical answers from our readers, and hope to be able to make this column of inquiries and answers a popular and useful feature of the paper.*]

1.—Emery Wheels.—Can I make emery wheels similar to those used in a foot lathe, that will answer for sharpening fine tools, such as gouges, rounds, and hollows, and if so, how shall I proceed?—F. W.

2.—Boiler Furnace.—I have two boilers, twenty-four feet long and four feet in diameter each, with five ten-inch flues. The fire passes under the boiler, and enters the flues at the back end, passes through the flues, and enters the smoke stack at the front end. I use hard pine wood for fuel. Will some of your many readers give me the best way of constructing the flue under the boiler, from the end of the grate bars to where it enters the flues at the back end, and also state the proper distance from the back wall to the end of the boiler?—N. H.

3.—Medal Casts.—I have some medals which I should like to copy. Having tried several times, and failed, I thought that I would ask advice through your query columns. I do not know of what the medals are manufactured. They are, I suppose, made to imitate bronze. I have tried casting them in plaster of Paris molds, but have had very poor success, as the surface of the medals was covered with small holes. The metal used was lead and antimony, seven to one. I should like to know, if there be any metal that I can cast them of, and bring out the bronze color afterwards, or if there be any metal that I can cast them of, and afterwards color by some solution. Also, of what should I make my molds?—J. E. M.

4.—Removing the Taste of Tar from Rain Water.—Will some of your correspondents tell me if rain water, which runs off a gravel roof, and tastes very strongly of tar, is unhealthy, and if there be anything that will prevent its tasting, as it is very disagreeable for cooking purposes?—C. E. H.

5.—Sorghum Molasses.—How can I separate the molasses from the sugar, in sorghum sugar mush, to make a dry merchantable sugar?

6.—Flux for Aluminum.—Will some of your readers tell me, through your columns, the best flux to use in melting and mixing aluminum and copper?

Inventions Patented in England by Americans.

[Compiled from the Commissioners of Patents' Journal.]

APPLICATIONS FOR LETTERS PATENT.

350.—Breech-loading Fire-arms.—Eli Whitney, New Haven, Conn. February 10, 1871.

352.—Governor.—Stilliman B. Allen, ——, Mass. February 10, 1871.

357.—Windmill.—A. P. Brown, New York city. February 11, 1871.

332.—Furniture Casters.—F. A. Gardner and H. S. Turrell, Danbury Conn. February 8, 1871.

339.—Wire Fabrics for Mattresses.—Samuel Rogers, New York city. February 9, 1871.

340.—Screw Propeller Canal Boats.—Thomas Main, Pierpoint, N. Y. February 9, 1871.

362.—Flyer for Spinning Machinery.—Thomas Mayor and Geo. Chatterton, Providence, R. I. February 14, 1871.

373.—Telegraphic Apparatus and Detectors.—W. B. Watkins, Jersey City, N. J. February 14, 1871.

381.—Steam and other Safety Valves.—Walter Dawson Scranton, Pa. February 15, 1871.

388.—Iron Rails and Bars, and Modes of Manufacturing the same.—Eldridge Wheeler, Philadelphia, Pa. February 15, 1871.

Official Lists of Patents.

ISSUED BY THE U. S. PATENT OFFICE.

FOR THE WEEK ENDING MARCH 7, 1871.

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112,309.—Hose Sprinkler.—William Anderson, San Francisco, Cal.

112,310.—Locomotive Spark Arrester.—J. G. Armstrong, New Brunswick, N. J.

112,311.—Tool for Carriage Makers' Use.—George Atkinson, San Francisco, Cal.

112,312.—Potato Probe.—John A. Beal, Waterford, N. Y.

112,313.—Hinge for Carriage Doors.—George W. Beers, Bridgeport, Conn.

112,314.—Stove Leg.—James Birckhead, Jr., Baltimore, Md.

112,315.—Clothes Pin.—Orris A. Bishop, Chicago, Ill.

112,316.—Manufacture of Rochelle Salts and Borax.—V. G. Bloede, Brooklyn, N. Y.

112,317.—Beehive.—Felix Brewer, Waynesville, Mo.

