The real difficulty in ordnance lies, however, in the projectile. To contrive a projectile which can be driven most rapidly out of the gun, without wriggling in the bore, with its center coincident with the axis of the piece, and with the minimum of strain upon itself and the gun, while receiving the impress of a rotation proportionate to its length, has exercised many minds. Though the lead-coated projectile of Krupp has many excellences, high velocity or great penetration cannot be amongst the number, inasmuch as the drag through the barrel resists high speed, and the peeling off the lead coat in passing through armor impedes perforation. Vavasseur's copper-ringed projectile would compare favorably in both these aspects. And either would ensure a far steadier passage through the barrel, and therefore more equable powder pressures, than the balancing studs of Woolwich. France appears to have adopted copper rings on the projectiles for its new breech loaders. Objection may be taken to the overhang, unsupported at either end of these shot; but as the ring bites the grooves above as well as below, there is none of that balancing movement which is present wherever a windage shot touches the bore only at the two studs beneath and is free all round its body. If the long iron bearing and centering devices, employed in muzzle loaders by Vavasseur, Scott, Lancaster, and Whitworth, could be efficiently employed in breech loaders, we should expect higher velocities and better penetration than from any compression system of rifling. The difficulty is not insurmountable of preventing these windaged projectiles overshooting their seat when loading from the breech. Withworth has breech loaders on his system, but of small caliber, where the difficulties are small, and we can hardly accept this evidence as alone decisive in favor of the employment of windaged shot in breech loading ordnance.

The dispassionate tone adopted by the naval mission of the United States in describing the ordnance of Europe lends weight to their impartial descriptions and very reasonable recommendations; so that, whether we adopt their conclusions or not, we cannot but listen respectfully to their suggestions. The sum of their recommendations is that the Vavasseur system of construction is the best in Europe; the Parsons system of conversion, most suitable for old guns. Breech loading cannon being universal except in England, the breech closing arrangement of Krupp, with the Broadwell ring for "gas check," is regarded as best for adoption, while projectiles should have the copper rings of Vavasseur.

The Woolwich system is honored in being made the standard of comparison with that of the civilized world, with the result, however, of being declared inferior to the Vavasseur and Krupp; and the concluding paragraph of this extensive report is reserved for a condemnation of the studded projectile in favor at Woolwich, which is the chief offending cause that has landed us in such artillery difficulties that Rear Admiral Sherard Osborn, C. B., F. R. S., says: "I, for one, do not desire to take any share of responsibility in the great gun *fiasco*, which, I fear, awaits us on the commencement of a war with a first class naval power."—*Iron*.

The Education of Artisans.

Since the application of steam as a motive power for the production of almost every commodity required by man, everything seems to be wanted in a hurry; and for smart, intelligent workman of every craft, a continually increasing demand is plainly observable. But in nearly every calling thoroughness has been hitherto sacrificed to the impatience of customers, and we seem to become the more pressing the quicker we are served. The consequence is that the mechanical arts are cut up into branches, and the artisan, who should know all about his business, is made a mere expert at one particular part. Whatever a workman is quickest at like a machine, that he is kept to; and as long as he earns a living by that one thing, it is ten to one if he ever seeks to know any more. Were he compelled to turn his hand to other parts of his business, he would have to occupy in a useful way, in order to qualify himself for the performance of task by which he earned much brain work, he is the more easily led into idle pastimes, in which he often indulges to excess. His comparative prosperity makes him consequential. If he were made his daily bread. But this being secured to him without to feel that on the completeness of his abilities depended the bread which he is in the habit of earning by the repetition of a mere mechanical performance, which through constant practice becomes of no trouble to him, his mind would receive a new stimulant with each different job, and study would be the result.

Being thus compelled to see for information, his mind would be led into the parts of true knowledge in the search, and, once fairly started on that road, he would not be long until he could discern sound argument from bombast. There is much talk at present about technical education; but before the attainment of it will bear any fruit, the system of parceling out must be changed. When a boy is apprenticed to the tailoring trade, if he proves any way smart at making a vest, he never will get the chance of making trousers; and if he be quick at the latter, he will never be asked to put a stitch in a coat. What is the use of teaching the theory of any trade in schools with such a practice in existence?

