his hand forward, and put his finger on the under side of the barrel at the precise spot where pressure or a blow must be applied to correct the defect.

B.

New Haven, April 18, 1865.

Zincing Cast Iron.

MESSRS. EDITORS:—A correspondent of the SCIENTIFIC AMERICAN states a difficulty in galvanizing cast iron, and at the same time exhibits his process.

The use of chloride of zinc as a flux in covering cast iron with zinc will surely defeat him as often as he tries it, for it is decomposed by a heat considerably less than the melting point of zinc. But for tinning, at a heat of about 450°, it may be used with great advantage in combination with sal ammoniac (chloride of ammonium). Thus, to a saturated solution of chloride of zinc, add to saturation sal ammoniac—decant it clear; and I would recommend the addition of an equal bulk of distilled or rain water with this compound, clean, or sometimes—with tact—dirty metal will become tinned without friction, except iron and steel.

These latter metals being perfectly clean, may sometimes be tinned with the aid of this double chloride without friction, but always with, preferably, a brass wire or brush.

I suspect that the lack of success of your correspondent is due to a failure in presenting the iron to the zinc chemically and perfectly clean. The dilute sulphuric acid should be thoroughly washed off in hot water, so that, as well as being clean, the cast iron will be instantly dry, and the whole process should be finished at once. There are, however, various means of preventing the oxydation of the metal for a short time, if necessary, with which he is doubtless acquainted. R. H. A.

Baltimore, Md., Oct. 16, 1865.

An Acknowledgment.

MESSRS. MUNN & Co.:—Your letter, together with my French patent for knitting machines, is received. Allow me to return you thanks for the very satisfactory manner in which you have thus far conducted my business. I have received my patent from the United States Patent Office for setting up apparatus for knitting machines, granted Sept. 12th, and have read notice of allowance of my other case, in two weeks time, making two American and one French patent received through your hands during this month—the three aggregating the large number of thirty-five claims.

You have already successfully conducted my business in every case entrusted to you, having secured for me five separate patents. You have three more cases for the United States belonging to me yet in your hands, and I anticipate sending three or four more to you during the year. You have, in short, given most *perfect* satisfaction in every case, for which you have my hearty appreciation,

I. W. LAMB,

Office of I. W. Lamb's Knitting Machine, Rochester, N. Y., Sept. 26, 1865.

[Mr. Lamb has patented in this country and some foreign countries several valuable improvements in knitting machinery.—EDS.

The Most Reasonable Explanation of the Razor Question.

MESSRS. EDITORS:—Having observed in your valuable paper the controversy as to whether a razor cuts better when hot, I will give you my reasons, aside from my experience, for believing it does. I cannot agree with the gentleman that the expansion of the razor by heat would contract its teeth, but believe they must be affected the same as the razor. The reason of its cutting better when hot is from the dissolving or softening power of the heat that it gives off to the beard when the hot edge of the razor comes in contact with it in the drawing cut; hair being of the same nature as horn is effected by heat in the same manner—heat softens it. When boiling hot it may be cut as easily as cheese; when cold it is very hard. Yet in this state, I believe a tool heated to a degree that would still preserve its temper would cut much better than a cold one. I have used them without temper. A given degree of heat would cause a tool to melt its way through a piece of horn. A hot knife will readily sink of its own weight into a lump of hard butter, which, when cold, it would have made no impression on. RICHARD LEWIS.

Williamsburgh, N. Y., Oct. 17, 1865.

The Teeth of Wheels.

MESSRS. EDITORS:—The pitch of a gear is the distance between the centers of two adjacent teeth, measured in a straight line; and these centers are all situated in an imaginary circle, called the "pitch circle." In treating of gears, it is customary to consider the pitch as an arc of this circle instead of a straight line or chord, and the rules usually given for proportioning the number of teeth, and the diameter of the pitch circle, are based upon this assumption. When the number of teeth in the gear is large, or where the gears to be matched are of the same size, or nearly so, these rules are sufficiently accurate for practice, but every mechanic who has had occasion to make gears of differing sizes mesh together, particularly if of coarse pitch, has found that teeth determined by circular pitch will not run properly, and he has been compelled in such cases to find the true diameter by a series of trials. The less the number of teeth in a gear, the greater the disparity between the true and the circular pitch. If there are but three teeth, to take an extreme case for an example, the variation amounts to over twenty per cent of the true pitch.