112,318.—Thill Coupling.—Theodore Burr (assignor to Allen Muir and Henry Muir), Battle Creek, Mich.

112,319.—Evaporating Pan for Saccharine Liquids.—F. C. Butler, Bellows Falls, Vt., assignor to himself and James B. Williams, Glastonbury, Conn.

112,320.—Door Securer.—William H. Caldwell, Wheeling, W. Va.

112,321.—Toe-calk Bar.—R. B. Caswell, Springfield, Mass. Antedated March 2, 1871.

112,322.—Glass Flattening Furnace and Leer.—James Clabby, Lenox, Mass.

112,323.—Spring Bed Bottom.—Alex. Cole, Manamuskin, N. J.

112,324.—Water Wheel.—E. E. Coleman, West Cummington, Mass.

112,325.—Toy Horse and Carriage.—John B. Cuzner, Bridgeport, Conn.

112,326.—Mackerel-line Holder.—E. L. Decker, Southport, Me.

112,327.—Sewing Machine.—J. William Dufour, Stratford, Conn.

112,328.—Steam Boiler.—Edwards Evans, North Tonawanda, N. Y.

112,329.—Medical Compound for Cure of Catarrh and Asthma.—Erastus Field, Ostrander, Ohio.

112,330.—Machine for Grinding the Cutters of Mowers, etc.—H. C. Fisk, Wellsville, N. Y.

112,331.—Machine for Making Hooks and Eyes.—Jeremy T. Ford, San Francisco, Cal.

112,332.—Churn.—Thompson Freeman, Westfield, Ill.

112,333.—Attachment for Revolving Mold Boards for Plows.—J. S. Godfrey, Leslie, Mich., assignor to himself and S. M. Loveridge, Pittsburgh, Pa.

112,334.—Grain Cleaner and Fertilizer Sifter.—J. A. Green, Mill Dale, Va.

112,335.—Screw Propulsion.—E. C. Gregg (assignor to A. H. Gregg and C. P. Gregg), Trumansburg, N. Y.

112,336.—Seeding Machine.—P. M. Gundlach, Belleville, Ill.

112,337.—Compound for Kindling Fires.—J. L. Hannum and S. H. Stebbins, Berea, Ohio.

112,338.—Lawn Mower.—Benjamin Harnish, Lancaster, and D. H. Harnish, Pequea, Pa.

112,339.—Composition for Pavements.—C. B. Harris, New York city. Antedated February 25, 1870.

112,340.—Spring for Vehicles.—John R. Hiller, Woodland, Cal.

112,341.—Harvester Rake.—S. T. Holly, (assignor to John P. Manny), Rockford, Ill.

112,342.—Door Clamp.—Henry O. Hooper, Diamond Springs, Cal.

112,343.—Taper Holder.—Thomas W. Houchin, Morrisania, N. Y.

112,344.—Metallic Garter.—Henry A. House, Bridgeport, Conn.

112,345.—Bobbin Winder.—Henry A. House, Bridgeport, Conn.

112,346.—Method of Knitting Stockings, etc.—Henry A. House, Bridgeport, Conn.

112,347.—Apparatus for Evaporating and concentrating Liquids.—John Howarth, Salem, Mass. Antedated March 1, 1871.

112,348.—Apparatus for Evaporating and Concentrating Liquids.—John Howarth, Salem, Mass. Antedated March 1, 1871.

112,349.—Apparatus for Removing Oil from Vegetable and other Matters.—Elias S. Hutchinson, Baltimore, Md.

112,350.—Apparatus and Process for Removing Oil from Grain, Seeds, etc.—Elias S. Hutchinson, Baltimore, Md.

112,351.—Chandelier.—Charles F. Jacobsen, New York city.

112,352.—Culinary Vessel.—Carrie Jessup, New Haven, Conn.

112,353.—Machine for Cutting Leather.—Aberdeen Keith, North Bridgewater, Mass.

112,354.—Attaching Knobs to their Spindles.—John F. Keller and Nathaniel Sehner, Hagerstown, Md.

112,355.—Miter Machine.—T. E. King, Boston, Mass.

112,356.—Take-up for Corset Looms.—Julius Kuttner, New York city.

