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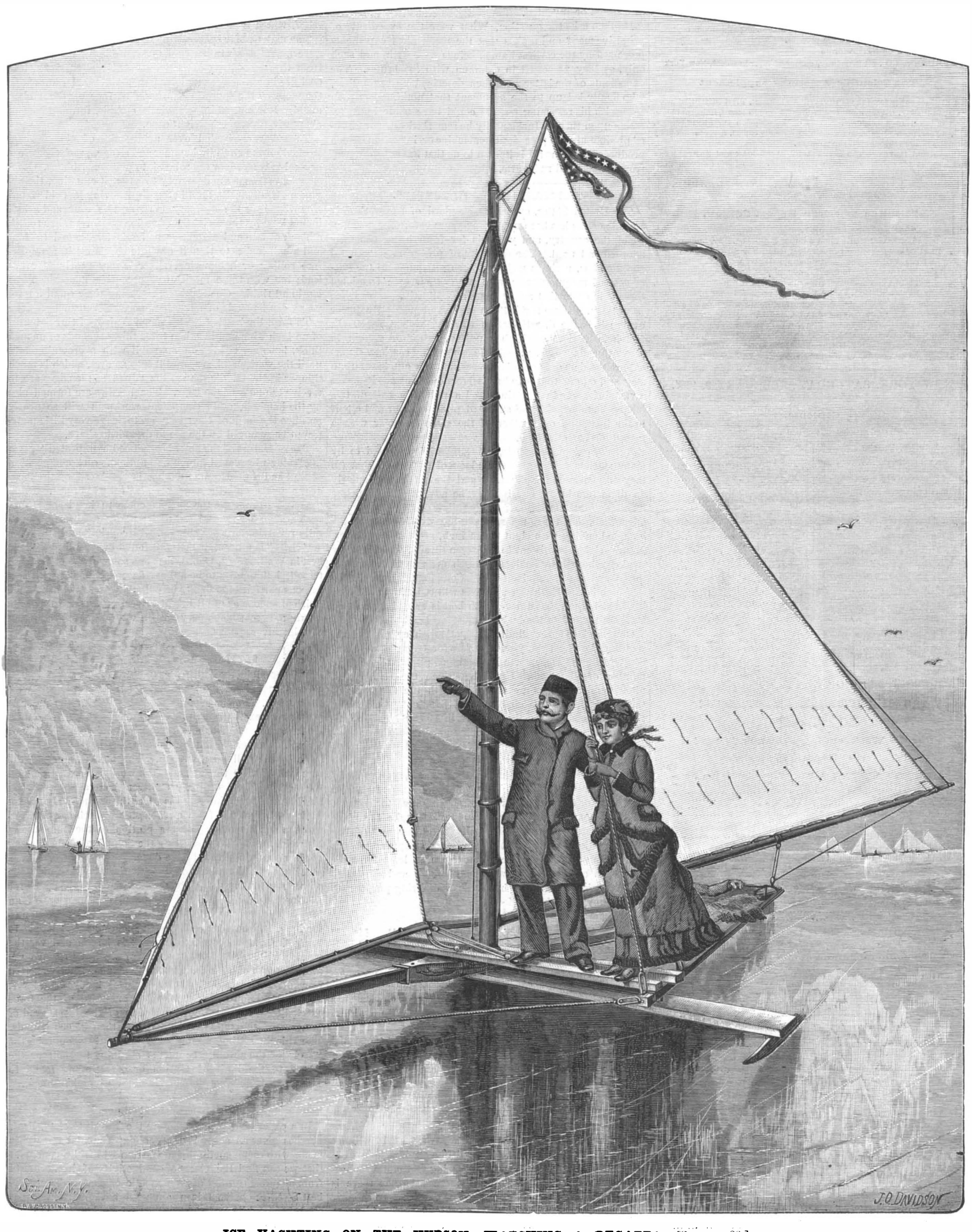

ICE YACHTING ON THE HUDSON.—WATCHING A REGATTA.—[See page 88.]

Scientific American.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 423,

For the Week ending February 9, 1884.

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AN INQUIRY INTO THE ORIGIN OF INVENTION.

In an interesting paper read before the Anthropological Society of Washington, Mr. Franklin A. Seely gave the results of an investigation, the object of which, he stated, was to consider the nature of the first steps in mechanical invention, far back of history, of tradition, and of the revelations of archæological research. He showed by several examples that every invention, however complicated, was the end of a process of evolution starting from the most primitive beginning. He traced thus the evolution of the modern steam engine as well as the bow and arrow of the savage; they could all be traced back to rude types in a few mechanical expedients which man possessed at his earliest origin, and employed, guided by his own selection, and which have been supplemented by other expedients from time to time discovered or invented.

He then asks the question, What were the expedients of primitive man? and replies that the mechanical expedients possessed by the earliest human beings were such, and such only, as they possessed in common with the brutes. The expedients of the latter were then described by the author, who finally led up to the argument that nothing less than *man* with his reasoning powers could have made improvements upon them. Incidentally he remarked that the finished product always precedes the machine or invention which produces it, and no art is known to us that has not grown up from simpler and ruder arts.

THE STANDARD SCREW THREADS.

Our United States, or Sellers, standard of screw threads and diameters has been now many years before the mechanics of the country, and yet it is far from being generally adopted and used. The difficulty of procuring its general adoption has, perhaps unjustly, been attributed to the selfishness of manufacturers, who prefer their own fractional threads in order that repairs and reduplications must come from them. There is a better reason, and possibly a juster cause; it is the dissatisfaction with the system itself. In fact it is hard to establish a uniform, absolute system in screw threads. Every mechanic can readily see how different are the demands on a bolt on which the nut is set up to stay and on one that is to be used for adjustment. It makes a vast difference in "setting up" a nut on a bolt of two inches diameter with the standard pitch of four and a half to the inch, and on another of the same diameter with a thread of six to the inch.

But beyond special needs, the standard is objected to by many mechanics because of the lack of proper relation (so they say) between the diameter and the pitch, particularly on diameters below one inch. The advance in diameters from one-fourth of an inch to the full inch is by sixteenths of an inch, and the pitches, beginning with twenty to the inch and ending with eight to the inch, are ten in number. A three-eighth bolt is cut to a sixteen thread, which greatly weakens the bolt by its depth—much more so than an eight thread can weaken an inch bolt. Complaint is made that a half inch bolt with thirteen threads will twist in two before it will strip, and that a five-eighth bolt is ruined by cutting it eleven threads to the inch.

Our standard is very similar to the English, or Whitworth, standard, having twenty-one pitches for twenty-nine diameters, while the Whitworth has eighteen pitches to the same number of diameters. Up to one inch the relations of pitches and diameters are the same, with the exception of the half inch bolt, which by United States standard has a thirteen thread, but by the Whitworth has twelve. In estimating the relative strength of bolt and pitch of thread, reference must be had to the form of thread. Beyond dispute the Whitworth is the strongest thread yet produced, as much above our modified sharp V-thread, called "standard," as that is above the old V-thread itself, and more. Its rounding, or convex, bottom is never inducive to fracture. If it was not so costly to produce, it would take the place of our square bottom thread for all general purposes. Some of these objections against the standard will appear to have more than prejudice for their foundation, at least for some uses, by a comparison between the threads and diameters and a consideration of the hundreds of differing purposes to which they are to be applied.

U. S. STANDARD.

Diam.....	1/4	5/16	3/8	7/16	1/2	9/16	5/8	11/16	3/4	13/16
Pitch.....	20	18	16	14	13	12	11	11	10	10
Diam.....	7/8	15/16	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	
Pitch.....	9	9	8	7	7	6	6	5 1/2	5	
Diam. ...	1 7/8	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4
Pitch.....	5	4 1/2	4 1/2	4	4	3 1/2	3 1/2	3 1/4	3	3

TO DRILL HOLES IN LINE.

In large castings where holes are to be finished in parallel projections, as the two spindle holes in the uprights of a lathe head, the boring bar, passing through both holes, insures perfect line. But there are many small jobs of a similar form which will not admit of a drilled or cored hole to be afterward bored, but must be finished by the drill. It is difficult to insure perfect line in such cases by ordinary methods. Even the use of the round, twisted drill will not insure accuracy. It is not easy to drill a straight hole, even in a continuous piece of cast iron, owing to the unevenness of the material, and the trouble is increased when there is an interval between two portions to be drilled.

There is, however, a simple method that may not be generally known, which will insure accuracy. Drill one hole in one of the rings, either by chucking the piece or by suspending it on the lathe center. Then fit an arbor nicely to the drilled hole, making a fit sufficient to hold the piece while rotating. Dog the arbor to the live center of the lathe, and support its other end by a center rest close up to the casting, having the arbor, of course, in line with the lathe centers. The casting will revolve with the arbor, and makes a line hole a certainty. If the weight of the overhang is too great to secure even rotation, counterbalance by a weight on the other side.

MANUFACTURE OF SILVER SPOONS.

Probably there is no article of table or of other household use in the production of which so little of machine working is employed. Almost all the work on solid silver spoons is handwork; the exceptions are the rolling of the ingot into plates and the production of spoons with ornamentation in relief, which is produced by recessed patterns on the rolls.

The material for spoons is coin silver obtained from the government mints in ingots, or from trade for old silver, or from the use of current coin. This is melted over a charcoal fire in plumbago crucibles to a certain heat, known to the adept by the appearance of the surface of the molten metal. It is poured into cast iron moulds, forming bars of about seventy ounces weight each.

These bars are heated over a forge fire of charcoal and worked on the anvil by hammer and sledge, precisely as iron or steel is worked, or are rolled into plates or ribbons. Occasional annealings are necessary to prevent cracking, the annealing being heating red hot and quenching in cold water. The ribbon for the ordinary tea spoon is four and a half inches long by three-eighths of an inch wide. When rolled, a blank of two and a quarter inches is lengthened to four and a half inches to thin it down to spoon thickness. Before rolling or hammering, silver is very nearly as soft as lead; but with these mechanical processes it can be made hard and rigid. Good springs, retaining their qualities for years, can be made of silver hammered or rolled.

To form the bowl of the tea spoon the bar, of three-eighths of an inch wide and less than three thirty-seconds of an inch thick, is hammered flat on an anvil with a crowning face until the workman has spread it into an oval, which is much thinner in the middle than at the edges, as the edges are to receive the bulk of the wear. The handles are formed also by the hammer, and a competent workman will so nearly produce the form of the spoon as to leave very little material to be removed by the file to dress it to shape.

The curvature of the bowl is produced by repeated "coaxing" blows by a steel punch and a die of cast composition of lead and tin. No file dressing is employed on the faces of the spoon; only the edges are file-dressed to form. From the anvil and the die the spoons come to hand smoothing with Scotch gray stones and polishing by stiff brushes, generally revolving brushes charged with "grits" and oil.

"Grits" is a peculiar material found in several places, the best in Wallingford, Conn., that has some of the qualities of tripoli, but appears to be an argillaceous deposit with calcareous particles too fine to be palpable. Burnishing is the finish of spoons as of all bright silver goods. All these are hand processes; machinery has little to do in the production of solid silver spoons.

SETTING-UP WITH THE WRENCH.

It is possible that ultimate fracture of otherwise sound bolts is sometimes induced by injudicious setting-up with the wrench. Few mechanics stop to consider the possible power they exert through the medium of the wrench. In a manufacturing establishment recently, a bolt seven-eighths of an inch diameter was cut off as square as if by a cutting-off lathe by the pull on a wrench. The bolt was cut to the standard of nine threads, and the workman was setting up the nut with an ordinary eighteen inch screw wrench; thinking he could do more than feel the nut home, he took a hook wrench made from a seven-eighths inch bar of steel, and bracing his foot against a portion of the frame threw his weight on the lever, cutting the bolt of mild tough steel, as clean as a chisel could have done.

A little consideration would teach the workman that the power exerted through a lever, as a wrench, is enormous for the force applied. Take a nut on a three-quarters of an inch bolt for an example. The bolt has a thread of ten to the inch, and a wrench of twelve inches long is ample to bring the nut to bearing. With this length of lever the wrench will travel about seventy-five inches to move the nut one-tenth of an inch. Let there be a constantly exerted force of fifty pounds on the end of this twelve inch lever, and the strain on the bolt, allowing one-third of the force exerted to be absorbed by the friction of the thread and of the face of the nut, will be not less than 25,000 pounds. The rule in setting up on bolts and nuts should be the "feel" of the absolute contact; straining the bolt or the thread to the limit of tension or of stripping tends to weaken, if it does not actually induce an incipient break.

The Magnetic Balance.

In a paper read recently before the Royal Society, Prof. Hughes gives an account of some experimental researches made with a magnetic balance, from which he concludes that we can find the electric conductivity of iron or steel from a simple reading of its magnetic capacity. Thus, the best Swedish charcoal iron annealed has a magnetic capacity of 525, while that of crucible cast steel annealed is represented by 84. The electric resistance of the same is respectively represented by 192 and 350.

TRICHINOSIS.

At a recept meeting of the French Academy of Medicine, M. Brouardel read a paper relative to the recent trichinosis epidemie at Emersleben in Germany, he having been detailed by the government to investigate the occurrence. He stated that the cause of the disease was traced to the flesh of a hog which had been chopped fine, and of which a large number of people had partook, spreading it upon bread as if it were cheese. Between the 12th and the 19th of September 250 persons were taken ill, of whom 42 died; in the neighboring village of Deesdorf 42 were affected, of whom 9 died. On the 19th of September, the rest of the chopped meat having remained unsold, the butcher mixed it with a fresh lot and sold it at the town of Nieubagen; here 80 persons were attacked, though less seriously than the former, and none died.

At the beginning, the nature of the disease was misunderstood, it being considered as a diarrhœal cholera, either of spontaneous origin or due to the poisoning of sausages. The true cause of the disease was recognized only at the eleventh hour. M. Brouardel set out to determine whether the time intervening between the killing of the hog and the consumption of the meat had any influence upon the virulence of the disease and the time of its appearance. He found that the noxious qualities of meat containing trichinæ diminished according to the ratio mentioned. Those that partook of the meat six days after the killing were still sick, but none died; whereas in the case of those who ate the day following it, fatal symptoms were rapidly developed.

The main question of danger from trichinosis lies in the preparation of the meat. Every one of the victims had eaten it *absolutely raw*. A single family that had cooked the meat in the shape of sausage, on the 15th of September, showed not the slightest indications of disease. It showed that the affected meat was rendered harmless by cooking to a degree even which might at first have been considered entirely insufficient. Another mode of prevention consisted in giving the consumers of the suspected meat a certain dose of alcohol, and the favorable action noted by the attending physicians is ascribed to its influence.

He remarked in conclusion that, in view of the German habit of eating meat raw, there was some justification in prohibiting the importation of American pork into Germany; but as regards France, where such habits do not exist, he doubted the advisability of the preventive measures to exclude American pork.

THE PATENT COMMITTEE'S ERROR.

One of the strongest safeguards of movable property lies in the fact that stolen goods are not readily salable. The market for stolen property is spoiled or greatly restricted by the circumstance that in law the receiver is as bad as the thief, and the innocent possessor of stolen goods is likely to lose the purchase money, if he does not get into more serious trouble, when the rightful owner's claim is made good. For a large class of patented inventions meeting popular needs this proper safeguard has been their chief safeguard. The infringing manufacturer is usually irresponsible, and the unauthorized vender cannot be found when the infringement is discovered; but the fact that the wrongful user is also liable has made prudent men cautious in dealing in such things; and enough men are prudent to diminish materially the profits of infringers and so discourage the dishonest from making over-free with the rights of others.

In asking Congress to take away this element of protection, hitherto accorded by the law to property held under patent rights, the Patent Committee allege that they do so on the ground that it has led to grievous abuses. There has been, they say, much complaint of hardship arising from the practice of owners or pretended owners of patents in allowing infringements to go on for a term of years, and then sending around agents to demand damages under threats of lawsuits, to the distress and loss of many innocent people. This is the only excuse given for legislation exempting the user of infringing manufactures, and confining the penalty for infringement to the maker and vender only. That the excuse would be inadequate, if true, has been amply shown in these columns. But is it true?

In what part of the country and in connection with what patents or pretended patents have the alleged abuses occurred and complaints arisen? And what proportion do the alleged complainers bear numerically to the fifty million people who in every sphere and walk in life are constantly surrounded by and dependent for occupation, income, convenience, or necessity upon articles patented or manufactured under patent rights? Have there come to the ears of the committee one complaint from each hundred thousand patent users, in connection with one in each thousand patents? And what proportion do the pretended hardships bear to the hardships complained of through disputed ownerships of other species of property?

If every person overreached, or who should think himself overreached and damaged, in a horse-trade, were to complain to Congress, the annual list of complainants would be a very long one; but that would scarcely be held a valid reason for legislation destroying or impairing all property rights in horses.

The truth is, the pretext for the recent action of the House of Representatives, in connection with suits for infringement, is essentially a false one. There has been no general practice of the sort alleged; from the nature of men and things there cannot be. As a class, patentees are not eager for lawsuits; indeed, suits at law are relatively fewer in connection with patents than with any other species of property of equal scope and value. And the proportion of all the patent suits that could by any forcing be brought into the class complained of by the Patent Committee must be and is extremely small. If pretended owners of patents harass people by threats of suits for infringement, the proper course is to turn the offenders over to the local authorities for punishment, as in the case of all other petty swindlers, and not punish all patent owners for the crimes of a few pretenders to patent rights.

It is not denied that there have been cases—marvelously few, though, in view of the number of patents issued, and the important part which patents play in the industrial world—a few cases in which patentees have been kept from the enjoyment of their rights by litigation, usually against powerful infringers, until other infringers have come to believe that the patentee had no rights or would never be able to enforce them; and then, after a struggle more or less prolonged, the patentee's rights having been established, they have proceeded to claim damages for the unlawful use of their invention. Sometimes the offenders have been morally innocent through ignorance; but more frequently they have discounted the chance of ever being called to account, and after infringing wantonly have complained of hardship when their miscalculation has reacted to their hurt.

It is, however, not this class of complainants whom the Patent Committee ask to have protected, but the victims of those who purposely allow the use of their inventions simply to gain ground for subsequent blackmailing operations under threats of lawsuits against innocent offenders against the law. The possible justice of the committee's requests hinges upon the existence of a considerable class of such evil-minded patentees. With all respect to the sincerity of the committee, we may say that evidence is lacking of the existence, or the possible existence, of such a class; and consequently there is, on the committee's own showing, no ground for legislation such as they have asked for and obtained in the House.

The only hope that patentees can now have of protection against the proposed invasion of the rightful privileges they have hitherto enjoyed, lies in the superior knowledge of the Senate, both as to the facts of the case and the conditions under which a large part of the productive industry of the country has been established and is maintained. Senators can scarcely fail to see that the pretext of the House committee, if founded on real hardship and actual complaints, would not justify so grave and costly a remedy, while in the absence of such foundation the proposed legislation is utterly destitute of reasonable, even plausible, grounds to rest on.

MODERN AND ANCIENT RAINFALL.

In discussing recently the question whether we were in danger of a permanent and increasing reduction of our available water power, a question of most vital importance, we were forced to conclude that no such peril was imminent, and that the scarcity of water so troublesome for two or three years past in New England and the adjacent States was merely local, and would be but temporary. It is however well worth our while to look further. We may find reason to believe that changes are in progress, though moving too slowly to be detected within one or two generations. Our rain records cover but comparatively a very few years, but there are records to which we can refer, going back several thousands, and they tell a different story from that which our brief national history seems to show.

We do not refer in this to geological evidence, though that is by no means to be disregarded, for it is manifest that vast areas of the earth's surface were formerly covered with water which has passed away solely by evaporation. Changes in elevation have raised the continents and thus forced the ocean back into narrower limits, but those changes are of a different kind. Areas of inclosed water owe their continued extent to the relative amount of evaporation and precipitation, and nothing can be more certain than that, in some instances at least, such areas have been in steady progress of contraction since certainly the close of the Tertiary age, this steady contraction being perfectly consistent with fluctuations which might continue many years each.

Two illustrations only are sufficient. The basin of the Aral-Caspian (for the two are to be counted but as one) gives us one. Humboldt says: "The desiccation which is unquestionably going on in the basin of the Aral Sea . . . is in no way dependent on any violent revolution in the order of nature." Major Herbert Wood of the Royal Engineers says that "there is no doubt of the former vastly greater extension of the combined Aral-Caspian Seas, and extremely little as to their former connection with the Polar Ocean."

The other we find on our own continent. Every one traveling on the Central Pacific Railroad has had the opportunity to see for himself that the Great Salt Lake of Utah has formerly covered a vastly greater extent of surface than it does now. The terraces which its waters have left all along the flanks of the Wahsatch Mountains, at elevations of thirty to fifty feet and more above its present level, are as plainly to be traced as any railroad embankment, a state of water which would flood a vast area.

But these manifestations we take only incidentally, for we know nothing of the amount of time involved in them. If we can find, however, that the same changes have been in progress within the time which we can measure by definite years, then these geological records become to us of immense importance, since they show a persistence of effects and causes that must certainly depend on natural laws, and may be expected therefore to continue in steady action now and for all time to come.