In the building trade, we have masons or stonecutters who are not expected to set the stone they have wrought; wallers who turn no arches; bricklayers who dress or set no stones; and hundreds who could not read a drawing or get out a mold by which to work. Among those who are called joiners, we have men who make sashes they could not hang, and who never saw a "mouse" in their lives. We have "fixers" who, as a rule, make nothing they put up; and "framers" who would not be able to perceive the same angle in two different positions. We have "staircase hands" who affect to despise everything else connected with the construction of a building, and who, as a rule, look upon themselves as gods of wood, although they never made a circular headed sash in the whole course of their existence. Well planned houses suffer in their erection through this practice; for the "bench hand," who has been kept for a number of years at what he can do quickest, is often necessitated to turn in with a crowd of "fixers" and scrape away as best he can.

Considering the present system, it would appear that, with most builders, profit alone is the *alpha* and *omega* of every undertaking. It looks as if they do not care whether a house stands or falls, after it has been built and their gains counted into the bank. Very few have any considerations for the welfare of those whom they employ; and consequently, there is little or no reciprocation. The workshop, which ought to be conducted on the principle of a school where technical instruction is imparted, as well as for the fabrication of an article which brings a profit, is very often superintended by a man chosen more for his driving qualities than for his information.

It is seldom that a man capable of imparting what he knows is met with in such positions, and the generality of men in charge are cross and intemperate in their language, instead of being kind and considerate. As to receiving instruction, men are left very much to themselves to pick up that which they would sooner and better understand if explained by a man competent to do so. The language used by the generality of foremen, too, is very often the most abusive and sometimes revolting, such as no man aspiring to are spectable position in society should be heard giving utterance to. The susceptible dull youth of one-and-twenty is sneered at if he chance to ask the foreman a question concerning his work, and mulcted out of money, or wheeled into paying for beer, for the information which he receives from his older fellow. Capitalists should look after these practices, and apply a remendy, for one or two hours' prefatory instruction or forethought often saves a great amount of labor. Those who cannot see before them lose much time groping their way, and obviously the loss is to the employer. It is often said that the workers are not expected to be thinkers. In fact, the remark is frequently made: "You are paid for working, sir, not for thinking," addressed as a reprimand to those who gave such a reason for being caught, as the man in charge might suppose, wasting the employer's time. This is, too, without the least inquiry concerning the truth of the assertion. The result of this system is that men who would otherwise seek to become intelligent and useful in a general sense, lay down their minds to become expert at one or two things, and in many cases sharp only at what is called "shaping," that is, by their bustling about and wielding their tools juggler fashion, making people believe they are qualified for anything. To be sure, this kind of tact shows a knowledge of human nature on the part of the person who employs it, and the present system is the chief cause that leads many to resort to it; but also shows the weakness, stupidity, perhaps vanity, of those who are the victims.

If it were the practice that the foreman was bound to call his apprentices and men together once or twice a week, say for an hour, or even half an hour, at a time, and give them a lecture during working hours upon some technical subject, hundreds would be very thankful, and willing to subscribe to the expense. After working hours, very many working men do not like attending lecture halls for such a purpose, and they would be more at home in a class got up specially for themselves, and particularly when it would be taught where every practical appliance necessary for demonstration was close at hand.—*The American Builder*.

Correspondence.

Horse vs. Steam Power.

To the Editor of the Scientific American:

I see that, on page 346 of your current volume, W. F. W. asks which is most efficient, a two horse steam engine or two horses weighing 2,000 lbs., when used in an endless railway power. The answer to this query states that usually an engine of one horse power will do more work in the same time than one horse could do, with the advantage that the engine would not get tired.

I desire to state that, from numerous statistics from English and French authorities for a century past, together with over thirty years' experience in the application and use of animal power as a substitute for manual labor, and numerous and exhaustive trials with all motors, especially horses and steam power, I am satisfied beyond a possibility of doubt that any two good work horses, of two thousand pounds weight, can walk eight hours each day at the rate of about 1½ miles per hour upon a moving plane at an inclination of from 13° to 15°, without fatigue or injury, for six days per week for their natural working life; and this, upon a well designed and constructed endless railway power, will cause them to exert an average constant power equal to about 82,500 foot pounds per minute, or equal to 2½ horse power; from which must be deducted for friction of such power (by actual results) from 11 to 15 per cent, which reduces the force transmitted and utilized to, say, 77,550 foot pounds per minute, or 38,775 foot pounds per minute for each horse, or 1·175 horse power net, transmitted. These data are partially taken from the reports of trials by the United States Agricultural Society and the New York State Agricultural Society during the past ten years.

In regard to small steam engines, I have always allowed and deducted (for their own friction) 25, 30,35 or 50 per cent from their rated power for six, four, two, and one horse steam engines respectively; and a long experience has confirmed in my mind the correctness of this reduction. With poorly designed and poorly constructed horse powers or steam engines, the results would be lessened, while almost invariably the expenses of operating them would be enhanced in a like ratio.