112,357.—Elevator and Carrier.—T. W. Lackore, Worth, Ill.

112,358.—Apparatus for Burning Hydrocarbon Oils.—James R. Lee, Grass Valley, Cal.

112,359.—Burglar Alarm.—Robert Lee, Cincinnati, Ohio.

112,360.—Telegraph Apparatus.—L. T. Lindsey, Jackson, Tenn.

112,361.—Harvester.—J. P. Manny, Rockford, Ill.

112,362.—Harvester.—J. P. Manny, Rockford, Ill.

112,363.—Harvester Rake.—J. P. Manny, Rockford, Ill.

112,364.—Cheese Curd Sink.—H. C. Markham, Collinsville, N. Y.

112,365.—Mowing Machine.—H. C. Markham and Dewitt C. Markham, Collinsville, N. Y.

112,366.—Propeller.—Alex. J. Marshall, Warrenton, Va. Antedated March 3, 1871.

112,367.—Oiler.—Edward McDuff and E. D. Forrow, Warwick, R. I.

112,368.—Wash Boiler.—John McInnes, Oxford, Pa.

112,369.—Propelling Canal Boats.—H. B. Meech, Fort Edward, N. Y. Antedated February 25, 1871.

112,370.—Water-proof Compound for Coating Cloth Wood, Metals, etc.—Peter E. Minor, Schenectady, N. Y.

112,371.—Cooking Stove.—W. N. Moore, Neenah, Wis.

112,372.—Boring Machine.—J. H. Pardieck (assignor to himself and S. M. Brown), Acton, Ind.

112,373.—Vapor Burner.—R. W. Park, Philadelphia, Pa.

112,374.—Machine for Pointing Blanks for Cultivator Teeth.—John Pedder and George Abel, West Pittsburgh, Pa.

112,375.—Bale Tie.—J. E. Perkins, San Francisco, Cal.

112,376.—Lining Walls with Felt, etc.—James Phillips, Chicago, Ill.

112,377.—Cooking Stove.—Samuel Pierce, Boston, Mass.

112,378.—Tack.—A. A. Porter, New Haven, Conn. Antedated Feb. 25, 1871.

112,379.—Machine for Shaping and Cutting Gear Cutters.—F. A. Pratt (assignor to the Pratt & Whitney Company), Hartford, Conn.

112,380.—Combination Camera and Developing Box.—E. C. Ratzell, Philadelphia, Pa.

112,381.—Punching Machine.—J. C. Rhodes, South Abington, Mass.

112,382.—Washing Machine.—J. W. Ricker, Chelsea, Mass.

112,383.—Curtain Fixture.—Charles Robin. Chester, Conn.

112,384.—Machine for Making Printers' Leads.—Isaac Schoenberg, New York city.

112,385.—Slide Valve for Steam Riveting Machines.—Coleman Sellers (assignor to William Sellers & Co.), Philadelphia, Pa.

112,386.—Machine for Polishing Thread.—Samuel Semple, Sr., John Semple, Samuel Semple, Jr., and R. A. Semple, Mount Holly, N. J.

112,387.—Paint Brush.—F. S. Shearer, Washington, Ill.

112,388.—Bee Hive.—S. A. Short, F. J. Short, J. B. Short, and Jasper Kile, Decatur, Ala.

112,389.—Apparatus for Removing Oil from Vegetable and other Matter.—Thomas Sim, Baltimore, Md.

112,390.—Retort for Producing Bisulphide of Carbon.—Thomas Sim, Baltimore, Md.

112,391.—Utilizing the Silky Down of the Wild Cotton. —M. H. Simpson, Boston, Mass.

112,392.—Pruning Shears.—Frank Smiley, Batavia, N. Y.

112,393.—Water-closet Valve.—A. J. Smith, San Francisco, Cal.

112,394.—Gang Plow.—J. W. Sursa, San Leandro, Cal.

112,395.—Grinding Pan and Amalgamator.—W. H. Thoss, West Point, Cal.

112,396.—Street Lantern.—Augustus Tufts, Malden, Mass.

112,397.—Cooking Stove.—Alvin Warren, Swanton, Ohio.

