# SCIENTIFIC AMERICAN

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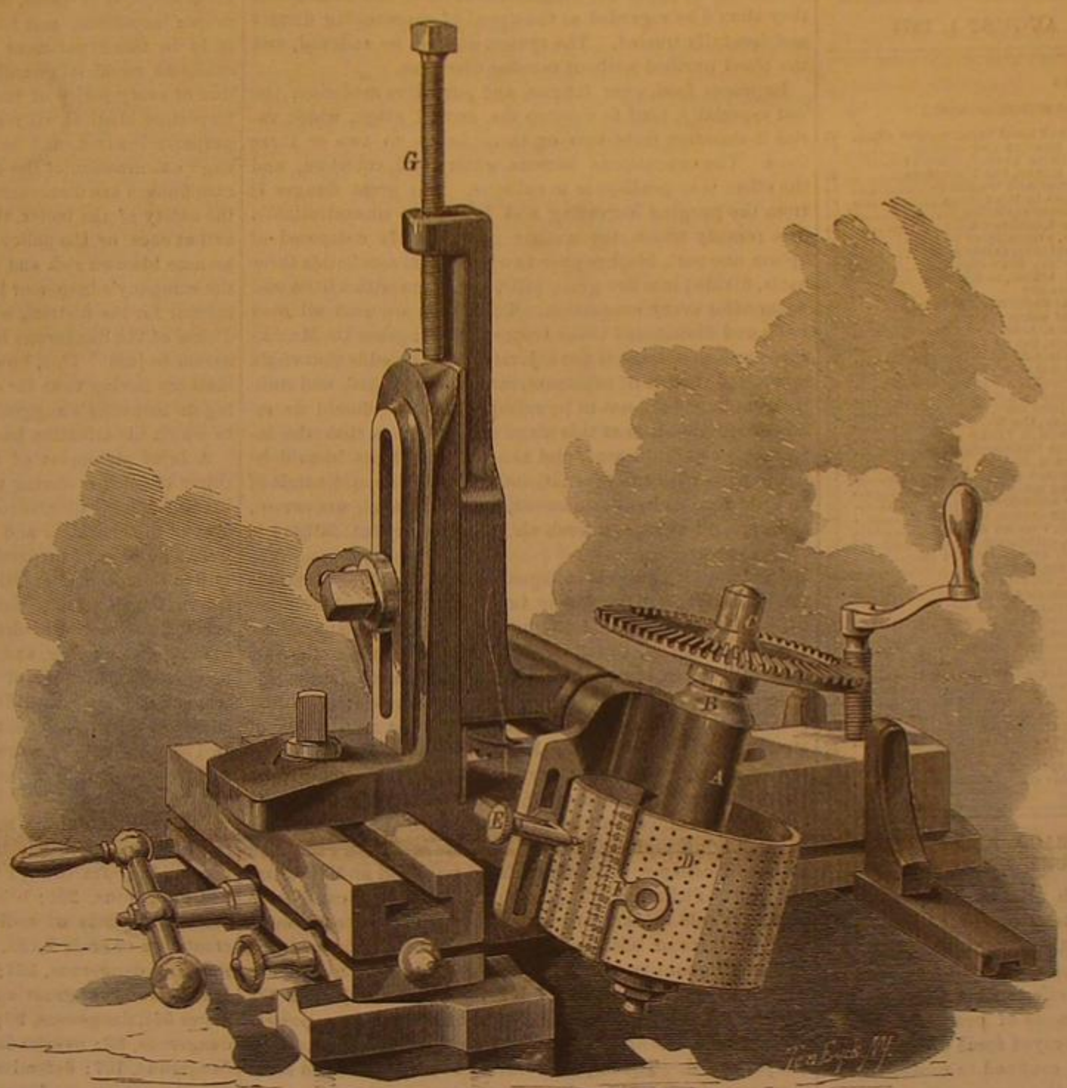
## IMPROVED GEAR CUTTING ATTACHMENT FOR LATHES.