No matter what views we may take of the origin of the human race, it is manifest to all that the oldest of all indications to which we can refer, written, monumental, or traditional, are mostly grouped around the eastern limits of the Mediterranean Sea, with the countries to the northeast beyond. We look in the dim light of extreme antiquity to the regions around the Euphrates and the Tigris. The Assyrian Empire is to us the embodiment of the very earliest days. Its power swayed all the southwest of Asia, and it was because it had a thickly peopled domain. Dr. C. Fraas says: "The most fruitful land of antiquity was, as is well known, the region bordering on the Lower Euphrates and Tigris, and in particular that called in later times Mesopotamia. But as Richter says, the land of great canals is now desert and barren, without settlement, and a dried up wilderness—covered with a growth of the plants peculiar to a saline soil, and all this where once was the 'garden of the world.'" Mr. Blanford, chief of the India Geological Survey, writes of Persia: "From the accounts given by ancient writers, it appears highly probable that the population was much greater and the cultivated land far more extensive 2,000 years ago than at present, and this may have been due to the country being more fertile, in consequence of the rain fall being greater."

Captain Burton says: "The once wealthy and commercial land of Midian has become a desolation among the nations; the area of some three thousand square miles, which thirty-one centuries ago could send into the field 135,000 swordsmen, is abandoned to a few hundreds—half peasants, half nomads." Once more, when the Israelites, in their exodus, came up on the east side of the Dead Sea, the whole Plain of Bashan was swarming with inhabitants. It was dotted over with walled towns, with intervals of but a very few miles in any case. The towns are there now, but where are the people? A few wandering Bedouins roam here and there, but the cities are "waste, without inhabitants." The land is in no way able to support the population which three thousand three hundred years ago lived in prosperity. We may not deny that various causes have contributed to this decadence—moral, social, political, but the one which has been engaging our attention is of itself imperative. "Ichabod" has been written on the land, for its glory has departed with the rain.

And so we might go on; the same truth is shown everywhere over Asia and Europe and the north of Africa. But we will look at only one other single line of evidence, and that shall be among the ancient people of America. We will come nearer in space and probably nearer in time, though how much nearer we do not know. It is well known to all that in many parts of New Mexico and Arizona are found extended proofs of the former occupancy of that country by a people certainly distinct from the Indians of modern type. They have long since passed away; how long since we can only conjecture. But their houses remain—some of them single, some in villages and towns. Some are in the valleys, some on the mesas far above the valleys, while many are real cliff dwellings, recalling in their situations the homes of Edom.

The one point which at present interests us as to these ruins is this: no one now can live where they were built, simply from the *lack of water*. Dr. Bessels, speaking of those along the Hoven Weep, says: "There is no running water whatever during the greater part of the year." Mr. W. H. Jackson, describing those on the San Juan, states that "there is not a living stream throughout this whole region." Capt. Simpson, in his report to the Secretary of War, detailing those he saw along the Rio Chaca, says: "The country, as usual, on account, doubtless, of constant drought, presented one wide expanse of barren waste." And yet over all that stretch of country was manifestly found long ago an abundant population.

It is evident, therefore, that then rain fell in much larger amount than now; and, inasmuch as there is nothing to indicate any sudden change, it is reasonable to infer that the change has been gradual, and hence that it may be still in progress.

One item of interest is worth mentioning as being a collateral proof of such a condition. Through all the region northward thence—New Mexico, Arizona, Nevada, and Utah—the tree growth (which is very limited) gives one constantly the impression that it is about to come to an end. The nut pines, for instance, all look old; there is scarcely such a thing as a young tree to be seen. The bare, ragged branches seem as though they might have battled the storms for hundreds of years, but could scarcely do it much longer, and then when they were gone there would be *nothing* left.

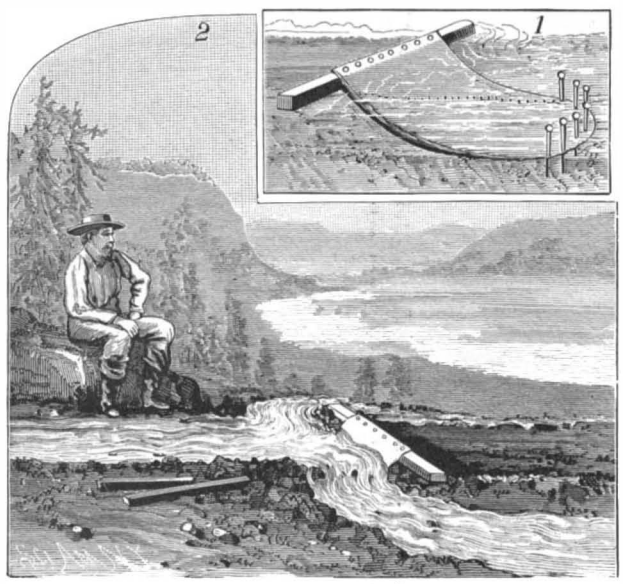
All these facts apparently make one indication, and though any local droughts, even if protracted over several years, may be of small moment, yet the evidence comes strongly to us that a gradual desiccation of the earth's surface is in progress; and that this proceeds from causes not connected in any way with human agency, and of course not under human control.

BARON NORDENSKJOLD is understood to be contemplating as his next adventure in exploration a voyage to the South Pole in 1885. This expedition would cost at least $1,000,000, as a ship of special type would have to be built for its purposes.

IMPROVED DAM FOR IRRIGATING-DITCHES.

In the engraving Fig. 1 is a perspective view of the dam, and Fig. 2 shows its position in the ditch. One end of a sheet of canvas, leather, or other suitable material is attached to a bar of wood, which is longer than the width of the canvas. This bar reaches across the ditch, the ends resting upon the banks, while the canvas lies in the ditch, with its free end extended up stream and secured by pegs driven through holes in it into the ground. The water pressing against the upper side of the sheet bulges the middle portion downward and presses the margins against the bottom and sides of the ditch, so that the sheet effectually dams the ditch in a most simple and ready manner.

By this plan the labor of building and removing the earth dams is saved, the only things necessary to do in this case being to lay the device in the ditch and drive a few pegs through the lower end when damming the stream; and for



BIGELOW'S DAM FOR IRRIGATING-DITCHES.

taking up the dam all that is required is to take the bar in one hand and pull up the pegs by the sheet.

This invention has been patented by Mr. William H. Bigelow, of Worthington, Minnesota.

Active Seasons with Inventors.

To those who have never given special attention to the patent business—many of whom incline to the belief that most of the great inventions of the age have been rather the result of chance than of reflection, study, and experiment—the statement that there are special seasons when the inventive faculty of the country is invariably most prolific, is not readily accepted. But when we show that this is so, and that it is only a legitimate manifestation of the natural relations between cause and effect, we destroy the theory that most inventions are the result of accident.

The records of our Patent Office for many years past show that there is always a great increase in the number of applications for patents when winter sets in, and the long evenings, during weather not suitable for outdoor employment, give the best opportunities for mental application; if at this season there likewise happens to come an unpropitious period in trade and manufactures, when workshops are closed, or running on short hours, and the times generally are hard, the activity of inventors is yet more marked, establishing conclusively the fact that, according as opportunity is afforded, do those in whom the originating, inventive, and constructive faculties are prominent devote themselves to the working out of ideas theretofore but dimly conceived or imperfectly apprehended.

And there is yet another fact even more strikingly contradictory of the idea that the generality of inventions are accidental, and showing that the bulk of those for which patents are granted result from earnest seeking after something to supply an acknowledged want. Great fires are followed by patents for a crowd of new devices in fireproof construction, for the extinguishing of fires, and for the escape of the inmates of rapidly burning structures. Memorable railroad accidents likewise mark an era of activity in the introduction of improved brakes, couplings, automatic switches and signals, and the thousand other improvements which have so effectively contributed to the development of our railway system.

In fact, a great want in anything which seems possible of attainment through man's ingenuity needs only to be widely known to call out earnest efforts to supply that want from inventors in all sections of the country. This, indeed, merely bears out the old saying, that necessity is the mother of invention; but it is only through the beneficent operation of our patent system that thinking men everywhere are encouraged, as occasion seems to call, to help in the working out of valuable inventions.

WORK on the Montreal ice palace began about the first of the year. Its size will be 100 by 150 feet; cost, $3,000.

The Dwight Life Insurance Case.

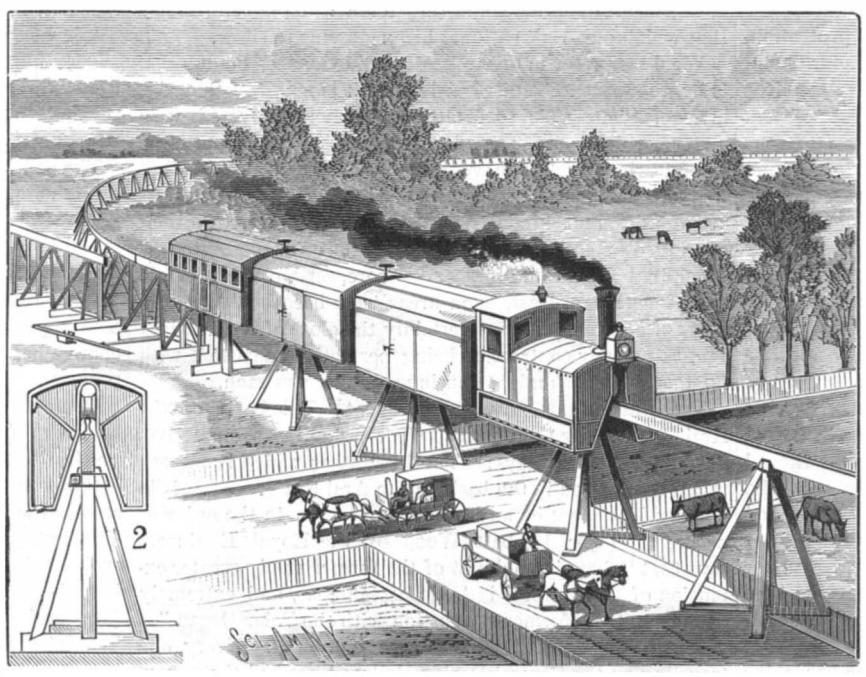
The expert testimony in the contest of the insurance companies to escape payment of the amount of the policies in this now famous case has not, thus far, been fully printed. Dr. Horatio C. Wood, a professor in the University of Pennsylvania, who was one of those experts on behalf of the life insurance companies, contributes to the *Medical News* a summary of the evidence. The professor says the experts were remarkably free from serious disagreement, that there was no evidence to show that overdoses of morphia had been given, and that no medical man ventured to assert that Col. Dwight died from other cause than strangulation. Col. Dwight's death occurred in November, 1878, at which time his life was insured for $256,000; only the first quarter's premium was ever paid on any of the policies, their annual maintenance would have cost over $8,000, the insured was at the time in bankruptcy, and the first premiums were paid with borrowed money. The most of the insurance companies have refused payment, claiming that Col. Dwight committed suicide; and although the courts have once given judgment against the companies, it is said they will appeal and further contest the case.

SINGLE RAIL ELEVATED RAILWAY AND TRAIN.

The rail may be the ordinary T-rail or a flat piece of iron or wood, and is fastened to a longitudinal string piece, which may be supported upon vertical posts rising from the ground at suitable distances. These supports may be placed on concrete bases or driven as pile supports. The girders are secured to the posts in any suitable way, and may be further strengthened by braces, which are placed in groups of four. The upper ends of the braces are cut away so as to form shoulders, affording a seat for the girder to rest upon. Two braces are brought together at the top and on each side, and are held in place by a band which passes around them and secured by a bolt. The lower ends extend diagonally outward, and are secured in plates attached to the posts. These braces are to be placed centrally between the posts, and prevent any lateral movement of the girder, as well as assisting to resist vertical strain.

The two sections to be used as a switch are adapted to move away from each other, so as to avoid moving one section to a great distance from the other, in order that the car can be switched. In this instance the supports and braces are placed on sills. Where the sections come together the sills are placed on grooved guide plates, curved sufficiently to allow the inner sills to move back and forth. The sections are secured to the supports about which they revolve by pivots or knuckle joints. On each section a horizontal bar is secured to the sills, and to which are pivoted the inner ends of two rods, the outer ends of which are pivoted to a lever that is centrally pivoted to a block. When the sections are in their normal positions the lever is parallel to the road, but when the levers are moved the sections move apart and afford room between them for the passage of a car.

The car is made in two sections, one on each side of the track, as shown in Fig. 2, the frame pieces being made of one piece of angle iron. The frame pieces extend above and below the rail. The body of the car is made in the usual way of tongued and grooved timber, the bottom resting on the bottom of the frames. The wheels have a double flange, and may be journaled in boxes secured to the upper or lower side of two beams placed in the upper bend of the frame.



SINGLE RAIL ELEVATED RAILWAY AND TRAIN.

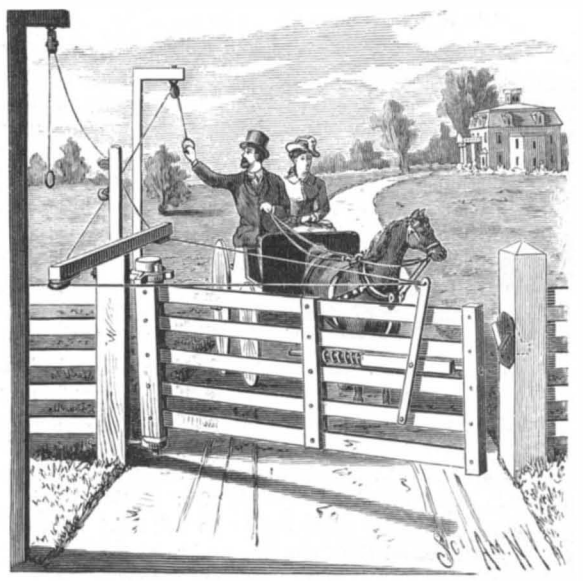
The exterior sides of the frames are vertical, the interior being bent outwardly from the track. This throws the weight outward from the roadway and prevents the oscillation of the car. The greatest weight is brought below the rail, the strain comes upon the wheel and rail, and derailment is prevented. The engine will have a boiler and fire box on each side of the rail, and the driving mechanism can be placed at each side of the beams, or in any suitable position.

This invention has been patented by Mr. E. S. Watson, of Water Valley, Mississippi.

IMPROVED GATE.

The gate is of any ordinary construction. The lower end of the rear upright has a pivot formed upon it which works in a socket in a plate attached to the hinge post by a bolt. The upper end of the upright is made round, and has a tooth or projection formed upon its forward side, and is surrounded by a bar, the middle part of which is bent into circular form and has three recesses formed in its inner side, one recess being in line with, and the others at right angles to, the gateway. The recesses are designed to receive the tooth and hold the gate in place when closed, or when opened to either side. The circular bar is provided with a bolt by which it is held to the post.

To the inner side of the latch post is attached a plate having an angular slot formed in it, with a flange along its inner edge. The flange serves as a stop and guide to the end of the fastening bolt as the gate swings shut, the bolt entering a deep recess in the angle made by the slot. The ends of the bolt slide in bearings between the upright bars of the gate, and is held forward to engage with the catch plate by a spiral spring placed upon its rear part. To the middle part of the bolt is pivoted a bar whose lower end is pivoted to a bar in the gate. To its upper end, which projects above the gate, are fastened two ropes that pass around guide pulleys attached to the outer ends of two arms secured to the hinge post. The ropes cross each other at the rear of the post, and are kept in place and from contact with each other by guide pulleys. The ropes then pass over pulleys attached to the lower side of arms projecting from the upper ends of posts set in the ground at suitable distances from the hinge posts. Handles are secured to the free ends of the ropes.



HAMILTON'S IMPROVED GATE.

When either end of the rope is pulled the bolt is drawn away from the catch plate by the pivoted bar, the gate is raised, withdrawing the tooth from the forward recess and releasing the gate, so that the strain upon the rope will swing it open in a direction away from the operator. The gate is held open by the tooth, which drops into one of the side recesses. After the operator has passed through he pulls upon the other rope, when the gate swings back. The strain on the rope is continued until the gate is between the posts, when the latch is shot out by the spring and the gate drops so as to let the latch enter the slot.

This invention has been patented by Mr. William James Hamilton, of New Boston, Iowa.

Irrigating a Vineyard.

The vineyard of Governor Stanford at Vina, Cal., consists of 10,000 acres, planted in vines of different varieties. The irrigation of this vineyard is, perhaps, the most complete in the world. At regular intervals through the vineyard avenues are cut which are forty feet in width. Through these avenues are run irrigating ditches, with a driveway on each side. The blocks thus formed by the irrigating ditches are about fifty yards wide, but extend a great length and contain about one hundred acres each. In this way the system of irrigation is made complete, and all the land receives an equal proportion of water. Every two of these blocks are planted to a different variety of grapes. The main ditches run east and west across the field, and where the field is uneven intersecting ditches are made. In some cases it has been necessary to construct flumes to carry the water over lower lands. A flume 1,800 feet long has been built to carry water over the alfalfa fields.

Vaccination in India.

The total number of persons operated upon during the year was over 4,400,000. Generally speaking, the treatment appears to have been successful, the ratio ranging as high as 98·39 per cent.

The Chinch Bug.

In a late number of the SCIENTIFIC AMERICAN was a short article saying that the chinch bug had made its appearance in Eastern grain fields, and in such numbers as to excite alarm. The cause for alarm is well founded if the pest named has showed itself, for Western farmers have had but few enemies so destructive and difficult to contend with as the chinch bug. When it works at all, it works so rapidly and in such myriads that but little effective opposition can be made. Wheat is the grain which suffers first, as a general rule; but when the conditions are favorable to the pest, it is liable to extend its ravages to all other grains, not excepting corn. More than once have I seen a fair sized piece of corn wholly ruined by the chinch bug. In such cases the stalks to the height of a foot and a half, or more, would look as if they had been flooded with muddy water which had left its filth behind on retiring. All the sap channels of the stalk would be cut through, leaving the grain and beans to wither away in absolute worthlessness. The bug only thrives in dry, hot weather; a wet season is one in which it can do no harm. Any means which can keep the ground about the grain roots cool and damp operates to check its ravages. Many have saved their wheat by sowing clover with it. Salt is thought by some to have a good effect from its tendency to attract moisture. Barley and rye generally get out of the way before the weather is hot enough to bring out the bug in full force; the outcrop is so dense and moist as usually to escape unharmed. A thin crop of spring wheat on a lumpy soil is the bug's delight on a hot July or August day. The bugs winter among the refuse of fence corners, and decaying logs and brush, and find good conditions in a field well covered with stalks and lumps of earth. The clearing up of such refuse and the rolling of the ground so as to leave a smooth surface have a preventive effect. The location of a nest of bugs can often be determined by the whitened heads of the grain in a particular part of the field. It is a good plan to try at once and destroy the nest, which can usually be done by stamping and pounding the ground down hard. Fire has but little effect on the bugs, that is, such fire as burning straw over them would make; they are more afraid of water. Some of our farmers have protected their fields quite effectively from outside invasion by sowing Hungarian grass around the outer edge of the field, for about a rod in width. C.

CONSTRUCTING, VENTILATING, AND COOLING CELLARS.

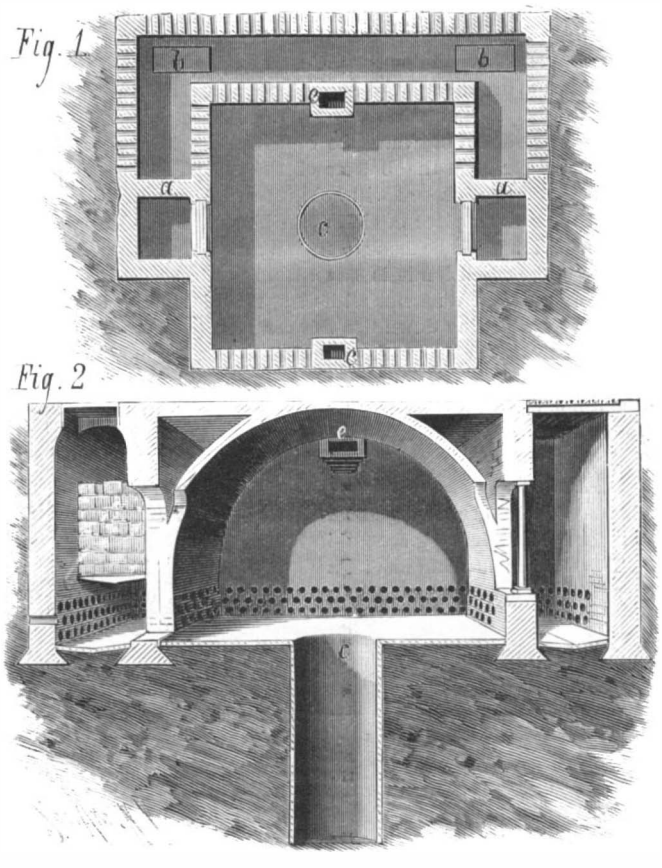
A current of cool air is caused to pass from the earth, stones, or gravel outside of the cellar walls through the cellar upward or outward into the open air. By means of tubes open at each end and extending through the walls, the air is obtained from the earth, where it naturally exists wherever the soil is porous, light, or sandy. The ends of the tubes toward the earth may bear either directly against the earth, so as to appear to be stopped up, or, as is preferable where the nature of the soil will admit, they may be inserted in holes bored in the earth a short distance, or, when that is not practicable, the earth may be removed from the immediate vicinity of the ends. By the last two methods there will be less danger of the tubes stopping up with earth and thereby lessening the draught of air thus obtained.