Albany, N. Y. HORACE L. EMERY.

The Mississippi River.

To the Editor of the Scientific American:

Having noticed within the past year a number of schemes to relieve the shipping of the bar at the mouth of the Mississippi river, I intend to bring before the government a plan for carrying vessels, not over but through the bar, in the following manner: I would build a propeller to draw as much water as the largest ship that will be required to be towed through the bar. She should be as short as possible, in order to be easily manipulated and not require too much ballast to get the required draft. In or near the bottom of her hold, I would place a sufficient number of immense force pumps, to be worked by steam. I would have five iron discharge pipes, of nine inches diameter, to discharge their water through the steamer's cutwater, one above the other, well down below the mud line. The two lowest pipes are to point slightly down in order that the water will pass under the boat when she is in motion. The pipes are to come flush with the outside of the boat and to be reduced to a diameter of six inches at the point of discharge, to give the water velocity. Then I would have three seven inch discharge pipes, contracted to five inches at the mouth, on each bow, one above the other, well down under the boat and pointing down and forward at an angle of 30°. Then I would have a row of seven inch discharge pipes about 10 or perhaps 15 feet apart, along the whole length of the boat on each side, well down under her sides and pointing down and forward at an angle of 30°. Those pipes are to be contracted at the mouth to five inches diameter. I propose also one six inch pipe to discharge its water down through or alongside the keel, well forward under the bow. The feed or suction pipes are to take the water as near the surface as possible, in order to use clear water.

I believe such a boat would tow any ship or steamer through the bar at the mouth of the Mississippi river with perfect ease and safety. She would have a perfect volcano under her, constantly bursting up through the mud and sand and leaving behind her an immense channel. And as she would be constantly tearing the bar to pieces, the ebb and flow of the river would in a great measure remove the bar altogether. I think there is no plan by which the obstructions can be so cheaply overcome, as one such boat will do all the towing both in and out of the river.

A powerful force pump put on board of the steamers running above New Orleans, to throw a powerful stream or two under their bows, would be a great assistance to them in getting off sand bars, where they often get stuck fast.

Presque Isle, Mich. SIDNEY COOK.

Prices of Gas.

The following are the current rates for gas paid by consumers, per 1,000 feet:

Albany	$2.50	Rochester	$3.50
Baltimore	$2.75	St. Louis	$3.25
Boston	$2.50	Syracuse	$3.25
Chicago	$3.37½	Troy	$3.25
Cleveland	$2 50	Washington	$3.56
Concord	$3.20	Hamilton	$3.00
Harlem	$3.00	Kingston	$3.50
Lowell	$2.75	London, Canada	$3.00
Manchester	$2.70	Montreal	$2.60
New York	$2.75	Quebec	$2.80
New Orleans	$3.00	Toronto	$2.50
Oswego	$3.50		

A writer in the Boston *Cultivator* finds that most of the so-called strained honey sold in bottles is composed as follows: Cane or other sugar is melted in a decoction of slippery elm bark in water. Some manufacturers use, instead of elm, a solution of gum arabic and starch, to give it consistency and save sugar; but this last does not resemble honey so much when dropped, as it lacks the stringy appearance. These mixtures, with or without the addition of a little cheap Cuban honey, are flavored with essence, and the mess is ready for sale. The only true way to obtain real honey is to buy it with the comb.

TO DESTROY MOLES.—Bryan Tyson, Washington City, gives the following method for making pills to destroy moles: Make a stiff dough of corn meal, mixing with it a small quantity of arsenic. Make a hole with a finger in the runways, drop in a lump of dough about the size of a marble, and then cover over with a lump of earth to exclude the light. After the first rain, go over the field again and deposit in all freshly made roads. I once concluded to plant a piece of sandy bottom land in sweet potatoes; but as it was much infested by moles, my success depended on first exterminating them. A few doses of arsenic given in the way described brought about the desired result, and it was a very rare circumstance to see the track of a mole in this piece of ground during the entire summer.

CHARGES FOR MACHINE TOOLS A QUARTER OF A CENTURY AGO.—The following is interesting as showing the cost of work done on machine tools twenty-five years ago. We give the charge per day for use of tools: Large boring mill, $17.50; medium boring mill, $12; large punching machine, $25; heavy lathe, $15; small lathe, $5 50; large drill, $8; medium drill, $4.50; large planer, $7.37½; medium size planer, $5.33⅓; forge (with smith and helper), $10; small forge (with smith and helper), $5. Machinists received from $1.95 to $2.15, and boiler makers, from $1.75 to $1.90.