For some time past I have used the following formulæ for determining the diameter of the pitch circle—the true pitch being given, and *vice versa*, and find them simple and convenient:—If n represent the number of teeth; p the pitch, and D, the diameter of the pitch circle, then

$$\text{nat. sin } (180 \div n)^\circ = \frac{p}{D} \quad \text{and,}$$

$$\text{nat. sin. } (180 \div n)^\circ \times D = p.$$

Or, in the form of rules:—

Divide the given pitch in inches by the natural sine of one-half the angle subtended by a tooth and space, and the result will be the diameter of the pitch circle in inches.

And—

Multiply the natural sine of one-half the angle subtended by a tooth and space, by the diameter in inches, and the product will be the true pitch.

With a table of natural sines at hand, these rules will be found to be of ready application, and gears proportioned by them will run properly in all cases.

It will be observed that the diameters of two gears having the same pitch are not in the exact proportion of the number of teeth, as is generally taught. For example, take two gears, of 2½-inch pitch, one with twelve, and the other with ninety teeth, their pitch diameters, as determined by the above rule, are respectively 9·66 and 71·64 inches, being in the proportion of one to 7·416, while the proportion of the number of teeth is as one is to 7·5. Consequently the formula,

$$n \times p \times .32 = D$$

given by Haswell is incorrect, as it ignores that fact. In the case of the two above-mentioned gears, Haswell's formula makes the lesser one $\frac{1}{10}$ths of an inch too small, and the larger $\frac{3}{5}$ths of an inch too large.

G. H. BABCOCK.

Providence, R. I., Oct. 8, 1865.

FOREIGN SUMMARY.

HISTORY OF COKE.—The following advertisement given in "Notes and Queries," fixing the period when coke first came into public use in this country, will no doubt be acceptable to any future historian of our coal trade:—"There is a sort of fewel made by charking or calcining Newcastle coals which burns without smoak, without fouling the furniture; and altogether as sweet, and is much more lasting and profitable than wood or charcoal; it kindles suddenly, and is useful either for chambers, roasting of meat, drying of malt or hops, woolcombing, distilling, preserving, or any such like employment. His highness the Lord Protector, with the advice of his Council, have encouraged and authorised the making thereof in order to the preservation of the woods of the nation. If any shall desire to make tryal of it for any of the use aforesaid, which will cost little or nothing the experiment, they may repair to London at Northumberland Wharff, near Chearing Cross; and according to the satisfaction they receive therein, they may be supplied from time to time with what quantity they shall have occasion to use. Those that have made tryal of it, finde it very profitable to all those uses abovementioned. It is also very useful for the tobacco pipe burners."—*Public Intelligencer*, No. 139, from Monday, August 16, to Monday, August 23, 1658, p. 764. This advertisement appears also in the succeeding number for August 30, but apparently not in any of the previous numbers.—*London Artizan.*

IMPROVING CITIES.—A paper on "improvements applicable to the City of London and other large towns to improve health and preserve life," by Mr. G B. Galloway, was read at the recent meeting of the British Association, in which it was suggested that the Corporation of London or a joint-stock company should purchase all bad-house property and rebuild the houses on an improved plan, a part of which would be the placing of iron bridges across the streets at intervals from one house to another as a means of avoiding crossings. Further facilities for crossing the Thames, and extra footways on the outside of the bridges, were suggested. As regards the purifying of the air of the streets, it was advised that at every window in every house and in every open space plants and flowers should be grown.

THE water pipes in several parts of Paris are being replaced by tubes of a larger caliber. This operation is being performed at present on the Pont au Change and the Pont St. Michel. These tubes are placed either under flags or under paving stones covered with cement. All along the Boulevard du Palais the water pipes are placed in the sewers. When the subterranean canalization of Paris is completed, the sewers will inclose not only the water and gas pipes, but likewise the electric wires by which the telegraph offices communicate with each other.