The filling of the tubes with porous soil will not destroy the draught of air, but may to some degree impede it. When the cellar walls are surrounded by a heavy clay soil, a well may be made outside of and adjoining the walls; this well should extend parallel with the wall, and may, if necessary, go entirely around the walls. The object of the shaft in clay soil is to afford a receptacle for sand, gravel, stones, or porous earth, from which the cool air is to come by means of the tubes through the cellar walls. Instead of tubes, openings of any sort may be made in the walls, but terra cotta tubes are preferable. The tubes may, if advisable, be inserted in the bottom of the cellar through the impacted earth of the floor down into the looser and more porous earth below.

This plan is also applicable to beer and other cellars where ice is used in hollow walls around the cellar to keep it cool. In such cellars the air is first taken from the earth in the manner described, and passed by tubes or openings into a vault or cell made cold by ice; then it is passed by another set of tubes into the interior of the main cellar, so that the air obtained from the earth is made cooler by being drawn through the ice cell. The ice rests upon a grating just above the currents of cool air. In beer cellars, where it is necessary to have an extraordinary amount of air and a rapid draught—greater than can be obtained from the earth, because it is not porous enough—a shaft is dug outside the ice cell and filled with coarse material. Tubes extend into the outside earth. Openings from the interior of the cellar to the external atmosphere are essential to produce a draught of air from the earth.

In the accompanying engraving Fig. 1 is a ground plan of a cellar, and Fig. 2 a view showing the interior. Along the bottom of the walls are shown the rows of tubes through which the air passes from the exterior; *b b* are trap doors; at *e* are openings leading to the outer air, and at *c* is an air well built in the center of the cellar floor. Just in front of the walls, *a*, are areas, and behind one wall is a mass of ice, shown in the left of Fig. 2.

This invention has been patented by Mr. Joseph K. Frick, of Evansville, Ind. For particulars address John Raum, Washington, D. C. (see Business and Personal column).

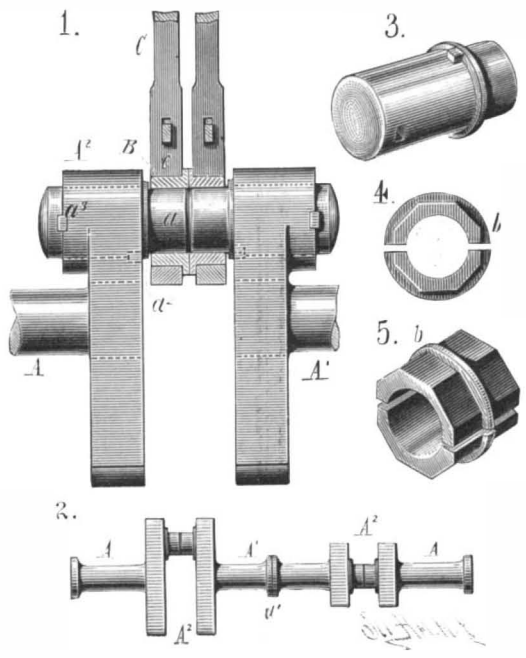


FRICK'S CELLARS.

CRANK PIN FOR STEAM ENGINES.

Too frequently we hear of ocean steamers being disabled by reason of a broken crank pin, crank, or crank shaft, and during the time occupied in repairing the damage the safety of the vessel is endangered. The object of the invention illustrated by the accompanying engravings is to provide simple and effective means for obviating the liability to breakage of crank pins in the crank shafts of steam and other engines, and for facilitating and economizing repairs, especially in the case of marine engines, either at sea or in port.

The crank pin (Fig. 3 is a perspective view of one section of a divided crank pin) is either forged in or subsequently divided transversely in two separate sections, each of which



EDDOWES' CRANK PIN.

has a cylindrical bearing surface at one of its ends for a distance equal to about one-half the length of the bearing surface of an ordinary crank pin, and a body of proper diameter to fit within the eye of the crank arm, A^2. In order to stiffen the sections, a collar, a^2, which may either abut against the face of the crank or enter a recess, is formed upon each section of the pin between its bearing surface and body. The outer end of the bearing surface is curved at its periphery, so that when the two sections are brought into line a small circumferential groove will be formed, which serves to give proper clearance to the brasses and also retain the lubricating substance.

The crank pins may be secured to the arms by being shrunk in in the ordinary way, but for greater facility of insertion and removal the inventor prefers to effect the connection as follows: The eyes of the cranks are bored out with a very slight taper, and the body of the pin is correspondingly turned so as to insure a good, snug, and moderately hard driving fit entirely through. A feather (shown in Fig. 3), formed upon the body of the pin at the face of the crank arm next the bearing surface, fits into a recess in the arm, serving to resist turning or twisting strain upon the pin. To further secure the pin, a key, a^3, is passed through a transverse slot in the body of the pin, the key fitting at its ends in keyways in the face of the crank eye. The key is carefully and snugly fitted, and should have a very slight draught to keep it safely in place. It may also have an adjustable keeper, secured by a top bolt and jam nut in the usual manner.

The crank pin box, of which Fig. 4 is an end view and Fig. 5 a perspective, is divided longitudinally into halves, each one of which may be in a single piece or be divided transversely into two sections, each fitting the bearing surface of one section of the pin, as in Fig. 1. In either case, to afford additional strength to the brass, a collar is formed upon each of its halves, extending around the periphery of the brass exterior to the plane of contact of the abutting ends of the crank pin sections. The collar may be accommodated either by forking the end of the connecting rod or by dividing the rod longitudinally into two parts, as in Fig. 1, each portion being fitted with a separate stub end to embrace the brasses of the adjacent crank pin section, and being coupled at its opposite ends to the cross head. In such case a slight degree of circumferential movement will be permitted between the two crank pin sections, thereby tending to relieve the box from strains induced by variations in the alignment of the crank shaft sections to which the arms are respectively attached. Fig. 2 is a side view, in elevation, of a crank shaft embodying this device, and Fig. 1 is a similar view, showing a pair of crank arms with the crank pin box in position and illustrating the method of securing the crank pin sections by keys and feathers.

In addition to the advantages already enumerated, this method admits of any desired section of the crank shaft being easily and quickly raised whenever desired, to afford access to the bottom brasses of the main journals, and enables a section of a shaft to be readily removed, if broken, and replaced by a spare section without disturbing the remaining portions of the shaft.

Further information regarding this invention may be obtained from the patentee, Mr. A. K. Eddowes, whose address is care Agent Pacific Mail S. S. Company, San Francisco, Cal., or from Mr. J. Snowden Bell, Pittsburg, Penn.

American Gems and Precious Stones.

Mr. George F. Kunz has contributed to "The Mineral Resources of the United States," published by the Government, an article on American gems and precious stones, of which separate copies have been printed. Mr. Kunz has for some years been connected with Messrs. Tiffany & Co., the well known jewelers of New York city, and has had an excellent opportunity for collecting facts concerning American gems.

He states that systematic mining for gems and precious stones is being carried on at only two places in the United States, viz., Paris, Maine, and Stony Point, North Carolina. In other cases where gems are found they are either met with accidentally, or occur in connection with other materials that are being mined or in small veins which are only occasionally met with. They are often gathered with little system on the surface, as is the case with the sapphire, garnet, and olivine found in Montana and New Mexico; or from the beds of streams and decomposing rock, as the moss agate from Colorado; or on beaches, as the agate, chlorastrolite, and thomsonite from Lake Superior.

Some eighty-eight different minerals occur in the United States which have been used as gems. Twelve of these occur in the United States only.

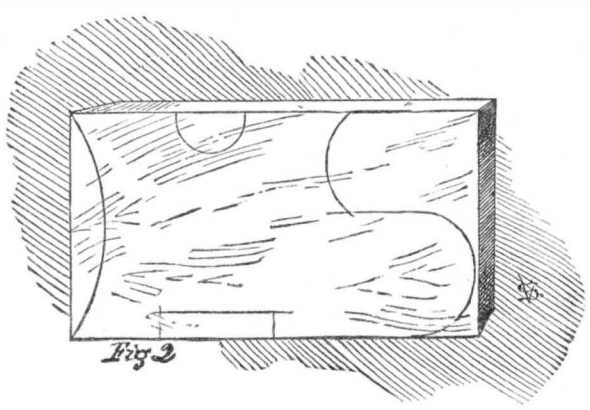
Diamonds are not mined in this country, although they have occasionally been found at a number of localities. A large diamond was found at Manchester, opposite Richmond, Va., by a laborer employed in grading one of the streets. It was an octahedron, and weighed, after it was cut, over ten carats. It was worth $5,000 before cutting. The principal localities for sapphires and rubies are in New Mexico, Arizona, and Southern Colorado, where they occur in the sand, often on ant hills. Garnets occur in the same region, about $5,000 worth of cut stones being annually produced. It is estimated that the value of the tourmalines taken from Mt. Mica, Maine, is between $50,000 and $65,000. Tourmaline and hiddenite are being regularly mined at Stony Point, N. C., some $7,500 worth having already been sold. Rock crystal is gathered and cut in large quantities, the sales at different localities probably amounting to $40,000 annually. Much of it is cut for jewelry, as "Lake George" or "Cape May" "diamonds." The clear crystal for optical purposes is almost entirely Brazilian, as the good material found here rarely reaches the proper channels. Although agates are abundant here, nearly all the polished specimens sold in America have been polished in Germany, having originally come from Brazil and Uruguay. Moss agates, however, are collected here in large quantities, although the cutting is done abroad. The sunstone and moonstone, from Pennsylvania and Virginia, is of good quality, although as yet used but little. The American turquoise is of much interest, but is not much used by jewelers. It is frequently blue when found, but soon turns green on exposure. Jet occurs in Colorado and Texas, and will probably soon be utilized in the arts. The bowenite of Rhode Island and the williamsite of Pennsylvania are used as a substitute for jade.

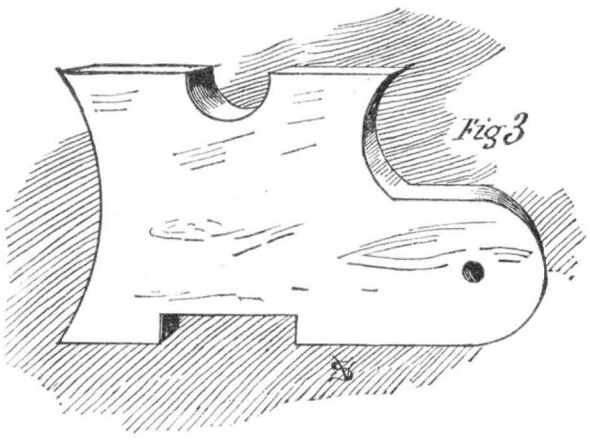
Why Patents are Necessary.

Henry M. Smith, in his address on "Farmers and Patents," says: "The number of patents granted annually is 15,000 to 16,000, and nearly half as many more were rejected last year. Since the adoption of the plan of examination, the number of rejections has been about one-third of the whole number of applications. This weeding out gives a value to the American patent which no patent issued on any other system can possess. It is this assured value of novelty that gives the American patent system its strength, and its value to the inventor, and hence to the public. The whole public is interested in the growth of material resources, and must be directly interested that the inventor shall be stimulated by a hope of reward, and that his expectancy be so well assured that it can be parted with and assigned to some one who can furnish the means to carry the invention to success.

"Tenfold more inventive skill is now called for than could have possibly found employment in a simpler age. Discovery is being pushed in directions only now for the first time possible. It is found in the history of inventions that inventions come in separate eras. The era of agricultural machinery is not old. It begins first with any solid meaning in 1850, yet what has it wrought! To-day the farmer can more easily feed 100 men than his grandfather could, with the old farm appliances, feed his household. It is shown by the recent census that we have 3,500,000 agricultural laborers in a total of about 17,500,000 workers of all classes, yet we export $288,000,000 worth of breadstuffs, or more than three times the amount of export per agricultural laborers ten years before. Agricultural machinery has been supplemented in advantages to the farmers at a multitude of points in the patent list.

"We need new inventions to meet a multitude of demands for the commonest processes and utilities. It is not the time to say now we have enough. When the steam engine itself, after one hundred years, is still so far short of perfection that it utilizes only a small amount of the power residing in its fuel, we need new motors, and we shall get them; new metals and new methods of manufacture in the oldest metals."—*Midland Industrial Gazette.*





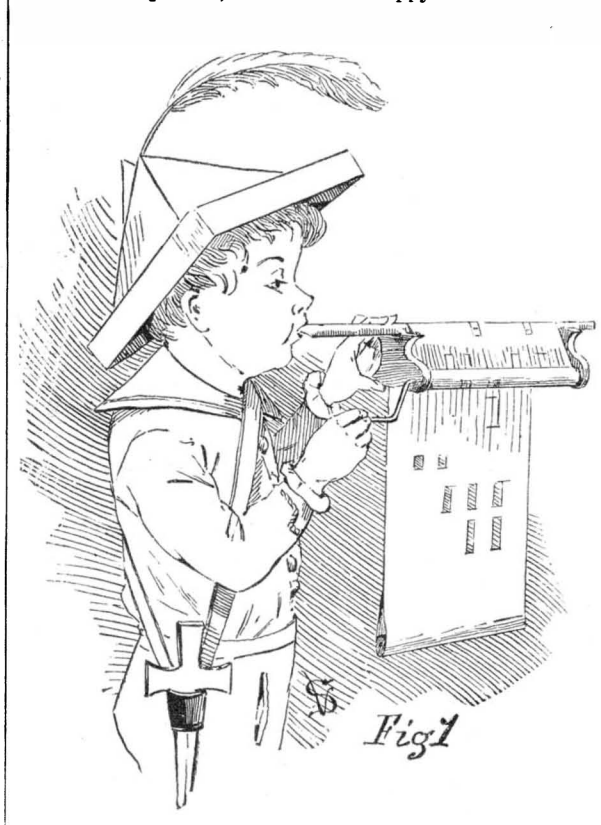
Sleeping Together.

Somebody has said that more quarrels occur between brothers, between sisters, between hired girls, between clerks in stores, between apprentices in mechanics' shops, between hired men, between husbands and wives, owing to electrical changes which their nervous systems undergo by lodging together night after night under the same bedclothes, than by any other disturbing cause. There is nothing that will so derange the nervous system of a person who is eliminative in nervous force than to lie all night in bed with another person who is absorbent in nervous force. The absorber will go to sleep and rest all night; while the eliminator will be tumbling and tossing, restless and nervous, and wake up in the morning fretful, peevish, fault-finding, and discouraged. No two persons, no matter who they are, should habitually sleep together. One will thrive and the other will lose.

THE AUTOMATIC FLUTE, AND HOW TO MAKE IT.

BY VICTOR SMEDLEY.

Most all boys have a natural love for music; with some it amounts to a passion, and such are happy and contented to



devote a large portion of their time in studying and practicing, to perfect themselves on some favorite instrument. Such are the favored few born with a musical talent, but a large majority, while they can enjoy and appreciate the music produced by others, lack the patience or application necessary to acquire the art. To all such this method will be doubly welcome, as it requires neither study, practice, nor teacher, and the only necessary expense will be ten cents for the tin whistle, which can be obtained at any toy shop. Paddy, when asked if he could play the flute, answered: "Sure, how do I know, whin I niver thried it?" To be sure this was a characteristic reply, but by following the instructions given below, any boy can play this flute on first trial.

For the ends two pieces of board about ⅜ of an inch thick, 2¼ inches wide, and 3½ inches long will be required. Mark on both of these with a lead pencil (as a guide in cutting them out) the shape shown in Fig. 2, with the exception of the circular incision in which the flute rests, which should be about one-third as deep in the one to be used at the tapering end as in the other; this is done that the upper part of the flute will be parallel with the roller. See Fig. 3. The lower incisions in the end pieces (1 inch wide and ⅜ of an inch deep) are for the ends of the connecting strips, A, to fit into. At about ⅝ of an inch from the ends of the projecting arms of both pieces bore holes for the axle of the roller to pass through, having them large enough to allow it to revolve in them freely. The connecting strip, A (see Fig. 4), 8½ inches long, should fit neatly the incisions that have already been made for it at the bottom of the end pieces; a single nail or screw at each end will hold it securely in place.

For the roller a piece of old broom handle, B (see Fig. 4), 7⅜ inches long, can be made to answer; the only objection to its use in the condition it is sawn from the broom is its not being of the same diameter all its length; this should be remedied by whittling down the thicker part (taking care to preserve its original rotundity) until it is of the same thickness at both ends. In the center of each end bore a hole about one inch deep of slightly less diameter than the wire to be used for the crank.

A crank is made of a piece of stout wire about 4½ inches long, bent to the shape as shown at C, in Fig. 4; the end that is to go into the roller should be hammered flat, as this will prevent its turning around in the roller.

To put the crank in place: First, put the roller in its proper position between the two projecting arms of the end pieces, then with a hammer drive the wire securely into the holes that have already been started for it.

Do not attempt to push it in with the hand, as it will spoil the effect of the flattened end of the wire.

Another piece of wire like that from which the crank was made, about 1½ inches long, will hold the other end of the roller in place.

Fig. 5 will show how the frame work will appear when finished.

The flute is held in position by a rubber band, D, or a piece of string passed around the thick end of the flute, then under the frame lengthwise and around the thinner end; this will hold it securely in place and also allow its being moved back or forward, if the holes do not exactly tally with those cut in the paper.

Common Manila wrapping paper, known in paper warehouses as Reigles, weighing 200 pounds to the ream, is of about the proper thickness on which to cut the tunes. It should be of one piece rather than several short ones joined together, as joints in the paper are apt to catch on the flute in passing over and prevent the regular winding of the roller.

The paper on which the notes are to be cut should be 7½ inches wide, the length depending on the number of notes there are in the air.

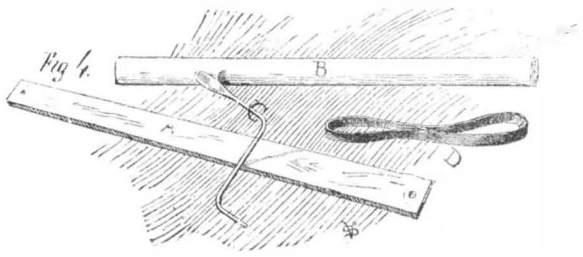
For "Yankee Doodle," which tune is shown in Fig. 6, a strip of paper five feet long will be needed.

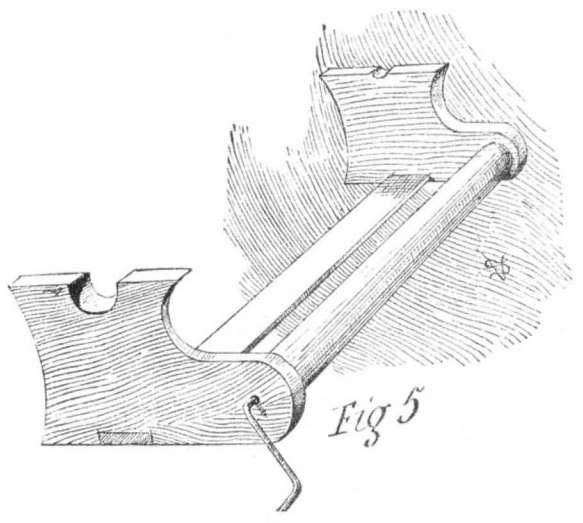
In the center of this sheet six lines one inch (or the distance that the holes on your flute are) apart should be ruled the full length of the paper. Leave about four inches of blank paper before you begin cutting out the holes, to paste on the roller and reach from it to the flute.

At the last end of the tune there should be enough spare paper to fold and form a loop in which to put the weight that keeps the paper close to the whistle, in order not to allow the air to escape through any but the proper holes. Fig. 6 is a model of "Yankee Doodle," and shows the number and length of the holes that are to be cut. By following this as a copy (allowing the first four holes to be ⅛ inch long, the rest in the same proportion, by using a sharp pointed knife, the tune can be cut out with very little trouble.

The diagram (Fig. 7) will be of great assistance. It shows which holes are to be opened in order to produce any of the notes that the flute is capable of playing.