112,398.—Safety Bridle.—James Weatherhead, San José, Cal.

112,399.—Fire Grate.—George Wellhouse, Akron, Ohio.

112,400.—Hay Knife.—G. F. Weymouth, Dresden, Me.

112,401.—Claw Bar.—Charles Winter, Chillicothe, Ohio.

112,402.—Steam Generator.—J. C. Woodhead, Pittsburgh, Pa.

112,403.—Animal Trap.—W. D. Wrightson, Queenstown England.

112,404.—Brush.—John Ames, Lansingburg, N. Y.

112,405.—Clod Fender.—F. L. Bailey, Freeport, Ind.

112,406.—Ruler.—H. S. Ball, Spartanburg, S. C.

112,407.—Fanning Mill.—Benjamin Barney, Time, Ill.

112,408.—Ice-cutting Machine.—Lafayett Barnum (assignor to himself and A. R. Hale), Bridgeport, Conn.

112,409.—Manufacture of Ice.—T. J. Bigger, Kansas City, Mo.

112,410.—Machine for Heading Bolts and Spikes.—Reinhold Boeklen, Brooklyn, N. Y., assignor to himself and Henry Torstrick New York city. Antedated Feb. 28, 1871.

112,411.—Washing Machine.—Joseph Boswell, L. M. Boswell, Jonathan Palmer, and J. H. James (assignors to themselves and Thomas Starbuck), Wilmington, Ohio.

112,412.—Water Wheel.—E. C. Boyles, New York city.

112,413.—Cotton Press.—R. M. Brooks, Pike county, Ga.

112,414.—Paper-cutting Machine.—Samuel Brown (assignor to himself and C. R. Carver), Philadelphia, Pa.

112,415.—Governor for Direct-acting Engines.—A. S. Cameron, New York city.

112,416.—Governor for Direct-acting Engines.—A. S. Cameron, New York city.

112,417.—Butt Hinge.—J. W. Carleton (assignor to the Union Manufacturing Co.), New Britain, Conn.

112,418.—Machine for Cutting Sheet Metal.—C. R. Choate, East Saginaw, Mich.

112,419.—Bit Brace.—William Cleveland, Lawrence, Mass., assignor to himself and James Swan, Seymour, Conn.

112,420.—Steam Engine Governor.—C. A. Condé, Indianapolis, Ind.

112,421.—Carpet-cleaning Machine.—J. C. Craft (assignor to himself and Antonio Rosello), Baltimore, Md.

112,422.—Steam Regulator for Paper Dryers.—Daniel Crosby, Hampden, Me.

112 423.—Metallic Piston and Valve Rod Packing.—G. M. Cruickshank, Providence, R. I.

112,424.—Grain-thrashing and Separating Machine.—John Culham, Grand Rapids, Mich. Antedated Feb. 25, 1871.

112,425.—Cooking Stove.—David Curtis, Mishawaka, assignor to himself and C. B. Graham, South Bend, Ind.

112,426.—Lightning Rod.—S. D. Cushman, New Lisbon, Ohio.

112,427.—Hose Bridge.—Patrick Daily (assignor to himself and J. J. Kehoe), New York city.

112,428.—Cover for Openings in Sidewalks.—William Dale, New York city.

112,429.—Rotary Pump.—F. O. Deschamps, Philadelphia, Pa.

112,430.—Machine for Cutting Files.—James Dodge, Manchester, England, assignor to David Blake, Spencertown, N. Y.

112,431.—Coupling for Railway Cars.—Henry Dubs and S. G. Goodall-Copestake, Glasgow, Great Britain.

112,432.—Tobacco Pipe.—P. J. Dwyer, Elizabethport, N. J.

112,433.—Basket for House Plants.—Albert P. Eastman, Washington, D. C.

112,434.—Sulky Plow.—Milo A. Elliott, Stratford Hollow, N. H.

112,435.—Stretcher for Paintings.—James Fairman, New York city.

112,436.—Body Lantern Holder.—Samuel C. Fessenden, Stamford, Conn.

112,437.—Stove Leg.—Amon L. Finch, Sing Sing, N. Y.