Not long ago we illustrated an ingenious work holder for lathes, the device of Mr. William P. Hopkins, of Lawrence, Mass. The same inventor has also produced another attachment for the same machine, the object of which is to cut gears. The work is operated upon by a cutter turning upon the centers of the lathe, and is held and governed by the means represented in the illustrations and described below.

A is the arbor box, in which freely turns a hollow spindle, B. Through the latter passes a tapered arbor, C, on the upper and larger extremity of which the gear wheel to be cut is secured. Fastened to the hollow spindle by means of a set screw, and hence rotating with it, is the index pulley, D. Attached to the arbor box is an arm in a slot, in which travels an index point, E, connected with a suitable spring, which holds its extremity in any of the orifices on the pulley, D, to which it may be adjusted. Several rows of different numbers of these apertures around the pulley, D, provide various graduations; and from the pointer, E, traveling freely along its slot, it may be readily placed over any desired row. When one groove or space is cut in the work, the pointer is lifted from the orifice, and the pulley turned, carrying with it the arbor spindle and its attachments until the next hole is met and entered by the index point. The number of holes in each row is marked upon the face of the slide clasp, F, directly over each series of apertures. The clasp slides entirely around the circumference of the index pulley, and can be used to mark the number of holes passed under the index point, serving the purpose of the spacing point on common gear-cutting machines.



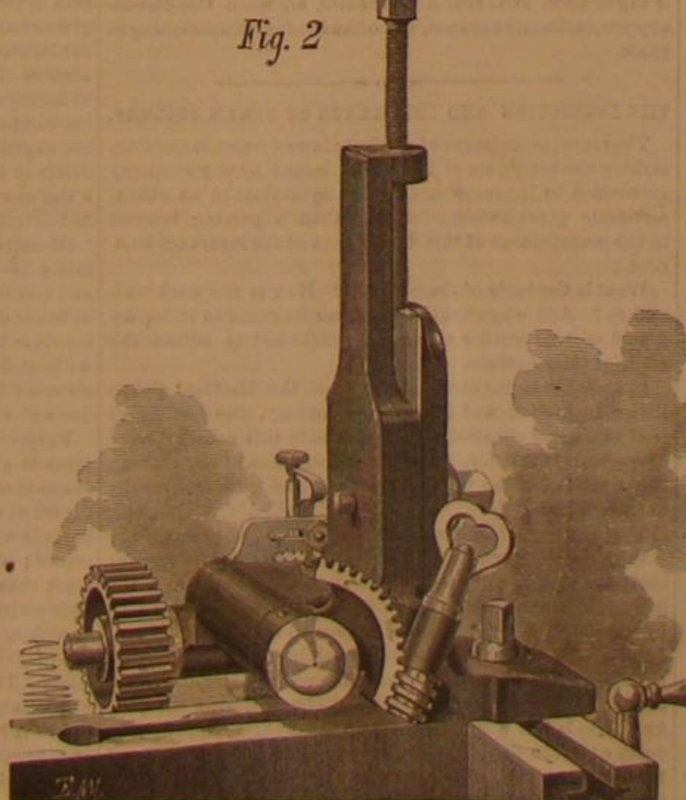
HOPKINS' GEAR CUTTING ATTACHMENT FOR LATHES.

The device may be attached to the lathe tool carriage, as represented, or bolted on top of the tool post block, when the point shaft box slides down below the angle iron frame. By means of the worm and segment, shown in Fig. 2, the pivot shaft may be rotated, so setting the attachment at any angle for cutting any variety of straight or bevel gear. The long set screw, G, serves to adjust the elevation of the device, and the remaining adjustments are obtained upon the ordinary lathe carriage in manner readily understood. The hollow spindle upon which the index pulley is fastened can be removed, and a solid one substituted, on one end of which a small chuck is fixed. The latter may be used for a variety of purposes with convenience and advantage.