AT a recent meeting of the Horological Institute, Lord Caithness in effect declared that the art of clock making was going out of England. Statistics prove that France and America are doing for us the work which we should do and profit by at home. From Switzerland especially the importation of watches, from France of Ormolu clocks, and from America brazen clocks, has, of late years, enormously increased, and this cannot be without its effect upon our artisan classes.—*London Artizan.*

TRACTION CARRIAGE.—The specification of Messrs. Bernier & Godard Desmarest's invention describes a steam carriage, in which the motive power, instead of being imparted to wheels, is transmitted by cranks to a set of legs, having an alternating or rising and falling motion, and bearing at the down stroke against the ground, rail, or surface to be traveled over, so that they propel the carriage in a manner somewhat similar to the action of the legs of a horse. An arrangement of rods, working in slotted brackets, and actuated in levers, is also described for bringing the legs in and out of action.

PROF. WHEATSTONE ascertained that the duration of the electric spark does not exceed the twenty-five thousandth part of a second. A cannon ball would appear stationary in its flight if illuminated by the spark, and the wings of an insect that move ten thousand times a second would seem at rest.

ACCORDING to Prof. Bottger, the mixture of cotton with linen may be detected by unraveling a piece of the tissue, both warp and weft, and plunging it into a solution of aniline and fuchsine. It should be taken out, washed, and, while moist, dipped in ammonia. The cotton threads will then lose their color, while the linen will remain red.

DR. SJOGREEN, a Swedish naturalist, states that the particles of pure iron found in the Swedish lakes result from the deoxydizing action of certain insects. Their larvæ absorb oxygen from the oxide of iron and form a cocoon of pure metal.

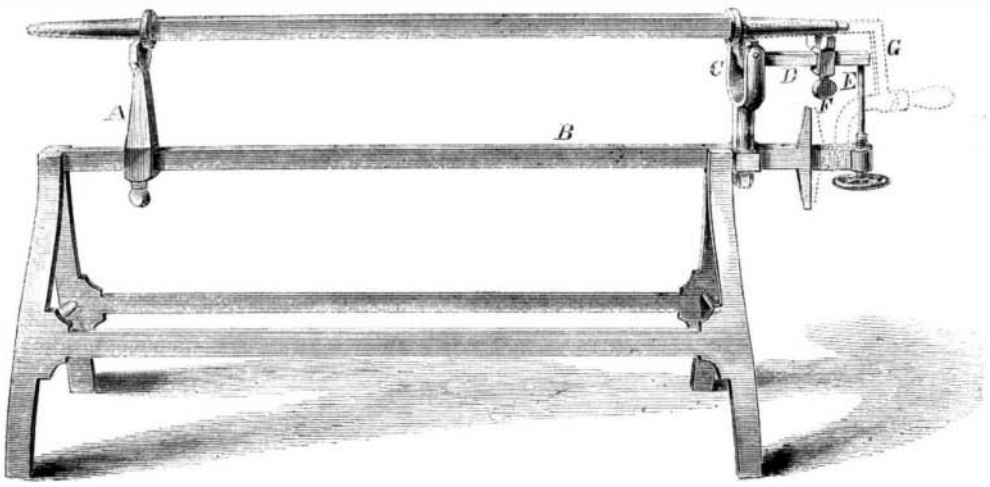
THE presence of a one hundred thousandth part of phosphorus may be detected in a body by Mitscherlich's process; and Dr. Herapath has found it perfectly possible to discover the ten-thousandth part of a grain of strychnia in solutions.

FROM analyses of cows' milk it has been discovered that the quantity of butter present in the evening milk is more than double that of the morning. The quantity of sugar of milk is greatest at mid-day, and decreases towards evening. The albumen, caseine, etc., remain almost constant.

Improved Axle-setting Machine.

Axles for carriages are generally made by the quantity in large factories, the ends alone being furnished, they being lengthened by a piece in the middle, and welded together by the purchasers. In welding them, care must be taken to set the ends the wheel runs on perfectly true, in line with each other, otherwise the wheels will stand in or out of a vertical line, as our readers have seen in some shackly old country wagon. This machine is intended to make the process of setting the axles true, expeditious and certain, and is well arranged to that end. Any length or taper of axle can be set in a few minutes.

Fig. 1



GORTON'S AXLE-SETTING MACHINE.