112,438.—Pump Piston.—John S. Follansbee and George Doolittle (assignors to the Forrester Manufacturing Company), Bridgeport, Conn.

112,439.—Shoe.—Samuel W. Francis (assignor to himself and W. H. Newton), Newport, R. I.

112,440.—Guard-Finger for Harvesters.—George Fyfe and Chester Hard, Ottawa, Ill.

112,441.—Dining Table.—S. R. Gardner (assignor to himself and S. M. Marquette), Independence, Iowa.

112,442.—Step Ladder.—M. Boland Geary, New York City.

112,443.—Oilcloth Printing Machinery.—Ebenezer A. Goodes (assignor to Philadelphia Patent and Novelty Company), Philadelphia, Pa.

112,444.—Tenoning Machine.—Lyman Gould, Norwich, Conn.

112,445.—Printer's Case.—Wm. H. A. Gresham, Atlanta, Ga.

112,446.—Lamp Chimney.—Geo. W. Griswold, Factoryville, Pa.

112,447.—Grain Separator.—Philander Griswold, Hudson, Mich.

112,448.—Clamp for Thill Couplings.—John W. Guider (assignor to himself and John Kiefer), St. Joseph, Mo.

112,449.—Bird Cage.—Gottlob Gunther, New York city.

112,450.—Stop Cock and Valve.—William Haas, New York city.

112,451.—Valve for Steam Engines.—Joseph L. Harley, Baltimore, Md., and Xaver Fendrich, Georgetown, D. C.

112,452.—Metallic Hub.—John H. Harper, Pittsburgh, Pa.

112,453.—Composition for Lubricating Machinery.—E. Q. Henderson (assignor to John C. Burroughs and Richard A. Springs) Charlotte, N. C.

112,454.—Post-hole Digger.—Bryant B. Herrick, Decatur, Mich.

112,455.—Door Check.—Levi S. Hicks (assignor to himself, J. Perrin Johnson, and John Buell), Peoria, Ill.

112,456.—Railway-car Brake.—Luther Hill, Stoneham, and Seth D. Tripp, Lynn, Mass.

112,457.—Truss.—Adam Hinoult, Montgomery, N. Y.

112,458.—Feed Bag for Horses.—Walter A. Hough, South Butler, N. Y.

112,459.—Shade Holder for Lamps—Mark W. House, Cleveland, Ohio.

112,460.—Lamp Chimney.—Mark Wiggins House (assignor to the Cleveland Non-Explosive Lamp Company), Cleveland, Ohio. Antedated March 1, 1871.

112,461.—Horse Hay Rake.—James Howard and E. T. Bousfield, Bedford, England.

112,462.—Tongs for Rolling Barrels.—Mark W. Ingle, Indianapolis, Ind.

112,463.—Pitman.—George W. Jayson, Lodi, Ohio.

112,464.—Paste for Paper Hangings.—John Jones (assignor to himself and Henry A. Smith), New York city.

112,465.—Twine Holder.—Edward M. Judd, New Haven, Ct.

112,466.—Clothes Pin or Clasp.—Amos L. Keeports and William Yount, Littletown, Pa.

112,467.—Putting up Hams.—Samuel Edward Kelly, Philadelphia, Pa.

112,468.—Limn Kiln.—Thomas A. Kirk, Kansas City, Mo.

112,469.—Fastening for Seats for Wagons or Sleighs.—John G. Knapp and John F. Robertson (assignors of one third their right to James H. Holly), Warwick, N. Y.

112,470.—Potato Planter.—George Knowlton (assignor for one-half his right to N. Haynes), Johnstown, Pa.

112,471.—Revolving Firearm.—Edwin S. Leaycroft, Brooklyn, N. Y., assignor by mesne assignment, to "Colt's Patent Firearms Manufacturing Company," Hartford, Conn.

112,472.—Revolving Firearm.—Edwin S. Leaycroft, Brooklyn, N. Y., assignor, by mesne assignment, to "Colt's Patent Firearms Manufacturing Company," Hartford, Conn.

112,473.—Railroad Cattle-Guard Gate.—J. H. Mallory, La Porte, Ind.