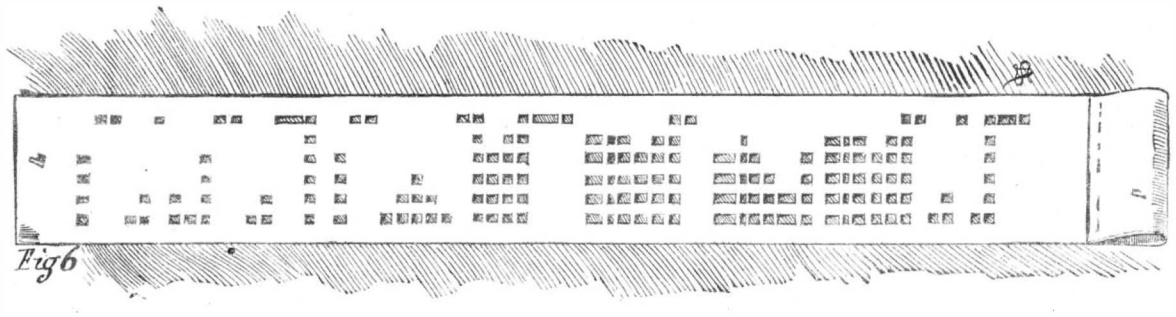
When a quarter note is to be cut out the hole should have a length of half an inch; for a half note a hole one inch long will be required; for a whole note two inches will be the required length of the hole. In width the holes are all the same, about one-half inch.





As there is in almost every family some one who understands music, by their aid you can cut out any melody, from a plain hymn tune to an operatic air, or make arrangements for a small orchestra of three or four instruments, thus producing a very pleasing effect.

Care should be taken to blow evenly, and not too strong, or tones will be played that are not intended. Fig. 8 shows the complete instrument. The flute made of tin may be bought for a few cents.



"YANKEE DOODLE" ARRANGED FOR THE AUTOMATIC FLUTE.

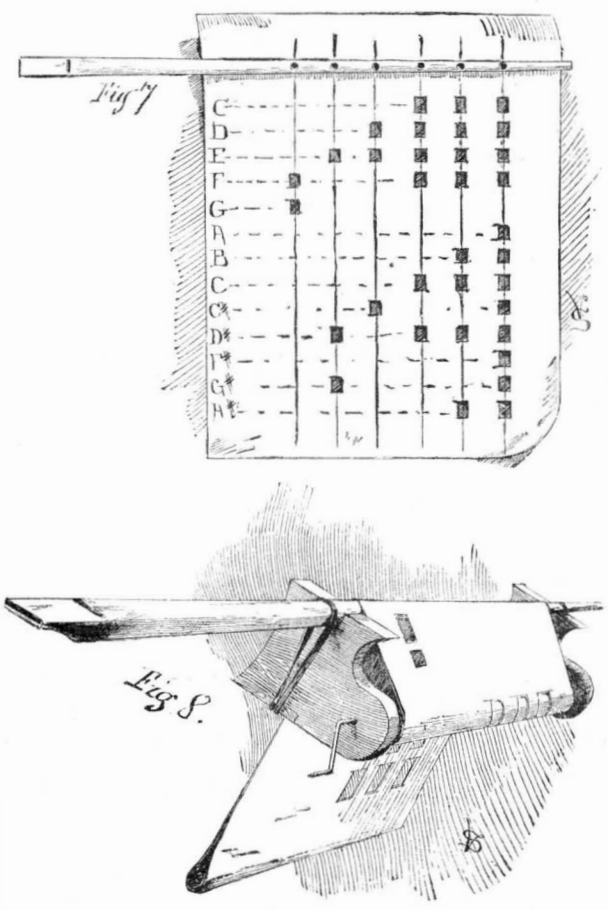
The Eyes Connected.

It has been shown by Knies and Horner, by injections of Prussian blue in dead bodies, that there is a direct communication between the two retinæ by the way of the optic nerves and chiasma. Pfluger has corroborated these assertions by making injections in dogs with a few drops of a saturated solution of fluorescine. This fluid is forced into the optic nerve, so that it passes not only into the subarachnoid but also into the subdural space. Two minutes after the injection both eyes showed a fluorescence of the retina, which persisted for five weeks. A small quantity injected into the orbital cellular tissue gave no result.

The Elevated Railways of New York.

Whatever may be said about monopoly, high fares, and watered stock, there is no local system of railways in the world that furnishes such admirable facilities for passenger transportation as the four lines of elevated roads in the city of New York. Since the trains commenced running on the two lines on the West Side, nearly six years ago, the traffic has steadily increased, until in the early and later hours of the day it is equal to the capacity of the trains, which run at intervals as short as safety will permit. The number of passengers carried on all the lines, comprising thirty-two miles of road, during the half year ending March 31, was over 46,000,000, and the whole number for the current year will probably fall but little short of 100,000,000. There can be no stronger evidence than this of the nature of the service rendered by these roads, not only to the vast population of the city proper, but to immense throngs of people from the suburban towns on every side, who come and go every day and at all hours of the day. The development of local passenger travel in the city within these few years has been tremendous.

The fares on the elevated roads are five cents during three hours in the morning and evening, which is the same as on the surface roads; and were it not that the cars on both are at such times equally crowded, it might be said that passengers have their choice between the two. The superiority of the former, however, is an ample compensation for the ten cent fares during the rest of the day. The speed of the trains, the capacious, easy riding cars, well warmed and lighted, the freedom from obstruction, comfortable stations and waiting rooms, with gate and platform men charged



THE INSTRUMENT COMPLETE.

with duties conducive to the safety and convenience of passengers, all contrast strongly with the absence of these most desirable things in the ordinary street car service. There is also a time schedule for all distances, which is adhered to with regularity and precision, and the average distance which a passenger is carried is five times what it is on the horse cars.—*Boston People's Fireside Journal.*

The Tunnel at Liverpool under the Mersey.

The great railway tunnel under the river Mersey is at the point of completion, and communication between the Lancashire and Cheshire shores will soon be opened. This engineering enterprise is just now of special interest to New York in view of the Hudson River tunnel enterprise.

The tunnel at Liverpool is a little short of a mile long, and, as usual in such undertakings, it has been bored simultaneously from both ends, with the intent to break from one perforation into the other near the middle of the river. The enterprise has required much patience, because the stream is deep. The entire tunnel had to be driven through rock. No check, however, has been experienced from encountering seams through which the water could break, and huge pumps have easily disposed of all ordinary leakings and drainage. The engines, working by compressed air or steam, for drawing away the refuse from the borers to the shafts and thence hoisting it to the surface, call for no special description.

Carefully lined with brick and cement, and having a width of twenty-six feet, the tunnel, lighted by electricity, will doubtless supply to general satisfaction the railway accommodation which has been the chief motive for its construction. It will take directly into the heart of Liverpool trains that hitherto have been forced to end their journey at Birkenhead, there transferring their freight and passengers to ferry boats. In Liverpool the tunnel will be continued so as to connect with all the converging lines of railways.

Correspondence.

Improved Nails Wanted.

To the Editor of the Scientific American:

I am a carpenter by trade, and find difficulty in driving the ordinary cut nails, owing to their square face on the point. A pointed nail will drive easier and nearer where it is wanted, and does not tear the wood as much. The square face carries more or less wood with it, making it scoot to one side, and very uncertain as to its direction.

On particular work I have taken a flat file, and by twirling the nail with the left hand, with the point of nail resting on a bearing, filed off the corners so as to leave only about half of the former face on the end, filing at about an angle of forty-five degrees, and it makes a vast difference in the driving, making a far better job.

Can you do or say anything to the nail makers to induce them to put a point on their nails, something like wire nails, but perhaps not quite so peaked or sharp, nor to a full point. This is of course more applicable to a finishing nail, but it would be of very much benefit for the ordinary nail; they can be stuck in their place with one blow, where two or more would be required with the square end, drive easier, and keep their direction better.

HAMILTON SHERMAN.

Waverly, Pa.

A Word with our Correspondents.

We have hesitated for some time speaking to our readers concerning the questions which are sent in to our Notes and Queries department, and we would like to correct the impression which seems to exist in the minds of some that the editorial department of the SCIENTIFIC AMERICAN is possessed of a wizard who longs to be questioned and who has answers always ready for any query which the curious may choose to put to him. Such, we beg leave to state, is not the case; the answers to most of the questions are only obtained after much study, and in some cases after we have been put to considerable expense to procure the desired information. We have always willingly done this, and we are still glad to serve our readers in any way we are able; we simply wish to call attention to the fact that nearly every question sent in requires some research to answer, and not infrequently costs us more than the price of a year's subscription to the paper to obtain the information. About two-thirds of the questions asked are answered by mail, so it is easy to judge by a glance at our Notes and Queries column what a mass of matter is sent in to us each week for reply.

We always answer every question that is asked, unless it is manifestly absurd or entirely out of our line. There is sometimes delay, owing to difficulty in obtaining the information or on account of the amount of matter awaiting publication.

No question should be sent on postal cards, or without a stamp for answer, for if the question is worth asking it is at least worth a stamp for reply. In cases where an early answer is especially desired, or where the information is for the benefit of the inquirer alone, a small remittance of $1 to $5 should be sent. Such letters take precedence, and are answered by letter, unless otherwise requested.

We refer to this subject, not to deter any one from asking questions, but to give us an opportunity to state to the individual inquirer what he has probably never realized before, and that is, that labor and money are expended to obtain from reliable sources answers to his and the multitude of other queries coming to this office. We actually pay out several thousand dollars a year to persons skilled in various departments of science and engineering for replying to these questions, besides what are answered in the editorial room of this paper.

Yankee Sardines.

It is said that fully nine-tenths of the so-called sardines consumed in this country come from the State of Maine. Very few of the genuine French fish are imported now. These Yankee sardines are nothing but small herring prepared and put up in boxes, with attractive labels and French inscriptions. In Eastport there are nineteen establishments devoted to the production of sardines, besides three at Lubec, two at Jonesport, and one each at Millbridge, Lamoine, and Robbinston. In 1876 a New York firm did a lucrative business packing "Russian sardines" in Eastport. These were little herring packed in small wooden kegs and preserved with spices of different kinds. It occurred to one member of the firm that these little fish might be utilized to better advantage by cooking them and packing them in olive oil, like the French sardines. The experiment had been attempted several years previous without success. The difficulty was to eradicate the taste of the herring. It was quite easy to cook the fish, pack them in olive oil in tin cans, and seal them air tight; but when they were opened they had not the rich, spicy flavor of the regular French sardines. After a great many experiments, one of the manufacturers succeeded in producing a compound of oil and condiments which removed the trouble.

The herring mostly used for making sardines are about four inches long, and are taken in immense quantities along the coast of Maine and New Brunswick. They can be purchased of the fishermen for about $5 a hogshead, although when the fish are scarce, as they often are in the spring, they bring as much as $15 a hogshead.

After being caught the fish are carried immediately to the factory and laid in heaps upon long tables. The first thing is to decapitate and clean the fish. The dexterity with which this operation is performed by the children who are employed is remarkable. On an average, seventy-five fish are cleaned and decapitated every minute by each child. Both operations are performed with one stroke of a sharp knife. A box holding about a bushel lies at the feet of each operator, and, as the cleaning is finished, the fish fall into the box. The pay for this work is ten cents a box, and some of the children make $1.50 per day.

The herring are pickled for half an hour, and are then laid upon trays and placed in a large drying room heated by steam. After drying, the fish are thrown into large, shallow pans of boiling oil, and thoroughly cooked. They are then packed in tin boxes by girls and women, and in each box is placed a quantity of the patent compound of oils and spices. Covers are then fitted to the boxes, and sealed on by men. As air must be excluded, the cans, when sealed, are placed in a tank of boiling water, where they remain half an hour, and are then removed and placed on an inclined plane, so that the air inside rushes to one corner of the box. This corner is punctured with an awl, the hot air escapes, and the can is made air tight by a drop of solder. The boxes are then ornamented with gay French labels, stating that the inclosed are "Sardines a la Francaise." Some are labeled, "A l'huile d'olive." The oil used is cotton seed oil, such as is made in South Carolina principally, and is not always the best even of that. The best oil is used, however, for fish sold as "prime."

An Evening with Other Worlds.

A very interesting lecture entitled as above was lately delivered before the American Astronomical Society, Brooklyn, N. Y., by Mr. Garrett P. Serviss, of the editorial staff of the New York *Sun*. This gentleman has an attractive style of delivery, a wide command of language, and a rare power of interesting his audiences. The large hall of the Long Island Historical Society was crowded. Among other things the speaker said the motion of the earth upon its axis, and the motion of the earth in its revolution around the sun, were secondary to another and a mightier motion whose rate had not been accurately computed. This was the motion of our entire planetary system through space. Each of the great scenes of human history which had taken place upon the mighty stage of this moving air ship from age to age had been in regions of the universe separated by millions of miles. Beyond this solar system was a region of suns and worlds so vast that the imagination was powerless before it, but into which we were advancing.

The first pictures cast upon the canvas were illustrative of Jupiter, its famous red spot of 1878, and its equatorial belts. The changes in these belts and in the red spot had told astronomers that the surface of Jupiter was not solid, like that of the earth, but liquid, gaseous. In the revolution of the planet the red spot had gradually passed by noticeable spots in the great equatorial belts, whereas upon a body like the earth they would have maintained their relative positions.

Jupiter, he said, was apparently a world in process of formation. There was one occasion when the speaker had gazed upon it with Prof. Young, through the great Princeton telescope, which magnified it fourteen hundred diameters, or many millions of times, when it presented a picture whose beauty it was impossible to portray in words.

From pictures of Jupiter under different conditions, some of them handsomely colored, the lecturer passed to several showing Saturn and his mysterious rings, which he said would more nearly present their flat surfaces to the earth in 1885 than for many years before, and would then be very beautiful objects. Changes in these rings, their broadening, and their gradual approach toward the planet since the sixteenth century, were shown by views.

Mars, cast upon the canvas as a great globe, with lines of latitude and longitude, continents, seas, and islands, was apparently very much like the earth. It was so well understood by astronomers, and its surface so well explored and so completely named, that an astronomer who might be cast upon it would have no difficulty in finding his way about and in telling the inhabitants more than they probably ever knew about their own Arctic regions. In successive pictures the marked changes in the Arctic regions in winter and summer were shown, and the fact was noted that it had changing seasons like our own.

"Venus," the speaker said, "is the most shy and provoking planet of all, since she persists in constantly hiding her face beneath clouds. There was every reason to believe that, more than any other planet, she was like the world, with rain and snow and changing seasons, and perhaps inhabitants."

The transits of Venus and Mercury were illustrated in successive pictures, and the surface of the dead moon, with its great mountains and its vast craters, was shown by several views. The lecture closed with a startling view of the earth as it would appear from the moon.

THE *American Angler*, a weekly publication of which Mr. Wm. C. Harris is editor, has recently issued some beautiful "portraits of fishes." They are printed on bristol board, 7 × 11 inches each, and include 23 engravings of fish killed in fresh water and 37 of fish killed in salt water. These portraits have been carefully drawn from nature, and equal in accuracy and minuteness of delineation any efforts heretofore made in this line.

SIMPLE PHOTO-ENLARGING APPARATUS.

With the introduction of gelatine sensitive silver paper, which has the property of being extremely sensitive to light, enlarged life-sized pictures may now be readily made in a few minutes with an artificial light at night. Expensive apparatus and lenses, such as are used in solar printing upon the common albumenized sensitive paper, are dispensed with, and in their place a simple camera or magic lantern with an ordinary lamp may be employed.

Gelatine paper may be obtained already prepared, is used in a dry state, is always ready for use, and will retain its sensitiveness for any length of time, so that it affords the photographer and amateur a ready means for quickly making positive prints, at any time.

Our engravings illustrate two forms of apparatus for exposing upon the sensitive paper. The upper engraving shows a photographic dark room separated by a partition from the exterior room.

Upon a table is placed a board on which a saddle slides back and forth. An upright frame is hinged to the upper side of the saddle, and when in use the frame is held in a vertical position by a flat metal latch as shown. At the upper end and in front of the frame is pivoted a board twice the length of the frame, provided at one end with a large rectangular opening covered with a ground glass, the ground side being set flush with the face of the board. The board revolves edgewise in a vertical plane, and is perfectly balanced. The small engraving shows the position of the board when folded up. Arranged upon the interior side of the partition of the room in front of the focusing board is a camera box made in two parts, the front portion, with the lens attached, sliding over the rear half, which is secured light-tight around a rectangular opening in the partition.

A short focus lens of the portrait combination type, provided with a diaphragm of an inch aperture, produces the best results.

The negative, with the film side toward the lens, is held in the slide in an inverted position, and is slid into the grooved frame upon the exterior side of the partition, as shown. This arrangement allows different sized negatives to be quickly and easily adjusted. On an adjustable shelf, which can be raised or lowered, is located the ground glass, kerosene lamp, and reflector. The center of the lamp flame reflector, negative, and the lens of the camera should be in one focal line.

The ground glass in front of the lamp diffuses the light equally over the negative; an ordinary magic lantern condenser may be used in place of the ground glass, thereby materially decreasing the time of exposure.

Our picture shows the operator in the dark room in the act of obtaining a focus; the room is supposed to be closed to all outside light except that which comes through the lens, and the enlarged image of the negative is seen very distinctly upon the ground glass of the focusing board. The saddle is moved back and forth until the correct focus is obtained, as, for instance, when the hair of the head or the pupil of the eye looks sharp and distinct.

The picture appears very soft, and viewed at a little distance shows a remarkably pleasing, crayon-like effect. The size of the enlarged image may be regulated by varying the distance between the lens and the negative. Our lower engraving illustrates the method of exposing the enlarged negative image upon the sensitive paper, showing how the operation can be carried on in one room. The amateur photographer only needs to provide a board having vertical wings or sides which fit tightly around the sides of the back of his camera, allowing the bed of the same to slide in and out easily. A frame holding the negative is secured to the back of the camera in place of the usual ground glass, the latter is suspended just back of the negative, and at the rear end of the wings is located the lamp with reflector inclosed in a metal box. The arrangement is clearly shown in the small cut.

Holes are made in each side of the lantern box at the top and bottom to admit a free circulation of air, and are protected from the light by interior deflectors. A door at the rear end of the box allows the lamp to be removed. A tin cracker box can be successfully arranged to hold the lamp.

The space at the top between the rear end of the camera and the top of the lantern box is covered by a velvet or other black cloth, to exclude the light. As before stated, the center of the light, negative, and lens should be in one focal line.

Having obtained the correct focus on the ground glass on the focusing board, the operator covers the lens with a cap of ruby glass, turns the ground glass end of the focusing board up, and fastens on the lower portion, in proper position, the sensitive sheet. When the sheet is rightly located the hook may be unlatched and the board turned flat, as shown, so that the paper may be more easily pinned to the face of the board; the latter is again raised, secured, and made ready for the exposure. As a vignetted picture is the most pleasing, and can be easily made, the operator needs to provide before exposure a cardboard having a notched oval aperture which, during the exposure, is held between the lens and focusing screen as shown. Looking upon the screen the dull red enlarged image may now be seen, but the moment the exposure is made by removing the red cap from the lens, the picture becomes suddenly bright and brilliant. The operator then moves the vignetting card to and from the exposed sheet, thereby decreasing and enlarging the vignetting circle. In this way the beautiful soft blending so characteristic of vignetted pictures is easily produced. With a lamp like a No. 3 Leader kerosene burner, giving a flame about 3½ inches wide by 1½ inches high, and of about 26 candle power, an exposure of four minutes has been found sufficient. The exposure may be quickly stopped by replacing on the lens the red cap.

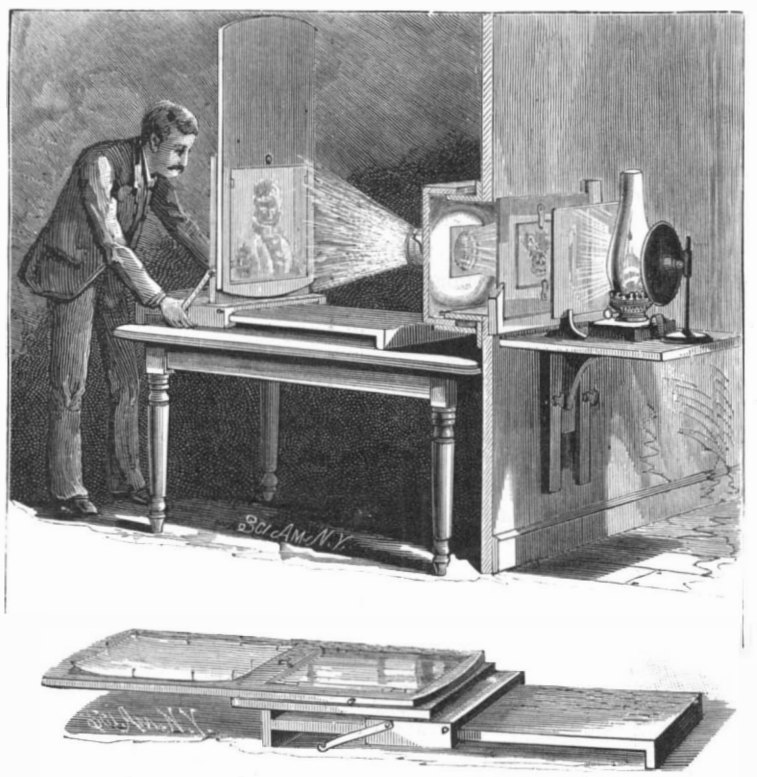


PHOTO-ENLARGING APPARATUS.—OBTAINING THE FOCUS.