In itself the machine is quite simple, being merely two uprights, A, on a frame, B. These uprights are adjustable by set screws at any distance. The upright, C, has a jointed bar, D, projecting from it, which rests on a screw rod, E. This bar is a straight edge, to show the taper of the axle; for when the same is placed on the uprights, as shown in the engraving, and the stop, F, brought up to it by the screw, the taper will be given by the gage, G, shown in dotted lines. If the axle does not touch the stop, F, it is too high on the end, and must be brought down by the blacksmith. If it touches at the end and not at the shoulder, it is too low, and must be treated accordingly. The axle is then turned end for end, and the operation is repeated. The T end on the frame is to set the T foot of the gage against, as shown. Fig. 2 illustrates the manner of obtaining the angle of the gage. The foot is set against the spoke, and the straight edge, H, is put in the axle box. This is a very useful machine, and will be of great assistance to wagon manufacturers.

This invention was patented through the Scientific American Patent Agency July 25, 1865, by John Gorton, of Providence, R. I. For machines or State rights address him at No. 107 Cranston street, that place.

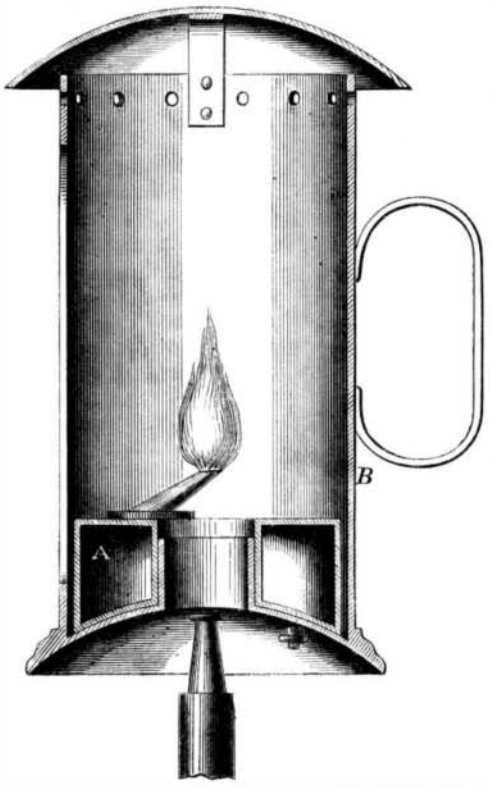
Iron Cow Stalls.

Our agricultural readers may be interested to learn the details of the new iron cow stalls in use abroad—similar contrivances being partially introduced in this country The stalls are formed of strong division plates of cast iron, the front having a round dwarf column which offers a smooth surface to the cattle when turning in or out; and each cow is fastened by the ordinary chain passing round the neck, the end of which slides up and down, a vertical iron rod attached to the stall division. The troughs or mangers are of cast iron, the whole length of the stall, raised a few inches above the level of the pavement, and are combined with the stall division in such a manner that water emptied into any one trough will flow along the entire range.

The fodder is contained in a wrought-iron rack, raised about a foot above the trough, and has open rails at back as well as in front, to expose the fodder to the action of the air. The advantages claimed for these improvements are, the stalls are more durable than can be attained by any other means, very compact, easily cleaned, and will not harbor contagion; the arrangement is convenient, and facilitates dispatch in feeding; the cattle have a greater relish for their food, and the fodder never gets damp or heated. Fresh air inlets are placed in front of each cow, and a feeding passage for trucks runs along the heads of the stalls. The doors are of flagging and asphalt or brick.

HARPER'S GAS LIGHTER.

Where many gas gets have to be ignited—as in public buildings and street lamps—much time is generally wasted, and quantities of matches consumed during the operation. It will be conceded that the lamp shown in the engraving is a great improvement on the common way of doing the business, being much more expeditious, cleaner, and more economical. With these recommendations it should certainly become popular. In order to light a gas jet with this device, it is merely necessary to set the lamp over the burner, as shown, when the flame of the lamp communicates with the gas, and lights it at once.