112,474.—Back-reflecting Mirror.—Richard Mason (assignor to himself and Matthew Ely), Newark, N. J.

112,475.—Ventilator and Chimney Top.—James McGowan (assignor to himself and Daniel H. Waring), New York city.

112,476.—Apparatus for Rectifying and Refining Spirits.—Frederick Measey (assignor to himself and Henry D. Fling), Philadelphia, Pa.

112,477.—Tin Can.—John F. Merrill (assignor to himself and Alexander Stewart), Cincinnati, Ohio.

112,478.—Take-up Mechanism for Looms.—John Michna and Joseph Fischer, New York city.

112,479.—Combined Baker and Broiler.—Wm. H. Miller, Brandenburg, Ky.

112,480.—Shuttle for Sewing Machines.—James D. Moore, Grinnell, Iowa.

112,481.—Cotton Chopper and Grain Cultivator.—Daniel Mosely, Osark, Arkansas.

112,482.—Sad and Fluting Iron.—Frederick Myers, New York city.

112,483.—Reed for Organs and Melodeons.—Augustus Newell, Chicago, Ill.

112,484.—Straw Cutter.—Amon Park, Germanville, Iowa.

112,485.—Apparatus for Aging Whisky and Other Spirits.—Josiah Peiffer and Samuel Richards, Valonia, Pa.

112,486.—Combined Cotton and Corn Planter.—Louis A. Perrault (assignor to himself and Joseph Huber), Natchez, Miss.

112,487.—Faucet.—Solomon Pfleger, Reading, assignor to himself and J. S. Pfleger, Tamaqua, Pa.

112,488.—Treadle.—George K. Proctor, Salem, Mass.

112,489.—Lubricating Compound.—Victory Purdy, Poughkeepsie, N. Y.

112,490.—Fertilizer and Seeding Machine.—Archibald Putnam (assignor to Elizabeth Putnam), Owego, N. Y.

112,491.—Rotary Pump.—George W. Putnam, South Glens Falls, N. Y.

112,492.—Hat Brush.—Robert Dunbar Radcliffe, Palmyra, N. Y.

112,493.—Refrigerating Show Case.—Thomas L. Rankin, Lyndon, Kansas, assignor to himself and D. W. Rockwell, Elyria, Ohio.

112,494.—Device for Starting and Stopping Cars.—Philip Rhoads, Carlisle, Pa.

112,495.—Pipe-molding Machine.—George Richardson, Milwaukee, Wis.

112,496.—Sulky Cultivator.—Richard B. Robbins, Adrian, Mich.

112,497.—Hand Plow.—Nelson Rue, Harrodsburg, Ky.

112,498.—Mechanical Movement.—Edward G. Russell, Ravenna, Ohio.

112,499.—Railway Car Brake.—Lyman Alphonzo Russell, Shrewsbury, Vt.

112,500.—Stovepipe Cleaner.—David Sanford, Ashton, Ill.

112,501.—Twine Holder.—Joseph B. Sargent and Purmont Bradford (assignors to Sargent & Co.), New Haven, Conn.

112,502.—Dovetailing Machine.—James M. Seymour, Newark, N. J.

112,503.—Wooden Pavement.—Eaton Shaw, Portland, Me.

112,504.—Guard for Circular Saws.—George W. Shipman, Ischua, N. Y.

112,505.—Breech-loading Firearm.—Dexter Smith and Martin J. Chamberlin, Springfield, Mass.

112,506.—Spark Arrester.—James Smith, Altoona, Pa.

112,507.—Horse Hay Rake.—Solomon P. Smith, Waterford, N. Y.

112,508.—Plow.—S. M. Stewart, New Harrisburg, Ohio.

112,509.—Medical Compound for Treating Fever and Ague.—George E. Swan, Mount Vernon, Ohio.

112,510.—Device for Cooling Journals of Car Axles.—Henry G. Thompson, Milford, Conn.

112,511.—Cooling Journal of Car Axles.—Henry G. Thompson, Milford, Conn.

112,512.—Cooling Journal of Car-wheel Axles.—Henry G. Thompson, Milford, Conn.

112,513.—Device for Cooling Journals of Railway Cars.—Henry G. Thompson, Milford, Conn.