The exposed sheet, with the latent image impressed thereon, should now be removed to a light-tight receptacle, where it may remain ready to be developed at the convenience of the operator.

Full directions in regard to exposure, development, and fixing are sent by the manufacturers of this gelatine paper.

As the process is so simple and the manipulation so cleanly and easy, nothing could be more pleasing, interesting, and instructive to the amateur than to amuse himself by enlarging as described.

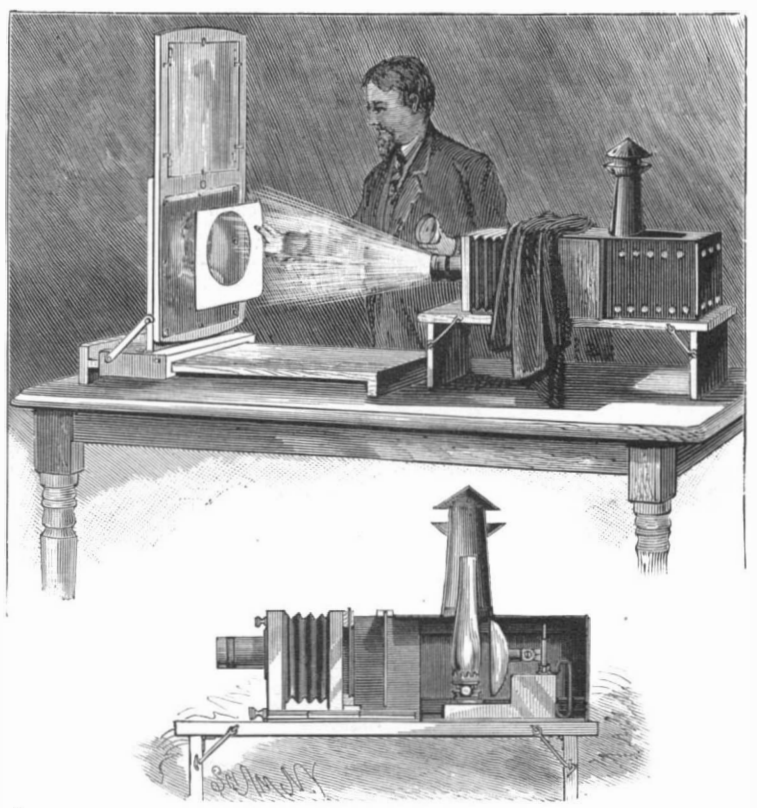


PHOTO-ENLARGING APPARATUS—MAKING THE EXPOSURE.

The pictures are permanent, possess a soft, crayon-like appearance, and when finished form a beautiful adornment for one's walls.

Gelatine rapid printing paper is likely, therefore, to come into extensive use, and we predict for it a brilliant future.

SIR JOHN HERSCHEL first produced the tints of the spectrum on a daguerreotype in 1839.

Art Study.

An address was recently delivered by Professor W. Boyd Dawkins, F.R.S., at the distribution of prizes to the students of the Brighton School of Science and Art. In the course of it he said there were two important requisites or corner stones to the proper study of art. The first was that by which a student was enabled to see things. It was absolutely necessary, before anything could be represented properly, that it should be seen properly. He knew from his own experience that it was one of the rarest things in the world for a man really to be able to see a thing properly. But he did not know that a man could learn to see things outside himself properly better than by trying to represent them. A man could not realize the beauty of a figure or a landscape, unless he had attempted to draw them. Until he had a knowledge of the essentials to the production, until he could pick out the salient points in the landscape or figure, he doubted much whether any man could be said to have seen the one or the other. With regard to the second corner stone, the power of representation, he thought there was as great a dearth in that direction as there was in the power of seeing. He believed that many artists who had reached the highest rank in their profession were deficient in the capacity of adequately representing what they saw. He therefore desired to impress upon the minds of the young art students that their first duty was to represent in their art what they actually saw, and what was true.

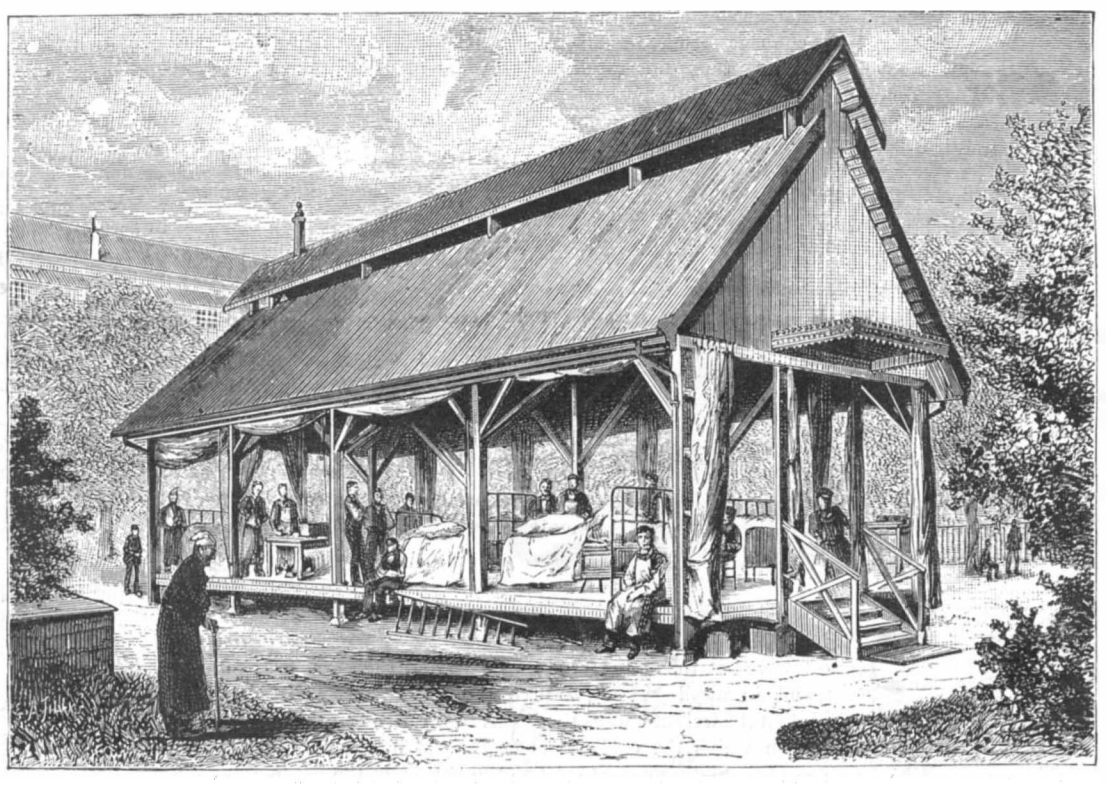
They must study the conditions and master the surroundings of the picture which they had to represent, and, above all things, try to be true to nature. The Professor then called attention to a number of rough sketches of animals, fishes, etc., arranged at the back of the platform, which, he said, represented the earliest traces of art known in Europe. Pointing to one sketch, that of a reindeer feeding, he said his audience would notice that the outline was wonderfully well done. Its unmistakable contour was clearly defined, and was altogether a piece of true art. When they saw such a figure they were perfectly certain that the individual who drew it represented exactly what he saw. Yet those drawings were originally produced upon fragments of antlers and of bone and little pieces of stone, while the drawing implements those early artists had at their command consisted only of rude splinters of flint. Those drawings also indicated that the young artist should not begin with the brush, painting away with indistinct outlines, but first try to represent objects by bold outlines, which, he believed, was the best way of arriving at a thorough mastery of art.

In conclusion, the Professor stated he would say a few words regarding some other things. He thought there was in this country most unfortunately an antagonism existing between handwork and headword. In this country there were two distinct lines, if he might so put it. There was one which he might call the professional line, where it was considered a very fine and estimable thing for a man not to work with his hand, but with his head or pen. That antagonism seemed to him most unfortunate, and he thought all students should bear in mind that it was a thing which really ought not to exist. It would not exist if it were not for an intensity of vulgar prejudice. He would say that the old craftsmen of Italy, those men who were the builders of Florence and other great cities, were men who had no prejudice of that kind, and he thought that, if they really wished to do their work in the world, they must get rid of that absurd and ridiculous prejudice as quickly as possible. The work truly done was equally noble, and the man who made a table to the best of his ability was equally great, as far as his work went, with the man who painted a beautiful picture or composed a beautiful piece of music. That consideration led him to another point, and that was —What was to be the end of all this higher education? It seemed to him that if the end of it all was the production of more professional men—more doctors, more lawyers, more clergymen, more professors, and more clerks—the less they had to do with it the better. The professional classes were being overstocked, owing to that vulgar prejudice, and if education was to be of any good it should aim at making a man better fitted to carry on his work in the world than he was before.

His opinion was that the best education was that which would make a man better at his handicraft. If a man had the chance of pushing forward in the world let him do so, but if he tried to get out of his own line of life let him do it at his peril. It appeared to him a most ridiculous thing that a man who knew a great deal of Latin, or geology, or chemistry, should on that account think himself entitled to be supported by the State. The education he had in his mind was that which was not confined to the rich, which belonged not to one class any more than the other, but to all, and which would enable all classes equally to do their work better in the position in which they found themselves.

ISOLATING PAVILIONS FOR CONTAGIOUS DISEASES.

Physicians and hygienists have for a long time condemned that system of hospital buildings in which the patients, crowded in halls of a beautiful architectural aspect, find neither the necessary amount of air nor the isolation demanded by certain diseases. To cite the amount of expense occasioned by the construction of such edifices is enough to condemn a system that is repelled in the name of hygiene. Isolated pavilion hospitals are much the most healthful. During the war of the Rebellion the enormous number of wounded led to the improvising of barracks, which, as imperfect as they were, gave complete satisfaction to the heads of the hospital service. Experience, many a time repeated, has ended by triumphing over administrative routine, and, in many cities, a simpler and less expensive system is substituted for the edifices of old times. We may cite, as an example, the pavilions of Mr. Tollet constructed for the Bourges barracks, and, with a few modifications, made appropriate for the Bichat, Montpellier, and other hospitals. The hospital pavilion, or field hospital, shown in the accompanying cut, is situated in the gardens of the cantonal hospital of Geneva, and is designed to perform the role of an isolating ward for contagious diseases. It may likewise be appropriated to a service for the wounded, or, in a word, be adapted to all the needs of a hospital service. Among all the models of structures of this kind that have hitherto been devised, this is the simplest. It is built entirely of hard wood, simply varnished or coated with tar, and is 15 meters in length by 7 in breadth. To prevent dampness the floor is raised 70 centimeters above the ground. The roof, which has a steep pitch, is surmounted with a lantern to allow of the passage of air. The side walls are formed simply of thick curtains of sail duck. The structure contains eight beds. The arrangement, which is perfect for the summer season, appears to be less comfortable for that of winter, which is sometimes severe at Geneva. The walls then are lined with a double curtain, and the stoves that are installed in the interior suffice, it would seem, to keep up an equable temperature. When the infection of a ward necessitates its being evacuated, the patients are transferred to the pavilion, which offers the inestimable advantage of allowing them, during the extreme heat of summer, to be entirely in the open air. This is indeed an improved field hospital, of which the cost is not very high, and the erection of which may be effected very quickly.—*La Nature.*



ISOLATING PAVILION FOR CONTAGIOUS DISEASES

The Architecture of a Bone.

A lecture was lately delivered at the London Institution on "How a Bone is Built," by Mr. Donald McAlister, of St. John's College, Cambridge. The lecturer explained that he would treat the construction of a bone as a question of architecture or engineering rather than of anatomy. In looking at an ordinary marrow bone two points would strike one: In the first place, the shank or shaft of the bone was hollow, forming a somewhat thin walled tube; secondly, the end of the bone next the joint appeared on section to be not hollow, but filled with a spongy or "cancellous" meshwork of bony tissue. The tube form appeared not only in bones but in many other structures characterized by combined lightness and strength—such as the stalks of plants, reeds, bamboos, quills of feathers; and among human constructions in a vast variety of shapes, from tubular bridges to backbones of bicycles or tricycles. What was the common principle underlying all these manifold varieties? Why was it that, weight for weight, a hollow column was so much stronger than a solid one? The lecturer then showed that when an ordinary rectangular cross beam was slightly deflected by a load, the upper fibers were in a state of compression, while the under fibers were in a state of tension; whereas in the middle of the beam there was a neutral region neither compressed nor stretched. For load bearing purposes this region might be removed; the beam would thereby be made appreciably lighter but not appreciably weaker. The tube form of a bone was thus due to the fact that the material was concentrated at those parts which were most under strain and where it was most useful; it was removed from those parts where it added to the weight without adding to the strength. Tables were exhibited from which it appeared that bone in its physical properties resembled steel much more than such a material as cast iron. Bone, like steel, was almost as strong to resist tearing as to resist crushing. The spongy or cancellous ends of bone were next considered, and by photographs of actual specimens the lecturer showed that the apparently confused and irregular character of the tissue resolved itself on examination into a very beautiful and harmonious regularity. In the construction of such great structures as the Forth Bridge and the large cranes seen at the docks, engineers had found it useful to investigate the lines of the structure along which the pressure or the tension was at a maximum; these lines might be called stress lines *par excellence.* The material at disposal was most economically arranged when it was concentrated along these lines, leaving empty the mesh-like spaces corresponding to the neutral region of a cross beam. A skeleton or lattice framework might thus be built up, having all the strength of a solid structure of the same shape or loading, but with much less expenditure of substance. Such a structure would, moreover, be free from the danger of giving way by "shearing" or "faulting" in the geological sense. In other words, its parts would have no tendency to give way by sliding or slipping over each other; they could only be directly crushed or directly torn asunder. This was, therefore, an ideal mode of building such structures, and it was only because skilled workmanship was more expensive than material that engineers did not oftener put it into practice. In bone building, the lecturer said, there were no such obstacles in the way of perfect construction, and in such a part as the head of the thigh bone the principle was carried out in ideal perfection. The cancellous network in this bone was a material embodiment of the engineer's ideal lattice work of true stress lines, so much so that in the Zurich School of Engineering thin sections of the thigh bone were placed before the pupils as the best possible illustration of the true principle of construction. In conclusion, the lecturer remarked that when such instances of adaptation as appeared in the eye and hand, and perhaps he might now add the common marrow bone, were brought before us we were filled with wonder, and some saw in them evidences of what was called direct design. These evidences might nowadays be interpreted in perhaps a worthier and grander sense, but the wonder would remain for all who had eyes to see.

At any rate, apart from all theology, and taking only the strict architectural sense of the words, we must agree that a marrow bone was well and admirably designed.

John Henry Dallmeyer.

On the 30th of December, 1883, John Henry Dallmeyer, the gifted and noted English optician, whose name is familiar in every American photographic studio, passed away, at the age of 53. His name has been for a generation prominently before the world of astronomy, micrography, and photography. As a scientific optician he had no equal, and his works received acknowledgment and appreciation in various countries, especially in the United States, Austria, Germany, Russia, and France.

At home he was a Fellow of the Royal Astronomical Society; Russia constituted him a Chevalier, and France nominated him Officer of the Legion of Honor.

His marked ability in the construction of improved lenses for the camera made his name universally known among photographers. His demise will be generally regretted by the photographic fraternity, and those who are fortunate enough to possess his lenses will now doubly prize them.

We learn that his son, whom he has educated, will undertake to continue the business.

Waterproof Clothing.

Waterproof clothing which allows a free passage for respiration can be prepared by dipping in a solution of acetate of alumina. The latter is made by adding a solution of acetate of lead to a solution of alum, and decanting the mixture from the sulphate of lead which is precipitated. The articles are dipped into this liquid and allowed to dry without wringing them.—*Rundschau fur Pharm., etc.*

The Amber and Meerschaum Industry of Austria.

Within the last thirty years, says *Globus*, the amber and meerschaum industry of Austria has grown from a very small beginning to an independent and special branch, which is at present capable of producing excellent results, so that goods of great beauty and excellent quality are sold at relatively moderate prices.

The manufacture of articles from amber and meerschaum is chiefly concentrated at Vienna, although very respectable representatives of this branch can be pointed to in other large cities of that empire.

It is scarcely credible how wonderfully these two substances can be wrought, and what a variety of different articles can be made from them, simple or complex in form and all in excellent taste and elegantly made. It is only necessary to cast a glance into the show cases of the large Vienna amber and meerschaum firms in order to obtain an idea of the numerous elegant and artistic articles of magnificent workmanship that catch the eye of the passer-by and involuntarily invite to purchase.

First of all in elegance and variety is the immense collection of neat and elegant cigar holders, of the simplest as well as the most fantastic shapes. While in former years the magnificent meerschaum pipes ruled the day, at present, when cigars and cigarettes are used by nearly all civilized people, they are almost entirely superseded by cigar and cigarette holders. In addition to a variety of plainer ones we see such figures as angels, Venuses, veiled Venuses, sleeping Cupids, Indians with amber lances, jockeys with their horses, etc., also heads of women, of zouaves, and of Bedouins, and are astonished at the thousands of methods of combining these two substances, amber and meerschaum, and no less at the artistic design and execution of the articles. Equally varied is the collection of meerschaum pipes, that must enchant every passionate smoker. We see there the Dublin pipe of amber and meerschaum, the Albert, the Rigolbouche, the Irish, and the Belgian pipes, also the curved London and French pipes, and the Suez Canal pipes mounted in silver, meerschaum hand pipes with eggs, serpents, fruit, etc, all neatly and tastefully cut in meerschaum. Then there are the celebrated Turkish pipes, both flat and pointed, and a legion of pipes ornamented with character heads and other carvings. Then the never failing artistic objects with which large pipes are ornamented, carved in larger dimensions. Cigar holders ornamented with initials, monograms, or whole names sell well.

We must also state that, like meerschaum, amber is used alone, or both together are used for smokers' articles.

For many years past a new mass called artificial meerschaum has been made from the chips and turnings of genuine meerschaum, and at present it is largely employed. Besides this, different kinds of artificial amber are produced and used to imitate these various articles.

Amber is distinguished by its remarkably fine color, and like meerschaum it is turned on the lathe, filed, cut, and sawed, and from this expensive material magnificent ornaments are made, such as necklaces, earrings, pins, brooches, and bracelets; also smokers' articles, especially mouth pieces and cigar holders, also coral, cups, saucers, wreaths, etc.

Austria imports both of these valuable raw materials—amber and meerschaum—in very large quantities, the former mostly from Danzig, the latter chiefly from Brussa in Asia Minor. The quantity of raw material imported, as well as of finished goods exported, is simply enormous.—*Deutsche Industrie Zeitung.*

The Phylloxera in Sandy Soil.

The London *Times*, in a recent issue, contains a dispatch which gives the condition of the French grape crop as follows:

"Only twelve of the southern departments seem satisfied with their vintage. The yield in general is expected to be even below the average of late years. Burgundy and Champagne report a yield extremely deficient both in quantity and quality, while Macon counts upon a better crop than had been predicted, though of somewhat poor quality. In Charente the quality is also poor."

The same dispatch, in summing up the observations of Lalande, Mayor of Bordeaux, on the conditions of the vines in the phylloxera-infested sections of the country, gives a most favorable account of the use of American stocks, and shows that even the French vines at Aigues-Mortes are flourishing in the sandy soils, thus emphasizing the fact of the impotence of the phylloxera in such sandy soils.

ICE YACHTING.

[SEE FRONTISPIECE.]

There is no sport, the excitement of which is so thrilling and whose records of speed so wonderful as that of ice yachting. Ice boats are to be found on the lakes and rivers of our Northern States, but their favorite cruising ground is on those great expanses of ice on the upper and middle Hudson. Here the principal ice yacht clubs are located, and the traveler often may catch glimpses of them from his car window as far south as Nyack and Tarrytown.

The ice boat, like the catamaran, is a racing machine, pure and simple. Its hull (if the few timbers forming that spider-like structure can be so called) is put together in such a manner as to obtain the greatest possible strength consistent with lightness.

Every village along the great river appears to have a few of these boats, but whether made by the boys, who nail a few boards together, with a bean pole for a mast and a blanket for a sail, to the gentleman whose mighty flier rejoices in plated hand rails, inlaid cockpit, and buffalo robes, the same principle of construction prevails, namely, a triangular frame with two widely extended runners abreast of the mast, and one astern which does duty as rudder. Some use the plain cat rig, some the sloop, with short, low, slanting gaff and long boom, and the single yard lateen has also been tried.

The season for the sport rarely lasts over thirty days, and some winters afford but a week of good racing weather. Of course there are many fine days scattered through the season, which the individual ice boat enthusiast watches for and takes prompt advantage of. The main obstacles to the sport are light winds, rough ice, and snow, and it is a delightful sight after a spell of bad weather to see the eagerness with which the devotees to the sport launch their fairy craft and fly overthe river with their snowy wings. On pleasant afternoons, when the wind is not too strong, one can often see many a family party out for an airing on the dainty craft, which glides smoothly along as if conscious of the necessity of extreme caution in all its movements; but when the whistling west wind whirls down the mountain side and sweeps across the bay, what a change is there in the actions of that same craft! How she darts about like a frightened bird, shivering and trembling up into the wind, now paying off and darting away again, seeming to leave the ice, then fading away and dropping out of sight like a feather on the gale! And when with wind abeam, and in a race, with her competitor close at hand, how madly she rears and holds tremblingly aloft the man perched upon her windward runner, as if intent upon shaking clear of her burden and flying into the air!