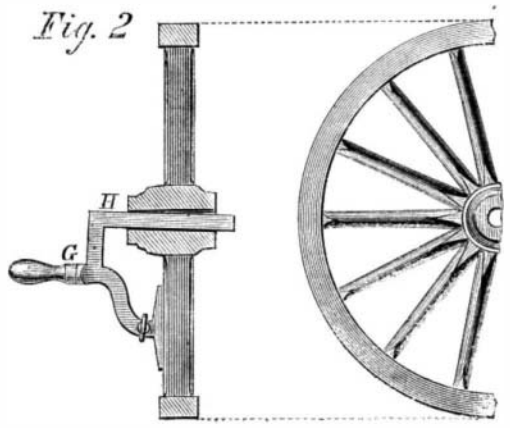


In construction, the device is simply a spirit lamp, A, set in a case, B. This case has an orifice at the bottom, which is placed over the burner with the result already alluded to. The lamp can be trimmed through a door in the case, and is protected from the weather. Thie is a convenient affair, and was patented through the Scientific American Patent Agency, by John G. Harper, on July 25, 1865. For further information address the patentee at the Metropolitan Gas Works, foot of 42d street, North River, New York.

Petroleum in Europe.

It is stated that petroleum has been discovered in Hanover, and capital is being privately subscribed in England to raise the oil from the wells, which are reported to be numerous. The constantly increasing importance of the trade in mineral oils at Marseilles, too, attract attention to the oil deposits of Europe. It is now considered certain that, in a period more or less short, the old continent will not be tributary to America for mineral oils for lighting. Every day new natural reservoirs of petroleum are discovered; and at the same time geologists are beginning to understand oil fields better, and the manner in which they are distributed over the globe. Among the localities which already export petroleum, is Moldo-Wallachia. Havre is the principal French market for petroleum. The *Marseilles Semaphore*, however, is of opinion that Marseilles, is destined to become a large market when the European reservoirs shall be worked on a large scale, and when it can receive the mineral oils of Asia by the Isthmus of Suez. There is an intimate connection between the reservoirs of petroleum in Gallacia and Moldo-Wallachia. These two oil regions, in fact, only form one, which corresponds to the general line of the Carpathian mountains—*London Artizan.*

Fig. 2



MARKET FOR THE MONTH.

The leading events in the commercial world for the past month are, a great speculation in cotton at Liverpool, an advance to seven per cent in the rate of interest by the Bank of England, a speculation in grain at Chicago, and a rapid extension of the credit system in our dry-goods trade. We look for a collapse in both speculations, and ultimate heavy losses by those who are granting large credits in our inflated currency. Prices at the last of October compare as follows with those at the end of September:—

	Price Sept. 26.	Price Oct. 25.
Coal (Anth.) ₩ 2,000 lb.	$12 00 @12 50	$13 00 @13 50
Coffee (Java) ₩ lb.	29 @ 30	32 @ 34
Copper (Am. Ingot) ₩ lb.	32½@ 33¼	31½@ 33½
Cotton (middling) ₩ lb.	44 @ 45½	57 @ 60
Flour (State) ₩ bbl.	$7 60 @ 8 35	7 80 @ 8 75
Wheat ₩ bush.	2 15 @ 2 50	2 40 @ 2 80
Hay ₩ 100 lb.	60 @ 65	60 @ 65
Hemp (Am. drs'd) ₩ tun.	325 00@350 00	310 00@325 00
Hides (city slaughter) ₩ lb.	11½@ 12	11½@ 12
India-rubber ₩ lb.	36 @ 70	35 @ 75
Iron (American pig)		49 00 @50 00
Iron (English and American refined bar)		125 00@130 00
Lead (Am.) ₩ 100 lb.	9 50 @ 9 62½	10 00
Nails ₩ 100 lb.	8 00	8 00
Petroleum (crude) ₩ gal.	38 @ 38½	37 @ 37½
Beef (mess) ₩ bbl.	9 00 @15 50	11 00 @17 00
Saltpeter ₩ lb.	22	22
Spelter (plates)		10¼@ 10⅝
Steel (Am. cast) ₩ lb.	13 @ 22	13 @ 22
Sugar (brown) ₩ lb	11¼@ 17½	13 @ 19
Wool (American Saxony fleece) ₩ lb.	75 @ 77	75 @ 77
Zinc ₩ lb.	14 @ 15	15 @ 15
Gold	1 44	1 46¼
Interest (loans on call)	5 @ 6	7

Work upon the Chicago lake tunnel is to be carried on through the winter, and provisions, coal, and stoves have been carried out in tugs to warm and comfort the laborers in the cool depths. About thirty-five men will winter in the crib.