112,514.—Non-heating Handle for Sad Irons, etc.—William H. Towers, Boston, Mass.

112,515.—Lubricator.—John Erst Uhl, Renovo, Pa.

112,516.—Combined Corn Planter and Cultivator.—Franklin Underwood, South Rutland, N. Y.

112,517.—King Bolt.—Wendel Vondersaar, Indianapolis, Ind.

112,518.—Wheat Roaster.—George W. Waitt (assignor to himself and Robert B. Fitts), Philadelphia, Pa.

112,519.—Plaster Sower.—Thomas J. West, Alfred Center, N. Y.

112,520.—Ticket Holder.—Henry Wexel, Providence, R. I.

112,521.—Tobacco Press.—Abraham N. Zell, Lancaster, Pa.

112,522.—Combined Bag Holder and Scales.—William Zimmerman, Lebanon, Pa. Antedated February 25, 1871.

112,523.—Breech-loading Firearm.—James M. Mason, Washington, D. C.

REISSUES.

4,287.—Treating Fruits to Dry, Saccharify, and Preserve Them.—Charles Alden, Newburg, assignor of part interest to Alden Fruit Preserving Company, New York city. Patent No. 100,835, dated March 5, 1870; reissue No. 4,011, dated June 7, 1870.

4,288.—Device for Securing Pulleys to Shaft.—John H. Buckman (assignor to himself and Peter W. Reinshagen), Cincinnati, Ohio. Patent No. 98,144, dated December 21, 1839.

4,289.—Shawl Strap.—George Crouch, Westport, Conn. Patent No. 82,606, dated September 29, 1868.

4,290.—Atmospheric Dental Plate.—Nehemiah T. Folsom, Laconia, N. H. Patent No. 60,871, dated January 1, 1867.

4,291.—Pessary.—William R. Gardner, Leonardsville, N. Y. Patent No. 105,191, dated July 12, 1870.

4,292.—Division A.—Skate.—James L. Plimpton, New York city. Patent No. 37,305, dated January 6, 1863; reissue No. 3,906, dated April 5, 1870.

4,293.—Division B.—Skate.—James L. Plimpton, New York city. Patent No. 37,305, dated January 6, 1863; reissue No. 3,906, dated April 5, 1870.

4,294.—Apparatus for Pitching Barrels.—Louis Schulze, Baltimore, Md. Patent No. 106,964, dated August 30, 1870.

DESIGNS.

4,694.—Picture Frame.—John H. Bellamy, Charlestown, Mass.

4,695.—Bell Crank and Escutcheon.—Pietro Cinquini, West Meriden, Conn., assignor to Parker & Whipple Company.

4,696.—Pedestal for a Cake Dish.—George Gill (assignor to Reed & Barton), Taunton, Mass.

4,697.—Table Caster.—William Parkin (assignor to Reed & Barton), Taunton, Mass.

4,698.—Buckle Frame.—John E. Smith, Waterbury, Conn.

4,699.—Back of a Chair or Sofa.—George Unverzagt, Philadelphia, Pa.

TRADE-MARKS.

182.—Hat.—Nathan A. Baldwin, Milford, Conn., James H. Prentice, Brooklyn, and John R. Waller, New York city.

183.—Spool Cotton.—Lewis Coleman & Co., Boston, Mass.

184.—Salve.—Robert Dobbins, Binghamton, N. Y.

185.—Soap.—Leberman & Co., Philadelphia, Pa.

186.—Medicine.—Ridenour, Coblentz & Co., Springfield, Ohio.

187.—Paper.—Union Manufacturing Company, Springfield, Mass.

EXTENSIONS.

Wagons.—Edgar Huson, Ithaca, N. Y. Letters Patent No. 16,648, dated February 17, 1857; reissue No. 2,500, dated March 5, 1867.

Operating Valve of Steam Engine.—Samuel R. Wilmot, Bridgeport, Conn. Letters Patent No. 16,668, dated February 17, 1857.

Hinges.—John David Browne, Cincinnati, Ohio. Letters Patent No. 16,678, dated February 24, 1857.