Nevertheless, accidents are rare, and it is seldom that any more serious harm comes to the sportsman than a thorough ducking or a frost bitten hand or nose. The most serious accidents occur from collisions where the boats meet on opposite tacks, or when one, stopped suddenly by some unforeseen obstruction, is run into by another too closely following its course. Ladies are often keen participants in the sport, and take their share of its dangers, as in a recent instance off Poughkeepsie, where two were riding, one on each runner, when the ice suddenly gave way and precipitated one of them into the river. The accident happily resulted in nothing serious.

The authentic runs of some of these boats are really marvelous. The swiftest express trains are frequently overtaken and passed as if they were at rest. A mile a minute is often made by the fliers. Longer distances at this rate are not often recorded, on account of the fitfulness of the wind and the impossibility of getting perfectly smooth ice for a long distance. Under perfectly favorable circumstances and for short stretches these boats have probably flown at a rate as high as ninety or a hundred miles an hour. The distance between Poughkeepsie and New Hamburg is nine miles. The Snow Flake, 44 ft. 10 in. length, owned by Mr. Rogers, has made the distance in seven minutes. In 1872 the yachts Haze, Snow Flake, and Snow Squall sailed to Albany on one day and returned the next. In 1882 the Haze made nine miles in seven minutes, at times making two miles a minute. In 1879 the Comet, Phantom, Zephyr, and Magic sailed together ten miles in ten minutes, and most of the time the gale hurled the boats till their windward runners were at an angle of 45°.

A gentleman of Poughkeepsie wishing to speak to his brother (who had started on a train for New York) concerning some business of importance, jumped on his ice boat, caught up with and passed the train, and reached the depot at Newburg in time to meet and accomplish his object. The winning boats since 1869 bear such speed suggesting and wintry names as Haze, Arctic, Hail, Restless, Snow Bird, Æolus, Phantom, Avalanche, Jack Frost, Zig-Zag, Whiz, and Icicle. The latter is the largest ice boat on the river. She is owned by Commodore John A. Roosevelt. Her dimensions are as follows: Extreme length from end of bowsprit to main boom, 68 ft. 11 in.; length of frame, 29 ft. 3 in.; width between runners, 25 ft. 7 in.; area of sail, 1,070 square feet; hoist of main sail, 22 ft.; length of boom, 42 ft.; gaff, 42 ft. 9 in.; hoist of jib, 28 ft.; on jib boom, 23 ft. 6 in.; on stay, 23 ft; total weight of yacht, 2,360 lb.

A ride on one of these boats at full speed is most exhilarating, producing a sensation as of flying through space, a feeling as of delightful buoyancy, once experienced always to be remembered.

ONE of the surest remedies for destroying buffalo carpet bugs is benzine, if thoroughly applied.

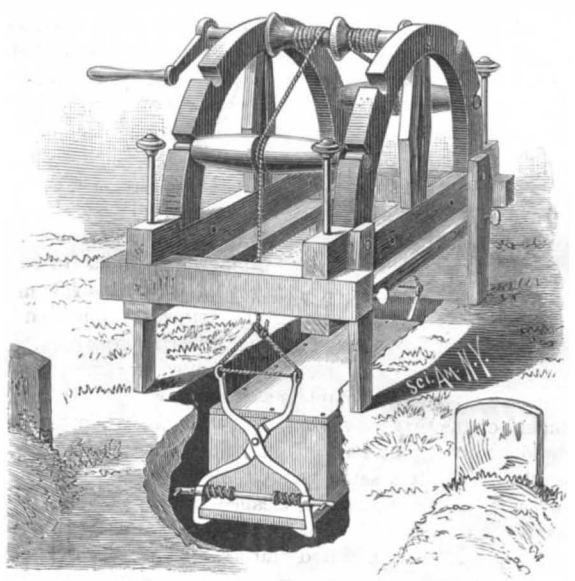
Pleasing Experiments with Glass Tubes.

A most remarkable phenomenon is produced in glass tubes placed in certain circumstances. When these are laid before a fire in a horizontal position, having their extremities properly supported, they acquire a rotary motion round their axis, and also a progressive motion toward the fire, even when their supports are declining from the fire, so that the tubes will move a little way upward to the fire. When the progressive motion of the tubes toward the fire is stopped by any obstacle, their rotation still continues. When the tubes are placed in a nearly upright posture, leaning to the right hand, the motion will be from east to west; but if they lean to the left hand, the motion will be from west to east, and the nearer they are placed to the upright posture the less will the motion be either way. If the tube be placed horizontally on a glass plane, the fragment, for instance, of coach window glass, instead of moving toward the fire it will move from it and about its axis in a contrary direction to what it had done before; nay, it will recede from the fire, and move a little upward when the plane inclines toward the fire.

These experiments succeed best with tubes about 20 to 22 inches long, which have in each end a pretty strong pin fixed in cork for their axis.

IMPROVED BURIAL WINDLASS.

A strong bench, of longer and wider dimensions than the horizontal measurements of a grave of the largest size, has four legs pivoted to the frame so as to fold up against the sides when the bench is being carried about or stored away. The legs are provided with thumbscrews, which hold them in either a folded or open position. On the top of the bench is an arch-shaped frame of two parallel beams spanning the frame from end to end and suitably connected to it. At the crown of the arch is a rope drum, having a crank for turning it, and having cords extending each way from its respective sides along the arch and over rollers mounted on the outer sides of the arch, to guide the ropes for being raised



McDONALD'S BURIAL WINDLASS.

and lowered at the ends of the grave. From the cords are suspended grappling tongs, so pivoted and connected to the cords that the weight causes the hooks to gripe firmly. The board on which the coffin rests is grasped by the hooks. When the coffin has come to rest on the bottom of the grave, the tongs are disconnected by springs placed on a bar passing through each leg, which press the legs apart. Until the coffin is ready to be lowered the legs are kept a certain distance apart by means of pins which are passed through the bar outside of the legs. The pins are then shifted to other holes in the bar, sufficiently distant from the hooks to allow them to escape from the board by the pressure of the springs when relieved of the weight of the coffin. Series of bearings are made in the arch, so that the rollers can be shifted from one position to another, according to the length of the grave. The construction of the windlass and tongs and the arrangement of the rope will be readily understood from the engraving.

This invention has been recently patented by Mr. John P. McDonald, of Litchfield, Illinois.

Color in Electro Gilding.

It is of the greatest importance to possess a knowledge of the art of regulating the current and general working of hot electro gilding liquids, so as to make the process useful in producing not only deposits of gold, but those of any desired color.

As a general rule, it will be found best to obtain any excessive color by additions to the bath, and not by attempting to work it up to this by the current or temperature. Thus, to obtain red or green gold of decided color, it will be necessary to make additions of acetate of copper and nitrate of silver. But if it is not required to perpetually gild in this color, or at least until all the added metal is worked off, the bath will be spoilt for ordinary gilding. It is, therefore, always wiser, when excessive color is required, to either make up a separate solution for that particular color, or to make the main bath up in that manner if the work is always to be carried on.

To make up a bath for red gilding, grind a little of the acetate of copper (crystallized) to powder, dissolve in water, and add to the bath, with stirring, every evening as much as may be required. In a new bath, where there will be no troublesome sediment to disturb, the addition may be made at any time, and the quantity augmented if the color is not sufficiently deep. It must not be forgotten, however, that gold so colored is not so fine as a yellow gold. Attention should be given to some of the directions which follow, so that the battery power and temperature may be regulated to assist in the production of deep color, it being important that too many foreign substances be avoided in a good bath.

To obtain green and white gilding the addition is a solution of the crystallized nitrate of silver. This is added in the same way as the copper. A very little (a few drops) will generally produce green gilding, and a little more, white.

To deposit a gold of pink appearance is a more troublesome matter. The surface is first coated yellow, then thinly red, and over this is produced an exceedingly thin coat of silver in a silvering solution. Such surfaces are very lasting, and should be burnished.

A good cyanide gilding solution should be of sufficient strength to allow of its producing from a pale and poor looking deposit to a deep and nearly red rich gold. For such purposes the solution may even contain as much as 1½ ounces of gold per gallon, but over this it is not advisable to go, for the reason that the paler tints are not readily obtainable. The poorer solutions will produce fairly pleasing tints when the current is strong and the temperature high, but the darker shades are very apt to have a dingy appearance, instead of that mellow and clear surface which is the chief aim of the practiced gilder.

A dead gilding will be produced by the addition of a little of the fulminate of gold in solution to the bath immediately before gilding, or dip the articles (brass and copper) before gilding in a mixture of sulphuric and nitric acids.—*Watchmaker.*

The Old Mohawk and Hudson Railroad.

Some interesting particulars of this road are contributed to the New York *Times* by W. W. Crannell, of Albany, N. Y.

The first railroad constructed in this part of the country was the Mohawk and Hudson Railroad, extending from Albany to Schenectady. The work on the road was commenced in 1830 and completed in 1833. It was constructed with an inclined plane at each end of the road; the one at Albany a little more than half a mile in length, and both of them having a rise of 1 foot in 18. The road was laid out about 16 miles in length, 6 of which were at a level, and the rest of it, with the exception of the two inclined planes, had an ascending grade of about 1 foot in 250. The width of the excavations was 36 feet, that of the embankments 26 feet. The deepest excavation was 47 feet, the highest embankment 44 feet, and the greatest altitude above tide water at this city, 353 feet.

Stone blocks laid on broken stone were placed 3 feet apart, from center to center, and cross sleepers of wood, 7 inches in diameter and 8 feet long, rested upon them, supporting the timber rails, on which were placed iron bars, ⅝ by 2½ inches, with the upper corners rounded to 1½ inches in width. The width between the rails was 4 feet 9 inches. The capital stock was fixed at $300,000, with permission to increase the same to $500,000. When the road was completed it was found to have cost $1,100,000.

In July, 1831, the locomotive De Witt Clinton arrived, at which time the road was completed for 12½ miles. Although the locomotive was found to be defective, it made the run over the completed road in one hour and forty-five minutes. An English locomotive, called the Robert Fulton, of double the power and weight of the American engine, was procured in September. The vehicles for passengers were built at the factory of James Goold, in this city, and were mere stage coach bodies placed upon trucks and supported upon thorough-braces, in the manner of stages, and capable of carrying about fifteen passengers each.

The time when the directors of the road felt prepared to crown the success of their labors by a grand excursion was on September 24, 1831. The Governor of the State, the mayor of the city, the editor of the *Journal*, the editor of the *Argus*, Billy Winne, the old penny post, and other distinguished and representative citizens were invited to celebrate the great event. There were five cars crowded with guests, and there was a crowd of spectators to see them off.

The greatest man on the train, in his own opinion, was the English engineer; but, alas! the English engine balked; there was some trouble with the feed pipe. The editor of the *Journal* suggested to the editor of the *Argus* that they borrow a horse whose feed pipe was in order. A man in the crowd shouted, "Give 'er a peck of oats, boss;" another cried, "Twist her tail;" and still another suggested that they "turn the wheels to start her off." After waiting until noon, the De Witt Clinton was substituted, and started off with a train of three cars, the remainder of the party following in the two other cars drawn by horses. After partaking of a late dinner in Schenectady, the locomotive returned with the entire train of five cars in thirty-five minutes. The American was now called the Brother Jonathan and the English engine the John Bull, and great was the talk of the superiority of American over British mechanism.

The Patentees' Rights Endangered.

A correspondent in the New York *Times*, referring to the obnoxious bills recently passed in the House of Representatives, the text of which was printed in the last issue of the SCIENTIFIC AMERICAN, justly confirms what we have said would be the serious consequences to patentees and patent property if the measures should become the law. The provisions in these bills are of a most dangerous and pernicious character, and so unusual in their scope that it is doubtful if the Supreme Court would not adjudge them unconstitutional.

Adopting the language of the *Times* correspondent, we proceed to state substantially what has appeared before in these columns on the same subject.

The bills provide that no damage shall be recovered for an infringement where, upon the trial, it shall appear the defendant was a mere user for his own benefit of an article purchased in open market, without notice that the same was subject to patent. An inventor suing for an infringement can only know at a trial if he will have a heavy bill of costs to pay for suing an infringer. A person owning a patent has not the same right that a person owning a bundle of rags has. A wrong doer may take away from him the exclusive right to his discovery, but cannot convert a bundle of rags purchased in open market. A greatly improved or perfectly adapted article bears on its face the result of study and invention, and nine out of ten thinking men would presume it was worthy of a patent, so that it carries with it actually, if not legally, a notice of its being the intellectual property of some one sufficiently to put any ordinary, careful man on his guard, as much so as though the tags of an owner were appended to it.

Would a man have the right to your horse simply because he did not know it was yours and had bought it in open market? Is this the exercise of the power conferred on Congress to promote the progress of science and useful arts by "securing to inventors the exclusive right to their discoveries"? Let inventors and manufacturers apprise their representatives in Congress personally and by letter of the dangerous and hostile character of such legislation. Such suits every lawyer knows are extremely rare. Who sues for such small damages? But it is in effect a bill for aiding infringers while pretending to protect innocent users. It is a dangerous sham and an entering wedge to hostile legislation.

Meat for Chickens.

We do not think that we can be mistaken in the belief that we should be far more successful in the raising of young chickens by giving them a great deal more animal food than we are in the practice of doing. Corn meal mush, boiled potatoes, and similar substances generally compose, as we all know, the principal food of young chickens; but we can see no reason why these young birds should be exceptions to the ordinary rule of young birds in general, which feed very largely, indeed chiefly, on animal food; even those which, when they are mature, live mostly on fruits and seeds, are fed when in their nests on worms, grubs, and insects. We notice the old birds all day long busily engaged in supplying their young with food, but always with animal food. In fact, it is very rare that we have seen anything else. Why, then, should chicks be an exception?

The recommendations, almost without exception, in our poultry publications are to give more animal food to our grown fowls if we expect them to give us more eggs, especially in winter, when they can help themselves to none. That it is a great inducement to make them lay more generously, we have too many proofs to admit of any doubt. Besides, it is claimed that animal food has other advantages in the way of good health, etc. Why, then, let us ask again, should the young chickens not be benefited with at least a moderate supply of animal food? All chicken raisers know the great losses always suffered in the growth of them, and may it not be owing to a large extent to the withholding entirely of this strengthening food, which is of so much benefit to the matured bird? We, therefore, suggest to our farmers to change their method of feeding their young chickens by giving them a due proportion of animal food, chopped up in very small pieces, and thus find out, each one for himself, whether it is not a very decided benefit in raising to maturity an additional number of the chicks into strong, healthy fowls.—*Germantown Telegraph.*

High Heels.

Since the high heel made its appearance, medical men have more than once borne witness to its bad effects. The late Mr. Hilton condemned it. Others have done the same. Of late years public opinion has done away with certain of the long established extravagances of dress, and has given rise to methods more agreeable to the symmetrical development of the body. We hope that in the process of reform the feet, in which too often vanity pays a price which is dangerously expensive, will not escape notice. The evils of the high heeled boot or shoe are due to the fact that it is an essentially badly fitting article. It is made in defiance of the relation which it ought to bear to the anatomy of the foot, and to the direction in which the pressure of the body weight falls upon the latter. Hence the peculiarly cramped walk of ladies of the present day. Any one may observe the consequences of the "advanced position," nearly under the instep, and the increased height of heel in the substitution of a forward inclination of the body, and a trip suggestive in a measure of the stumbling gait, for the upright carriage and the free and graceful swinging movement natural to the leg in walking. These matters as far as they are merely relative to deportment do not strictly concern us, but there are attendant circumstances which deserve comment. The boot or shoe, in order that it may not shift on the foot, which has lost much of its usual purchase of direct downward pressure, must hold it firmly and even tightly, and in particular it is necessarily constructed so as to hold with undue firmness just above the back of the heel. With some persons perhaps no inconvenience results, with others, who have fine skins, chafing is readily produced. This is in itself a trifle, and is presumably altogether too inconsiderable to affect the will of fashion, but it may nevertheless be the slight beginning of graver troubles. Probably there is no practitioner fairly long acquainted with town practice who cannot recall a case or cases in which extensive inflammation of the leg with abscess formation has followed even such a slight abrasion, and the exciting cause, when looked for, was discovered in the patient's shoe. There have even been instances, fortunately rare, but still occasional, where abscesses arising round some neglected trifle of this kind have ended fatally. These are facts which cannot be denied and should not be overlooked; but even if they could, is there any woman with a mind of her own who will say that the dainty step so much desired by some, bought as it is at the cost of healthy muscular exercise, is not overvalued? We rather hope that the honest feeling and the sound judgment which have guided that sex in many better purposes will ultimately overcome the false sentiment which now leads certain of its members to support an unbecoming and injurious custom.—*Lancet.*

Difficulties of Building in Winter.

Limes and cements are liable to injury from frost if not thoroughly set or sufficiently hardened, the line of demarkation between setting and hardening being by no means clear, although said to be determined by the loss of plasticity. When this is quite lost, however, crystallization has ensued, and consequently hardening, though not to its full extent. Besides, what becomes of the phrase "setting hard," if mortar does not harden until after it sets? Evidently another term is required to denote ultimate induration as opposed to the hardening acquired by crystallizing. Lime mortar has been known to set so extremely hard that it has defied all fair means to injure it when only two days old. Frost does not usually penetrate into mortar joints to a greater depth than half an inch, or thereabout, and common pointing that will never indurate (however picturesque it may be made to look with lamp black or otherwise) is chiefly affected by it. This sort often stands when frozen, but peels or scales off when thaw sets in. Perhaps few incidents have caused more bickerings between builders and their supervisors than the failure of pointing from frost, and this because the contract has not enjoined that the work was to be delivered up complete and sound with all damage or imperfections that may have arisen during its progress repaired, rectified, and made good. Pointing executed with strong lime and little sand well troweled and consolidated by pressure into the raked out, cleaned, brushed, and wetted edges of the bricks is, like a good struck and cut joint, more adapted to remain unimpaired during a severe winter than a tuck pointed joint, however accurately trimmed. When not brought to a smooth, impervious face, joints remain porous, and are in danger of disfigurement from frost. A like disaster may happen when they are not weathered to throw off water, or through an exudation of the water of crystallization occurring during a freezing temperature. The porosity of Portland cement induces stucco made therewith to flake and peel off in frosty weather if cracked or laminated through careless admixture or rendering. This cement retains in setting a considerable portion of the water used in bringing it to a paste, and notwithstanding that it sets quickly and parts with all superfluous water, it takes months to indurate and dry.

Frost is doubtless particularly detrimental to all green work, which requires, therefore, efficient protection in the shape of boards, straw, and such like coverings. External work must not be proceeded with during frost, nor while frost is in the materials. In the one case there will be upheaval followed by collapse, and in the other destructive settlement. Buildings, however, already roofed in can be advanced during frost by stopping doors and windows with screens and lighting fires. Concrete, which plays so important a part in the stability of structures, should never be made in frosty weather. In spite of this fundamental precept some imagine that it can be done with impunity, because hot lime will take the frost out of the ballast, without reflecting as to the effect on the ultimate hardening its rapid rate of cooling may exercise. Concrete made in temperate weather, and exposed to frost, sometimes shows minute cracks on its surface that are the result of contraction; but these are too insignificant to interfere with the permanent expansion of concrete properly prepared with hot lime or cement, and which, by its great lifting power, affords so splendid a means of underpinning. Portland cement concrete compounded in frosty weather suffers a retardation in setting, and, consequently, its perfect cohesion may be fairly suspected when it eventually consolidates.

It would thus appear that in addition to its powers of weakening, disrupting, and gnawing, frost furthermore affects building materials by squeezing them as far as its severity will permit. It is also evident that the divergence in their relative loss of bulk, through contraction, is too trifling—excepting in the case of continuous girders, etc., unprovided with expansion arrangements—to produce anything like dislocation when mixed up in a building, and attaining, or not, an approximately equal temperature. The sensation of cold, which is misleading, would give the idea that such an attainment is impossible, since stones and metal feel so much colder than timber. All inert bodies, however, exposed to the same temperature, acquire it within a reasonable time. There are, of course, instances where an even temperature is never reached, as in the case of chimneys, etc., presently noticed. As to the motion superinduced by contraction and expansion, slight as it is, it no doubt produces countless fine cracks or threads in masonry and mortar joints, and perhaps helps to explain why old work can be lifted off sometimes piece by piece, or taken down with so much ease. The necessity of screwing and bolting the parts of large clock frames so strongly and tightly together would not be so apparent were tower walls motionless. In habitable structures, parts of chimneys, rooms, etc., or of the same constructive piece, its interior, ends, and sides, for example, are unequally, irregularly, or intermittently warmed and chilled day by day, and all the year round, throughout a wide range of temperature, whereby another class of cracks arise that are wrongly attributed to settlement, imperfect seasoning, inequality of bearing, etc., according to the nature of the thing affected, but which reach their maximum by the aid of frost. Then there are other points, such as the rate of cooling, specific heat of materials, etc., besides the puzzling question why foundations are left like buried pipes to go with the ground, whereas the superincumbent walls and what they carry have ample room, though no facilities for motion similarly to iron rails, girders, ribs, or piping provided with elongated bolt holes, expansion joints, sliding joints, or friction rollers, as severally required. Thus the whole subject of the total debilitating effect of frost on a building becomes very complex.—*Building.*

Postal Facilities in Germany and France.