The index pulley has 28 different graduations, and with two pulleys any graduation under 100, and all even numbers up to 130, can be cut. A small level on top of the index pulley indicates the proper adjustment for straight or spur gears. The construction of the device, we are informed, is of the most careful description, well calculated to insure durability and efficiency.

The apparatus may be seen at this office, and further particulars may be obtained by addressing the inventor as above. Patented September 30, 1873.

Fig. 2



### The California Wood Rat.

In a recent number of the *American Journal* is an extract of a letter from Mr. A. W. Chase, U. S. Coast Survey, concerning the habits of the so-called California wood rat. It is a little larger than an ordinary Norway rat, dark brown in color, with large lustrous eyes, and a tail covered with thin hairs. I should call it intermediate between the squirrel and rat. This creature builds its nest in the woods, sometimes on the ground, more frequently in the lower branches of trees. They accumulate a surprising quantity of dried twigs, which they interlace to form a dome-shaped structure, often ten or twelve feet high and six or eight feet in diameter.

Openings in the mass lead to the center, where is found the nest, consisting of the finely divided inner bark of trees, dried grass, etc. But it is to the peculiar thievish propensity of this little creature that I wish to call attention. To make my story intelligible, I would first state that I am partial owner of some property on the Oregon coast, on which a saw mill had been placed, but which, owing to various causes, has never been in operation. On this property was a dwelling house for the hands, in which, on work being discontinued, were stored a quantity of stuff, tools, packing for the engine, six or seven kegs of large spikes; in the closets, knives, forks, spoons, etc. A large cooking stove was left in one of the rooms.

This house was left uninhabited for two years, and, being at some distance from the little settlement, it was frequently broken into by tramps who sought a shelter for the night. When I entered this house I was astonished to see an immense rat's nest on the empty stove. On examining this nest, which was about five feet in hight and occupied the whole top of the stove (a large range), I found the outside to be composed entirely of spikes, all laid with symmetry so as to present the points of the nails outward. In the centre of this mass was the nest, composed of finely divided fibers of the hemp packing. Interlaced with the spikes, we found the following: About three dozen knives, forks, and spoons, all the butcher knives, three in number, a large carving knife, fork, and steel; several large plugs of tobacco; the outside casing of a silver watch was disposed of in one part of the pile, the glass of the same watch in another, and the works in still another; an old purse containing some silver, matches, and tobacco; nearly all the small tools from the tool closets, among them several large augers. Altogether, it was a very curious mixture of different articles, all of which must have been transported some distance, as they were originally stored in different parts of the house.

The ingenuity and skill displayed in the construction of this nest and the curious taste for articles of iron, many of them heavy, for component parts, struck me with surprise. The articles of value were, I think, stolen from the men who had broken into the house for temporary lodging. I have preserved a sketch of this ironclad nest, which I think unique in natural history.

Many curious facts have since been related me, concerning the habits of this little creature. A miner told me the following: He once, during the mining excitement in Siskyiou county, became in California parlance "dead broke," and applied for and obtained employment in a mining camp, where the owners, hands and all, slept in the same cabin. Shortly after his arrival small articles commenced to disappear; if a whole plug of tobacco were left on the table, it would be gone in the morning. Finally a bag, containing one hundred or more dollars in gold dust, was taken from a small table at the head of a "bunk," in which one of the proprietors of the claim slept. Suspicion fell on the new comer, and he would perhaps have fared hardly; for, with those rough miners, punishment is short and sharp; but, just in time, a large rat's nest was discovered in the garret of the cabin, and in it was found the missing money, as well as the tobacco and other articles supposed to have been stolen.

Steam on our canals seems to be an accomplished fact. Six boats are now plying on the Erie canal and twelve others will shortly be added, all capable of making the trip from New York to Buffalo in five days. It is believed that the grain trade of the fall will be considerably affected by the increased cheapness of transportation.