Keeper for Right and Left Hand Door Locks.—Calvin Adams, Pittsburgh, Pa. Letters Patent No. 16,676, dated February 24, 1857.

Solar Camera.—David A. Woodward, Baltimore, Md. Letters Patent No. 16,700, dated February 24, 1857; reissue No. 2,311, dated July 10, 1866.

Cast Seamless Thimble Skeins for Wagons.—John Benedict, Kenosha, Wis., administrator of Andrew Leonard, deceased. Letters Patent No. 16,688, dated February 24, 1857; reissue No. 575, dated July 27, 1858; reissue No. 1,229, dated October 8, 1861.

Mode of Casting Seamless Skeins for Wagons.—John Benedict, Kenosha, Wis., administrator of Andrew Leonard, deceased. Letters Patent No. 16,688, dated February 24, 1857; reissue No. 575, dated July 27, 1858; reissue No. 1,228, dated October 8, 1861.

Breech-loading Firearms.—William Cleveland Hicks, Summit, N. J. Letters Patent No. 16,797, dated March 10, 1857; reissue No. 1,952, dated May 9, 1865; reissue No. 3,798, dated January 18, 1870; reissue No. 3,860, dated March 1, 1870.

Seeding Machine.—Lewis B. Myers and Henry A. Myers, Elmore, Ohio. Letters Patent No. 16,772, dated March 3, 1857.

DISCLAIMER.

Solar Camera.—David A. Woodward, Baltimore, Md. Letters Patent No. 16,700, dated February 24, 1857; reissue No. 2,311, dated July 10, 1866. Filed February 23, 1871.

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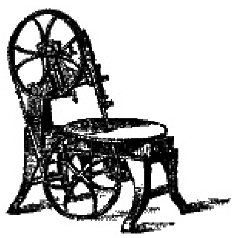

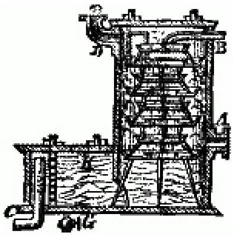

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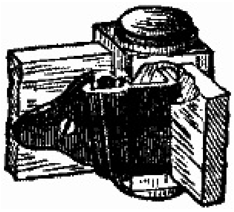

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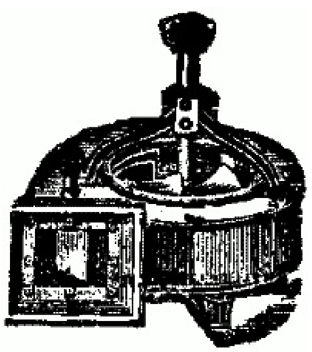

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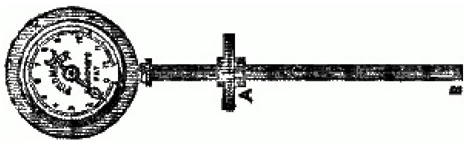

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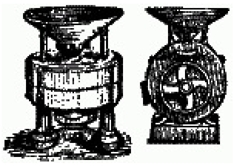

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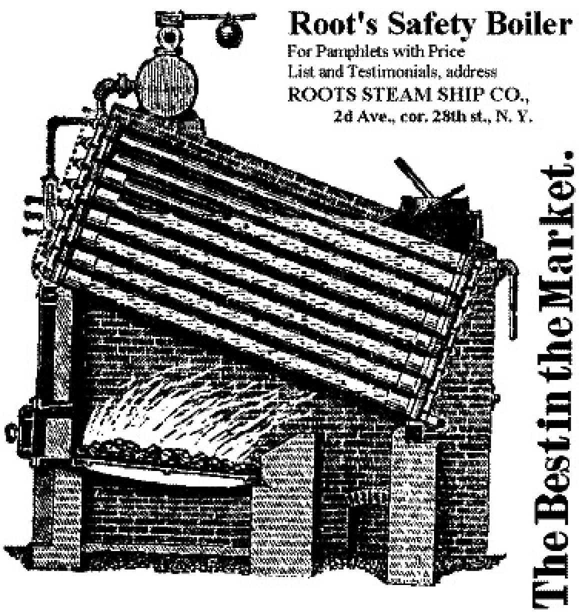

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