Some comparisons are made by *Le Génie Civil* between the cost and character of domestic postal service in Germany and in France, which are of special interest to us Americans, just beginning, as we now are, to dream of emulating the convenience, security, and cheapness with which transportation of this kind is performed abroad. In regard to simple letters, it seems that the postage on those circulating within the country is, for those weighing less than half an ounce, two and a half cents in Germany, and three cents in France; the rate in both cases being higher than the new rate here. With letters of more than the standard weight there is, however, a very great difference between the German practice and that of other nations; thus in Germany a single rate of five cents pays for the transportation of any letter more than half an ounce and less than eight ounces in weight; while an eight ounce letter in France would require to be prepaid with fifty-one cents' worth of stamps, and in the United States with thirty-two cents' worth. Postal cards cost in France two cents each and in Germany about one cent and a quarter; and sealed postal cards, at the same price, have just been introduced into the latter country. Postal orders, which cost in France twenty-five cents for the smallest sum, are in Germany only one-fifth as much, and in the latter country an extra payment of one cent entitles the sender to have the money carried by the postman to the house of the person addressed, and there paid to him. In the same way, the postmen are obliged to receive money from any one who wishes to send a postal order, and give a receipt for it, entering at the same time in a book the name of the person to whom the order is to be sent; and the postmaster then makes out and forwards the order required. A species of missive used in Germany, but nowhere else, so far as we know, is the express letter, which, for an extra postage of six cents, is forwarded to the person addressed without passing through the post office of the town in which he lives; a messenger, who travels on every mail train, taking the letter immediately on the arrival of the train, either by day or night, to the house of the one it is intended to reach. As the boxes in the stations are open to receive letters until one minute before the departure of the train, an express letter of this kind can be transmitted very quickly.—*Amer. Architect.*

A Wonderful Bell.

The temples at Kroto, Japan, says a correspondent of the Philadelphia *Press*, are mainly of interest on account of their great bell, which swings in a monster wooden belfry half way up the hillside, back of the buildings proper. This bell is a huge bronze cup with nearly perpendicular sides and a flat crown, and, like all other Japanese bells, is sounded by means of a huge beam kept in place by ropes, but, when occasion requires, brought against the rim of the bell with great force. It requires twelve coolies to manipulate this beam. Formerly it was only rung once a year, but now it may be heard two or three times every month. It is one of the greatest wonders in Japan. It is 18 feet high, 9½ inches thick, 9 feet in diameter, and weighs nearly 74 tons. It was cast in a monster mould in the year 1633. As the bell was cast with the rim up, the gold entering into its composition—computed to be about 1,500 pounds—sunk to the crown. It has a magnificent tone, and when struck by the open palm the vibrations may be heard at a distance of one hundred yards.

ENGINEERING INVENTIONS.

A car for inclines in mines has been patented by Mr. John Rosquist, of Park City, Utah Ter. There is provided a novel self-acting pawl attachment, whereby, if the rope or other appliance gives way, the pawl or pawls are made to automatically engage with locking racks on the track, to stop the car at any point.

A railway torpedo placer has been patented by Mr. Gilson W. Metcalfe, of Baltimore, Md. This invention relates to an improvement on a torpedo placer patented last year by the same patentee and Mr. M. F. Haber. It involves certain details of construction whereby the action of the wheel in placing a torpedo on a rail is made more certain and effective.

An automatic railway signal has been patented by Mr. Theophilus Arndt, of Florin, Pa. It provides for placing an extra rail at the side of one of the track rails, the extra rail being slightly higher and with sloping ends; there is an attachment to the locomotive, by which a lever is operated in passing over this extra rail, and thus the whistle is blown during the passage over the sloped rail.

MECHANICAL INVENTIONS.

A mandrel attachment for circular saws has been patented by Mr. Edward W. Johnson, of Waterbury, Conn. This invention provides for the fixing of a circular saw to a mandrel at any required angle, whether right or oblique, and enabling the operator to change the angle of the saw on the mandrel, so as to vary the width of the cut or groove to be made.

A screw driver has been patented by Messrs. George E. Gay and John H. Parsons, of Augusta, Me. The invention is an improvement on screw drivers in which the blade is fixed to the handle by a metallic plug in a transverse position, and has for its object to dispense with the flanges or screws in or upon such metallic plugs, thereby simplifying and cheapening the making of screw drivers.

A belt tightener has been patented by Mr. Frank Sager, of Pittsburg, Pa. In combination with screw threaded shafts and clamping rolls is a fixed and a movable cross bar, with an eye at each end, forming bearings for the shafts, the latter having collars and nuts at the ends of the eyes, and working in screw-threaded bevel-toothed nuts, operated by beveled cog wheels, a shaft, and a crank or handle.

AGRICULTURAL INVENTIONS.

A sulky plow has been patented by Mr. Benjamin S. Benson, of Baltimore, Md. This invention is designed to facilitate the more perfect guiding of the plow, and controlling the width of the furrow slice, which is effected by readily made adjustments of the various parts.

A sulky plow has been patented by Mr. Thomas T. Harrison, of Aubrey, Kas. This invention covers improvements on four former patents issued to the same patentee, and is for a manner of adapting plows to turn a square corner in passing around land, without it being necessary to raise the plows out of the ground.

An improved plow has been patented by Mr. Simeon A. Ware, of Danburg, Ga. The object of this invention is to promote convenience in adjusting plows and efficiency in operating them. A detachable landside is provided, in place of which a blade or cutter may be fixed to the side of the beam, to cut roots in the soil which would otherwise interfere with the working of the plow.

A pitman box connection for mowers and reapers has been patented by Mr. Charles Dixon, of Weedsport, N. Y. The invention provides for an improved construction to make a better working joint or fit of the socket portion of the box with the pin or ball which works therein, whenever, by irregularities from imperfect castings or otherwise, the same are liable to shake or jar and form an imperfect connection.

A horse hay rake has been patented by Mr. James M. Wishart, of Topeka, Kas. The teeth are attached to cross bars which form the head of the rake, one bar being under the upper or rear ends of the teeth, and one bar being over the teeth at a suitable distance forward of the rear ends to give sufficient space for the wheels on which the rake is supported to be located between said bars.

MISCELLANEOUS INVENTIONS.

A grain measuring machine has been patented by Mr. Joseph Nafziger, of Hopedale, Ill. This invention relates to a device adapted to be attached to and operated from the separator of a thrashing machine, for automatically measuring the grain as it is thrashed.

A stave and shingle sawing machine has been patented by Mr. William J. Henderson, of Naylor, Ga. The object of this invention is to promote convenience and accuracy in beveling and bilging staves, sawing shingles, laths, fruit crate slats, and other sawing.

A clamp for sheet holders has been patented by Messrs. Alfred P. Hayden and Francis Pickup, of Brooklyn, N. Y. This invention provides a device with peculiar construction and arrangement of parts for holding all kinds of loose sheets, as express receipts, check and note blanks, etc.

A flying target has been patented by Mr. James Jopling, of Oskaloosa, Iowa. The object is to provide a target of a form to prevent the shot from flying off, which shall sail well in the air, not be liable to breakage on the field, and so a large number can be safely packed in a small space for transportation.

A cotton press has been patented by Mr. John C. Allen, of South Sulphur, Texas. It is a horizontal press, with reciprocating follower worked by power, and arranged to receive cotton from a chute descending from a floor above, the construction being such as to make a very effective press without heavy or expensive fittings.

A grate bar has been patented by Mr. John Mailer, of San Francisco, Cal. In this invention the grate bars are fixed, and without vibrating motion; there are tongues on both sides of the opposite plates of each bar, in a staggered position, and beveled downward and inward to the plates, to insure a large air inlet, and not allow the passage of the lugs by each other.

A spring motor has been patented by Mr. James A. Wright, of Rockingham, N. C. This motor provides means whereby an elastic cord or other spring may be stretched to its full length and its contractile force utilized in a small space for such purposes as running sewing machines, churns, pumps, scroll saws, or for propelling bicycles, etc.

A cock and tank for drawing fluids of varying temperatures has been patented by Mr. James Byrne, of Cleveland, O. The invention provides for the division of an urn or tank into two compartments, and a faucet with a single outlet connected with both compartments, but so the flow of the liquid from both may be gauged as desired.

A glove fastener has been patented by Mr. Amedee Trouttet, of New York city. This is a cheap, novel, and practical device by which a glove may be fastened quickly and easily without button hook or other aid. There is a sliding buckle or fastener, with hooks, and a strap attached to the flap of the glove with suitable holes or eyelets.

A stocking supporter has been patented by Mr. George N. Buck, of Mattoon, Ill. An attachment is provided consisting of a single wire bent back and forth upon itself to form a series of separate parallel loops, as an elastic strap adjuster, and terminating in a spring pin and eye, or keeper, by which to attach it to a stocking.

A nut lock has been patented by Mr. John W. Haley, of North Hartland, Vt. In a fish plate, with lugs on its outer surface, is a frame or check nut, the frame being provided with diagonally opposite lugs adapted to catch on the lugs of the fish plate and prevent the locking nut from turning, the nut lock being very easily applied, and firmly fixing the nut.

A dash board has been patented by Mr. William E. Minshall, of Minonk, Ill. This invention provides means for securing dasher frames to their feet without holes in the frames, also for repairing broken dasher frames, and for fixing the whip socket to the dasher, in a more solid and economical manner than by present methods.

An apparatus for adjusting the beat of pendulum clocks has been patented by Messrs. George H. Brown and Henry J. Welteroth, of Blossburg, Pa. The invention provides means for adjusting the verge or pallet relatively with the escapement and pendulum rod, so the clock may be set in perfect beat when resting on an unlevel surface or support.

A saw envelope has been patented by Mr. Frederick Schluchtner, of East New York, N. Y. A fastening strap is provided at one or both ends with a cross head to engage with slits in the envelope and fasten it in place upon a saw; in the side of the envelope is an aperture to display the figure indicating the number of teeth to an inch in the saw.

A cigar mould has been patented by Mr. Remsen Appleby, of New York city. This is an improvement on a former patent issued to the same patentee, intended to prevent the point of the cigar from being packed and badly drawn, and provides for the cutting off of the surplus tobacco without packing the point, while at the same time the tips are made secure and the work is accurate.

A rock dredge has been patented by Mr. Isaac Du Bose Seabrook, of St. Helena Island, S. C. This invention is intended to better accomplish the disintegration and recovery of the phosphate rock deposits of river bottoms than is at present possible, the device provided giving greater flexibility of action, thereby accommodating itself more perfectly to the irregularities of the river bed.

An easel has been patented by Mr. Delbert K. Woodward, of Lordstown, O. This invention relates to certain improvements on an easel for which a patent was granted last year to the same patentee. The easel frame has a short rear leg or legs attached to a cross bar near the center of the easel, and there is an adjustable shelf bracket, with several specially devised and ingeniously arranged parts.

A fire engine has been patented by Mr. William F. Baldwin, of Grayville, Ill. This invention has for its object to provide means whereby any number of cisterns may be adapted to receive the same pump and its operating gear, and the gear adapted to operate one or more pumps by hand or animal power, being much more economical and more quickly adapted to use than a portable engine.

A combined extension saw horse and scaffold has been patented by Mr. John W. Phillips, of Oakdale, Neb. An extension top piece and extensible legs are hinged to a hinged head block, and there are also intermediate extensible legs hinged to the top piece, so the saw horse can be lengthened or shortened, or made higher or lower, to adapt it for use for various purposes.

A velocipede has been patented by Mr. Christian F. Riley, of Philadelphia, Pa. This invention covers improvements in means of coupling the guiding or steering and driving axle of a hand crank velocipede with the reach or bed frame of the hind axle, and also devices for steering or guiding the driving wheels by the feet of the driver, the object being to make the machine simple, efficient, and durable.

A shingle sawing machine has been patented by Mr. Patrick O'Connor, of Tallman, Mich. The machine has a stationary frame and a rotary annular frame divided into compartments by stationary and hinged bars, and provided with stationary and with movable dogs operated by spring pressed jointed bars and cam guides, and adjustable tilting tables, the whole to facilitate the sawing of shingles and promote accuracy.

A hoisting apparatus has been patented by Mr. Pentecost J. Mitchell, of Dragoon Summit, Arizona Ter. The drum shaft is contrived to be lifted with its bearing at one end for disengaging the gear from the driving gear on the main vertical shaft to which the power is applied, and there is a friction brake device to control the lowering load when the gears are disconnected, the whole making an easily worked and safe machine.

Business and Personal.

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

NEW BOOKS AND PUBLICATIONS.

THE TABOR STEAM ENGINE INDICATOR. By George H. Barrus, S.B. Ashcroft Manufacturing Company, Publisher.

This little book, arranged in pocket form, not only describes in detail the construction and manner of working the Tabor indicator, but, in well chosen terms, treats of the indicator in general. This useful device, revealing every idiosyncrasy of the steam engine and infallibly pointing to the proper remedy, should be used with judgment and skill, and each one of its peculiarities should be perfectly understood by the operator. The indicator diagram tells a complete and unvarnished story to those who are able to interpret it. The author has dealt with these questions from an eminently practical standpoint, and has succeeded in compiling one of the most accurate, concise, and plain expositions of the indicator we have seen.

A "Directory of the Iron and Steel Manufacturers of Great Britain" is published by our contemporary, the *Iron Trade Exchange*, London, being a careful compilation by its editor, Mr. Herbert W. Griffiths. The names and addresses of the manufacturers are given, the brands by which their goods are known, and the various kinds of products, in the iron, steel, tin plate, galvanized iron, and tube trades.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

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

(1) N. P. asks: What is the difference between crucible steel and cast steel, also what is the difference between common spring steel and spring cast steel, and how can the difference be told? Also about books treating on the general nature of steel and on spring making? A. Cast steel, such as is used for tools and similar purposes, is made from a particular grade of iron which is rolled into bars of one half inch by three inches, or thereabouts, and these are packed in an oven with charcoal dust and lime and kept at a red heat for seven or nine days. When they come out the bars are covered with blisters—hence the name "blister steel." They are as brittle as glass when cold, and are broken up into lumps of half a pound to one and a half pounds, and melted in plumbago or in fire clay crucibles—hence the name "crucible" steel—and poured into moulds of cast iron in convenient shapes for the afterward rolling or tilting (hammering). Other steel is also cast, as Bessemer, which is made from a certain mixture of irons in a cupola or "converter," and a blast of wind is sent through the melted iron, burning out the excess of carbon. When "converted," this steel is also cast in iron moulds, and so, in one sense, it is "cast" steel. But it differs materially from crucible cast steel, and is unfit for edge tools. Steel is also made from iron on the open hearth, and partakes largely of the qualities of Bessemer steel. To make a flat spring that will not set, crucible cast steel must be used and the spring must be heated and hardened and then drawn to a spring temper. Bessemer or open hearth steel will not harden or temper. Some of the most valuable practical papers on the nature and working of tseel will be found in the back volumes of the SCIENTIFIC AMERICAN SUPPLEMENT. The working of steel at the forge or the tempering bath can be learned only from the practical master—not from books.

(2) J. B. C. writes: If a man has a certain continuous work to perform which requires the power of ten horses, he naturally decides to get a ten horse

power steam engine. That is, he will procure an engine which with 70 lb. of steam will do the work, and with it a boiler which will furnish continuously that amount of steam. His power will then be just equal to his necessity. Is this the most economical thing to do? If he will get an engine of fifteen horse power, with proportional boiler, the work could be done with less steam and without strain. But the larger machinery would not only cost more as a plant, but the fuel and running expenses would be heavier, of course. What is the proper allowance for economy? In other words, what per cent increase of power beyond actual need would be wise and economical, and above which would be wasteful. It is probable that this subject has often been argued, and perhaps settled, but steam uses are becoming more numerous every day, and such questions are, I take it, generally interesting. A. There are no general rules or standards to apply to this problem—each case is surrounded by its own conditions, in respect to both engine and boiler, and in the application of the power.

(3) J. A. B. asks: 1. How to make steel castings smooth? A. You cannot make steel castings as smooth as gray iron castings, because, with the same care in moulding and dressing or facing the mould, the steel has to be poured hotter than the iron, and burns into the sand. 2. And what is the alloy silicide of manganese, and what percentage of it do they use? A. Certain of the peculiarities of metallic manganese have been attributed to the presence of a small quantity of silicide. Its condition of combination in the metal has been called silicide of manganese. Also, it is likely that the same term is applied to a similar condition existing in steel produced by the Bessemer and other improved processes. 3. How can I analyze for carbon in steel the quickest and simplest way? A. The estimation of carbon in steel is an extremely delicate process, and requires considerable manipulatory skill. Eggertz's method, which is a colorimetric determination, is based on the fact that when steel containing carbon in chemical combination is dissolved in nitric acid, a soluble brown coloring matter is formed, varying in intensity according to the amount of carbon present. The solution is composed with known standards, and so the percentage determined.

(4) H. L. B. asks: What kind of wood is the most suitable for building the top of a violin? A. The tops of violins are made of the larch. Spruce may also be used.

(5) C. H. R. asks: How are steel tools tempered for turning and finishing chilled castings? Is there a mixture of chemicals used, and if so, what is it? A. Tools for chilled rolls require to have square cutting edge, should be of the best steel, and hardened in sulphuric acid at the very lowest heat that it will harden at. Do not draw the temper—cut very slow.

(6) A. G. L. asks: Is a 5 in. steam pipe large enough for a 20 in. bore by 36 in. stroke engine, running 100 revolutions per minute? The main fly wheel 16 ft. diameter, made in 6 sections, bolted to 6 straight arms. Rim 4 in. wide by 8 in. deep. Will it be safe to run it 100 revolutions per minute? A. Your pipe should not be less than 5½ in. You do not give the size of the arms, nor how they are connected, hence we cannot make the necessary calculations; but assuming the wheel much like ordinary fly wheels, we doubt the safety of running it at so high a velocity.

(7) J. W. P. asks why a twist or coil is made in the small steam pipe attached to steam gauges? Have been able to get only contradictory statements from engineers and others who ought to know. A. To provide a receptacle for the condensed water, so that there shall be a stratum of water between the steam and spring of the gauge, so the latter may not be affected by the heat of the steam.

(8) G. H. M. asks whether it injures the speaking qualities of a telephone (bells being rung by battery) to allow the batteries which are not used when speaking, to pass through the receiver, or should only the induced current from the induction coil be used? A. The current from the induction coil is sufficient. If the battery current pass in the proper direction to augment the power of the magnet, the current will do no harm.

(9) G. T. W. asks: 1. Would there be any perceptible difference in the velocity of the wind blowing from the west at 75 miles an hour and that blowing from the east at the same rate, or does the atmosphere move around with the earth? A. You probably mean to inquire whether the force required to produce a velocity of 75 miles an hour would be the same in both instances. We think it would, as the atmosphere may be considered as the earth, revolving with it. 2. Can you tell me the address of some lumberman publishing house, "in the East," where I can purchase a lumberman's hand book of inspection and grading? A. Write booksellers who advertise in our columns.

(10) H. C. writes: 1. If a small balloon or kite were attached by a non-conductor to a wire, as in Franklin's experiment, would it be possible to conduct enough electricity from the clouds to be of any service in lighting or to be used as a motive power? A. We know of no commercial use for lightning. It is not available as a motive power. 2. Is coal oil a conductor of electricity, or can it be charged as water? A. It is not a conductor, and cannot be charged like water. 3. How long will brass hold electricity if it is insulated with glass and exposed to the air? A. It depends on the state of the atmosphere; but not long in any case. 4. How much heat would be generated in the discharge of the electricity produced by a thermopile of one cubic inch, from a source of heat about the intensity of an ordinary lamp burning for one hour? A. It depends entirely on the efficiency of the battery. The heat developed in any case would be only a fraction of that applied to the battery. 5. Which would produce the most heat—instantaneous discharge or a slow one? A. There would probably be no difference.

(11) H. M. D. writes: 1. I am putting up a telephone line (with ground connection), and I would like to know how to arrange the instrument with an ordinary electric bell, the telephone being used as transmitter and receiver? A. Connect your line at each end to the key bar of a back contact key. Connect the back contact of each key with a bell, and ground the bells. Then at each end of the line connect a battery with the bottom contact of each key and with the ground wire. The line is normally closed on the top of each key. Pressing down either key will ring the bell at the opposite end of the line. The telephone may be placed anywhere in the line. 2. What sized copper wire (cotton covered) should I use? A. For your line use No. 16 copper wire or No. 12 iron wire. 3. Could a wire be wound around a pipe to make a ground connection instead of being soldered? A. You can ground on the pipe without soldering if the contact between the wire and the pipe is good. 4. Should I use a closed circuit on a line three hundred feet long? A. You can use either closed or open circuit. If you prefer a closed circuit, you may place two or three cells of gravity battery at either end of the line, and the keys and bells may be placed directly. The telephones in this case should be arranged so as to be switched on to the line for use, owing to their great resistance.

(12) J. H. I. writes: 1. How can I make bayrum from bay oil, or where can I purchase recipe for making same?

A. Bay oil. .. ..10 fl. drms.
Pimento oil..... 1 "
Acetic ether..... 2 fl. oz.
Alcohol... ..... 3 gal.
Water... ..... 2½ gal.

Mix, and after two weeks' repose, filter. 2. What can I put into brick clay to make it burn hard? The purpose I want it for requires that it should be very hard. A. There are patented kilns in use which are extremely desirable for the purposes you are anxious to accomplish. The addition of any ingredient cannot very well be suggested, unless the precise composition of your clay be given as well as your process of manufacture. We would recommend to you the article on bricks in Ure's Dictionary of Arts, Manufactures, and Mines.

(13) W. B. asks how to clean and galvanize wire, and where he can get the tanks, etc.? A. The wrought iron tanks for galvanizing can be made by any boiler maker. The bundles of wire are loosened and boiled in water with caustic soda to remove all traces of grease, then dipped in a bath of one part hydrochloric acid to ten parts of water to clean. Then dip in a solution of muriate of zinc and sal ammonia, and dry; then put upon a reel and run through the melted zinc slowly to another reel far enough away to allow the zinc to become set before reaching the reel.

(14) E. C. S. asks why the bullets of the cartridges used in the Winchester repeating rifles are made flat on the end. Does this shape not cause great friction in the air? Would it not be better to have the balls pointed? A. The Winchester cartridges, as also other magazine gun cartridges, are made flat upon the head to prevent explosion in the magazine by the points striking the percussion primer. The primer is also recessed in the butt of the cartridge for safety.

(15) F. M. P.—For making soap with good lather take 30 pounds tallow, 10 pounds lard, 3 pounds resin. Boil them to a hard curd. After the lye has completely separated, the soap is carefully removed and placed in another vessel. Then seven pounds of cocoanut oil is put into a boiler and saponified with five pounds of potash lye of 30° B. When combination takes place, the curd is added and the whole continually stirred. Should the mass be too thick another five pounds of water is added, and the soap is boiled until it solidifies in a glass and is perfectly natural. The finished soap is filled into frames and perfumed. 2. The coloring of soaps is due to the addition of pigments; thus the red in Castile soap is produced by iron oxide, blue is obtained by adding ultramarine, gray results from the addition of manganese. For details of manufacture we must refer you to some of the technical encyclopædias, or to Dussauce, A General Treatise on the Manufacture of Soap.

(16) T. J. del C. asks: How can I make the so-called parchment paper? What strength of H_2SO_4 to use, and where I can obtain or how I can make the proper kind of acid for the purpose? A. Unsized paper immersed for a short time in a mixture of sulphuric acid and water (two parts of acid to one of water by bulk), and then washed with dilute ammonia, constitutes the so-called parchment paper. The acid can be purchased of any wholesale druggist.

(17) J. H. A. asks for a simple process for either making the ordinary lead very soft, or for securing a soft article of that kind from white lead, sugar of lead, or some other form of the metal, by chemical or some very simple treatment? A. The hardness of lead is due to impurities contained in it, such as antimony, copper, tin, arsenic, etc. These may be largely removed by the addition of alkaline nitrates, chlorates, and other bodies rich in oxygen, to the charge of molten lead; as they are removed, the lead becomes softer. If pure lead is obtained, it will be found quite soft. The addition of bismuth is also effective in producing the desired result. The other compounds mentioned are ordinary salts of lead, and their decomposition would only result in the production of the commercial metallic lead in its usual form.

(18) J. H. H. asks: 1. How can I clean and polish sea and fresh water shells? A. See answer to query No. 17, SCIENTIFIC AMERICAN, June 9, 1883. Dilute hydrochloric acid may also be used. 2. How to ebonize wood? A. Mix up a strong stain of copperas and logwood, to which add powdered nut galls. Stain your wood with the solution, dry, rub down well, oil, then use French polish made tolerably dark with indigo or finely powdered stone blue.

(19) H. W. asks: 1. Whether tartaric acid, when mixed with baking powder, is considered an adulteration? A. Tartaric acid need not be considered an objectionable ingredient of baking powder. 2. What constitutes baking powder? A. Powdered cream tartar, 30 parts; sodium bicarbonate, 15 parts; flour, 5 parts. All well dried, mix thoroughly, and keep dry.

(20) J. B. A. asks: 1. How can I prepare the double salt of cyanide of potassium and mercury used to flow the silver deposit on looking glasses? Dealers in chemicals do not keep it in stock. A. Cyanide of mercury combines with salts forming definite soluble crystalline compounds, which are obtained by evaporating the mixed solutions of the component salts. 2. I have mounted two 4-inch plano convex lenses in a brass cell, convex side together, and this makes the focus about 2⅛ inches. I wish to use them as a condenser for a magic lantern. Is there any danger of breaking on account of heat from the coal oil lamp, which must stand very near the condenser? The lenses are mounted loosely. A. There will be no danger of breaking the lens if you take the precaution to light up slowly, so as to give the glass time to heat evenly. You should use a glass chimney over the lamp. A naked light near the lens would not be safe, and does not make so intense a tight as an annular wick with a chimney.

(21) L. M. S. writes: 1. I wish to put up 4 flue boilers 28 ft. long, 42 in. diameter, with two 15-in. flues each. I have a chimney 42 in. square inside, 51 or 52 feet high. Will it be sufficient? If not, can it be made so by adding to it an iron stack, and if so, what diameter and what height? A. Your chimney is large enough, but would be better if height was increased 10 to 15 ft.; the chimney will probably bear carrying the masonry up that greater height. If an iron stack is added, it should be 46 in. diameter. 2. To set the boilers for Pittsburg coal, what grate bar surface is required—how long the bars and how wide? A. Bars 3½ ft. long and furnaces 15 ft. wide. 3. How many inches should there be between the grate bars and the boilers? A. Thirty inches. 4. How many from the brick pavement under the boilers to the boilers, just behind the furnace and at the rear end of the boilers? A. Depth of ashpit from under side of grates, 24 in. to 28 in.; at bridge wall 10 in., and at rear end 7 in. or 8 in. 5. Have you got a good book on caloric, one that is not too complicated? A. We think Barr on the "Combustion of Coal" would suit you.

(22) H. J. G. writes: 1. Please inform me of the best cement for cementing a piece of leather to an iron pulley, and how made? A. Ask your druggist for Le Page's liquid glue. 2. How many revolutions per miuute should a Brown & Sharp circular saw make —2½ in. diameter and ⅛ in. thickness—cutting annealed steel? A. Thirty revolutions per minute would be a rapid rate for cutting small pieces; but for long cuts a slower rate should be employed. 3. Is oil preferable to water when tempering steel? A. It depends upon objects to be tempered. 4. Give very best practical means for softening and hardening of steel. A. The question is indefinite, but steel (cast steel) can be best annealed by packing in a closed vessel (cast iron box) with air slaked lime, and exposing to a red heat in an oven or furnace for twenty-four hours, and then cool gradually. Much easier and sometimes as effective methods are those of heating and plunging in dry ashes or sand, or of heating to a generous red, and cooling in the air. 5. What colors are needed for the drawing of taps and dies, springs, cold chisels, reamers, screw drivers, drills, countersinks, and lathe tools for the cutting of steel? A. Taps and dies should be drawn to a straw color—a light yellow. Springs, either flat or coiled, should be drawn to a low blue, or else blazed off with oil. Cold chisels should be drawn to the first blue, unless they are "stunt" and are to be used simply for cutting off purposes, when they should be left a "pigeon breast." Reamers (rimmers) should have the straw color, and so with drills and countersinks and lathe tools. Screw drivers should be drawn to a low blue. Of course, the relative sizes of the tools should be taken into consideration, and the work they may be called upon to perform; a quarter inch drill will not stand the height of temper that is right for a one inch drill, nor can the drill for wrought iron and steel be left at so high a temper as that for cast iron or brass.

(23) M. A. E. asks: 1. Would wire known as double cotton wrapped paraffined and compressed be superior to the ordinary magnet wire used in making electro magnets? A. No, the insulation occupies too much space. Use ordinary silk or cotton covered magnet wire. The covering may be paraffined. 2. How many 1 quart cells of the Grenet battery would it require to give sufficient power to illustrate electric light with a small incandescent electric lamp of platinum, small size costing about $5.00? A. Cannot say without knowing the resistance of the lamp. Probably six cells would answer. 3. In the "Scientific American Reference Book" mention is made of a freezing mixture consisting of sal ammoniac, niter, and water; in what way is it used, and also is there any danger in using the compound? A. A vessel of water is immersed in the solution while it is being formed. There is no danger in its use. It is too expensive for common use.

(24) A. E. D. asks: How can I renew a Leclanche porous cup battery? The battery is used for ringing the electric bells in my residence. The porous cups have been in use some time, and do not seem to give off much electricity, even when newly charged with sal ammoniac. What material is placed in the porous cups, and can they be refilled by me without much trouble? A, Remove the carbon plate and the black oxide of manganese from the porous cup. Wash the porous cup, and then soak it for an hour or so in warm water. Soak the carbon plate in like manner. Then replace the carbon plate and refill the porous cell around the plate with granulated black oxide of manganese. A mixture of equal parts of black oxide of manganese and granulated carbon is also used for filling the porous cell.

(25) W. R. L. asks: 1. What is superheated steam? A. Steam received from a boiler and passed through a coil or series of pipes heated higher than the temperature of the boiler receives a higher temperature, and is called superheated. The coil or pipe may be placed in the smoke chamber or under the rear end of the boiler, or may be heated by a separate fire. 2. What kind of steel is best for making springs for gun locks, and how are they tempered? A. Use spring steel for the springs of gun locks. Harden in oil; polish and draw to blue color, or dip in oil and heat until the oil burns, then dip in water.

(26) W. S. C. asks: 1. What speed ought to be obtained with a steel hull boat 33 ft. long, 6 ft. 6 in. beam, with keel bottom, and good lines fore and aft? Engine double, 4½ in. bore, 4 in. stroke. Wheel 30 in. diameter, 36 in. pitch; hull, engine, boiler, wheel, and everything weighing about 7,800 lb. A. About 11 miles per hour. 2. Also what size steam ports had above engines ought to have? A. Steam ports, ⅜ x 3½ in.; exhausts, ¾ x 3½ in.

(27) L. A. Y. asks if coal tar or asphaltum can be prepared so as to make a good coating for paper roofing; if so, how prepared? Is there any other preparation better that I can make? If so, how? A. Coal tar is in common use for saturating the paper felt used for roofs. After the paper felt is laid it can be painted with a preparation of coal tar thickened with asphaltum, and then covered with gravel or sand, which makes a very durable roof. If you have no coal tar and can obtain naphtha and asphaltum, you can melt the asphaltum and stir in a little naphtha to thin it, and use it for saturating the paper felt, and use the asphaltum hot for the thick coat to take the gravel. The melting should be done away from the house, and guarded against taking fire.

(28) T. C. asks: What is the efficiency of those steam pumps that have a common piston rod and the steam and water cylinders in line, also how an injector ranks as a means of storing water in an accumulator at a pressure of say 100 lb.? A. We know of no direct tests of the efficiency of steam pumps, but we suppose about 80 to 85 per cent; but as a user of steam the ordinary steam pump is not economical, but we think it much better and more reliable for your purpose than an injector.

(29) B. L. & Co. ask for the right proportions of gas and air for a gas engine, and at what point of the stroke is the proper place to explode it? A. The mixture may vary from one of gas to seven of air to one to ten or twelve. It depends much on the character of the engine. The explosion should take place at about one-third of the stroke.

(30) J. H. writes: We have a dispute here regarding power of a boiler, which is agreed to be left to your decision. 1. Boiler 8 ft. long, 3 ft diameter, 68 flues, outside 2 in. diameter, inside 1⅛ in.? A. Twenty horse power with good working draught. 2. Its safe working pressure? Sheet ¼ in. common; sheet single riveted, 2 in. centers, ⅝ in. diameter? A. By Government inspector's rule, 104 lb. per sq. in., if good iron and in good order.

(31) G. S. S. writes: What can I use to remove oil paint from house bricks without destroying or damaging the same? A. Use a mixture of three pounds common washing soda with a few ounces of potash dissolved in a gallon of boiling water. If laid on with a common paint brush, it will in a short time so soften the paint that it can be readily removed with a stiff scrubbing brush.

(32) M. L. D. asks: 1. Is there anything that will precipitate rubber in naphtha? A. We do not know of any means by which rubber can be precipitated from naphtha. The following may perhaps be equally as satisfactory: Filter the liquid beneath a bell glass, so as to prevent evaporation; the filter retains the foreign matters of a reddish-brown color, while the solution passes perfectly clear, and almost colorless. The filtered liquid, exposed to the air in a saucer, allows the solvent to escape and deposits the white gutta-percha in a plate of greater or less thickness, which shrinks gradually in proportion to the evaporation of the liquid. The above is given in connection with the use of carbon bisulphide or chloroform as a solvent, and is equally applicable to naphtha, except that the latter is not so volatile, so that a gentle application of heat could be used. 2. Also how to make watered varnish, composed of water and shellac? A. An emulsion is produced by cutting the shellac with ammonia and then adding water. The ammonia volatilizes, leaving the shellac on the article referred to.

(33) J. A. S. asks: 1. Is there any method by which freckles can be removed from the face? Have tried oleate of copper, as you prescribed in your paper, but found it useless. A. Dissolve 3 grains of borax in 5 drachms each rose water and orange flower water; a very simple and harmless remedy is equal parts of pure glycerine and rose water, applied every night and allowed to dry. 2. How can I remove flesh worms as are found in the faces of most young people? A. See "Comedones," page 52, SCIENTIFIC AMERICAN, Jan. 28, 1882. 3. Will you also have the kindness to give me a recipe for artificial port wine? A. Wine made from whortleberries as follows is said to be a good "factitious port wine:"

Ripe fruit.....4 lb.
Clear soft water .. ..1 gal.
Sugar.. .....3 lb.
Cream of tartar dissolved in boiling water..1½ oz.
Brandy..... ... .2 to 3 per cent.
Flavoring as required.

The addition of an equal quantity of fruit and sugar increases the strength. The flavoring had best be purchased. 4. How is the fall of rain determined? A. The rain fall is determined by collecting the rain as it falls in a bottle or similar shaped vessel through a funnel of given diameter. See page 1606, SCIENTIFIC AMERICAN SUPPLEMENT, No. 101. For approximate purposes a tub or bucket with a thin edged mouth placed in a horizontal position to catch the rain, whose depth may afterward be measured by means of a graduated rod, may be employed, and if well constructed and used with care may fulfill most of the requirements of exactness.

(34) G. B. F. asks: 1. Is not the knocking at the crank pin of a steam engine a fault which should be remedied at the earliest notice? A. Yes. 2. Is there any practicable way or system to keep the air constantly moist in a factory? A. Yes, by permitting the escape of steam or vapor through small or fine openings in different parts of the room. You can use a hygrometer to indicate the moisture of the air in the room.

(35) T. M. De Z. asks: What kind of a cement can I make that will be steam and water tight and a non-conductor of electricity? A. Use rubber or vulcanized fiber.

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

C. N. S.—The specimen shows no evidence of mineral wealth, and is apparently a weathered portion of a sandstone rock. In order to determine the presence of metals, an assay will be required, the expense of which would be $5.00, and a quantity of the rock would be desirable.

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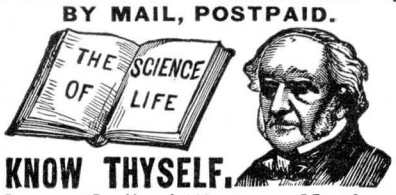

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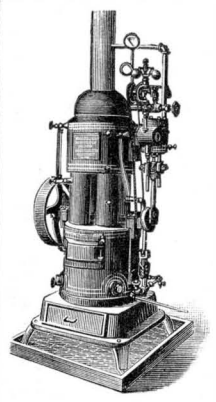

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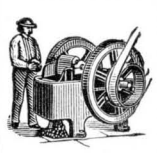

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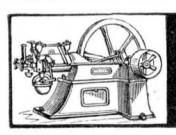

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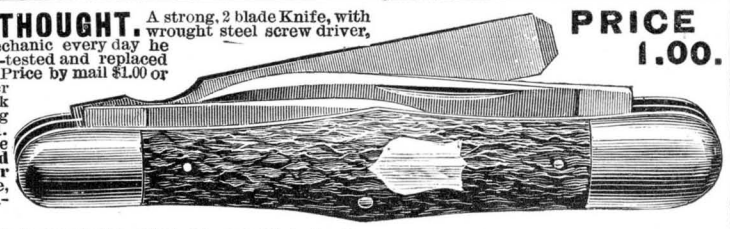

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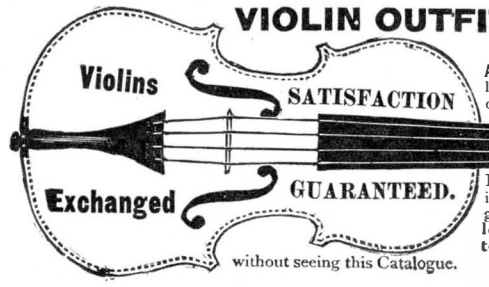

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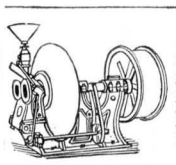

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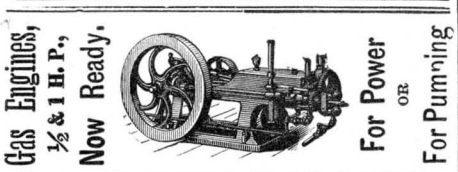

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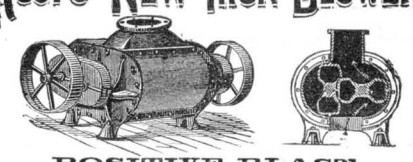

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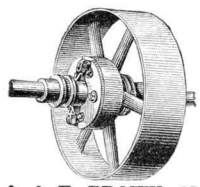

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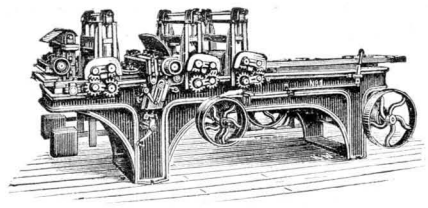

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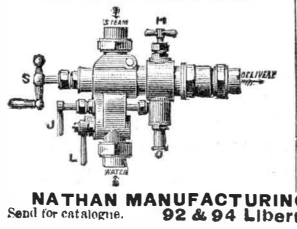

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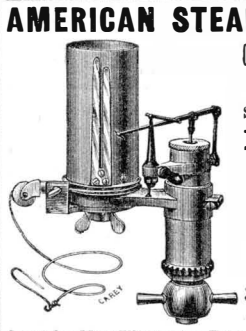

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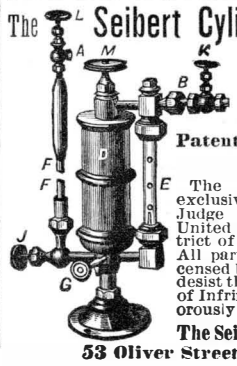

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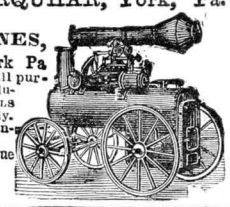

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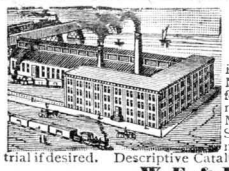

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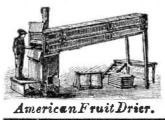

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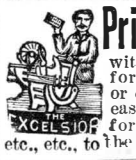

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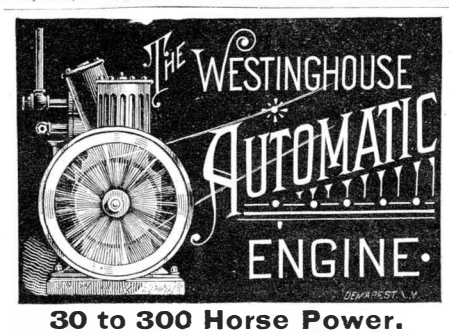

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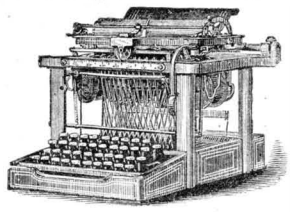

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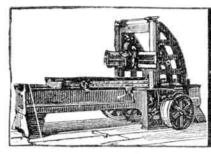

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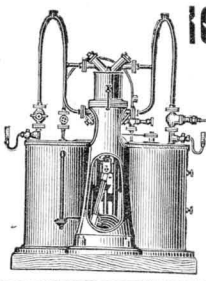

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