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## ANOTHER GREAT FIRE IN CHICAGO, AND THE MATERIALS ACCUMULATING FOR ONE IN NEW YORK.

Chicago was visited, on the 14th ult., by a second great fire, which devastated about eighteen blocks of buildings, and entailed a loss estimated in the neighborhood of two millions of dollars. Though falling far short of the conflagration of 1871 in its disastrous effects, this visitation has been the means of rendering thousands of people homeless. Unlike its predecessor, which destroyed some of the fairest portions of the city, it was mainly confined to rookeries and dens, in the obliteration of which the community is rather the gainer; but, as is the rule in such quarters, the population was dense, and consequently the numbers deprived of shelter are greater than would be the case had other parts of the town been burned.

There is evidence of mismanagement of the fire department, to which is probably owing the non extinguishment of the fire at an earlier period. Engines were posted behind the flames instead of in their path, and attempts at blowing up buildings were miserably unsuccessful, owing to lack of powder, a state of affairs difficult to comprehend. To one good substantial fireproof building, the safety of almost the entire city is due. The blaze lapped it all around, but its marble walls stood grandly; and then, as the fire attempted to crawl over it, the flames grew weaker and were beaten back by the firemen on the other side. One honest structure was the savior of millions of property; and the builders of the metropolis may well take the fact to heart.

New York, at this moment, fairly invites the fate of Boston, Portland, and Chicago. Buildings are being run up to hights to which water by the fire engines cannot be thrown. There are wooden structures in close proximity to some of the grandest edifices; there are blocks upon blocks of tenements filled with swarms of people, the majority of whom, from poverty, use kerosene in place of gas, and in which a great fire, once started, would work terrible ravages. In our up-town streets, houses shoot up half a dozen at a time together, a mass of the thinnest possible walls and kindling wood beams and fittings, built to sell and to realize a big interest on capital, without any regard to the simplest precautions in favor of safety. We have an admirable fire department, to the prompt exertions of which our immunity thus far is mainly due; but if circumstances combine to engender a great fire, as in both cases in Chicago, it will be through the mercy of Providence, and not through our own foresight, if we escape a terrible visitation.

## CHOLERA AND ITS TREATMENT.

In view of the general uneasiness which reports of apparent cases of Asiatic cholera, as they recur, will tend to engender, a little volume before us is of timely interest, inasmuch as it not only gives valuable information regarding the origin, symptoms, and nature of the disease, but also points out, probably, the most efficacious methods for its cure. The book, which is entitled "Observations on the Pathology and Treatment of Cholera" (G. P. Putnam's Sons, New York), has been written very recently by Dr. John Murray, Inspector General of Hospitals in England, and late of Bengal; and it aims to give the result of the author's forty years' experience during a residence in a country ordinarily considered as the hotbed of the disease.

Cholera is caused, we are told, by the presence of the poison in the system, and until this is removed health cannot be regained. The first stage of the disease, *malaise*, is frequently unnoticed by the patient, and it may be produced by many causes independent of cholera poison, such as over-excitement, fatigue, depression from misfortune, and similar physical or mental conditions. Hence, while such symptoms, under ordinary circumstances, need excite no especial apprehension, still, if the patient has been in contact with cholera cases, or in the neighborhood of an infected region, they should be regarded as the signal of approaching danger and carefully treated. The system should be relieved, and the blood purified without causing diarrhœa.

Improper food, over fatigue, and purgative medicine, the last especially, tend to develop the second stage, which varies in duration from two or three hours to two or three days. The evacuations become watery and colorless, and the effect is to predispose to collapse. The great danger is from the purging increasing and becoming uncontrollable. The remedy which the author prescribes is composed of opium one part, black pepper two parts, and assafœtida three parts, divided into five grain pills, and given with a little cold water after every evacuation. These pills are used all over India and distributed to the troops. Astringents Dr. Murray condemns as useless, if not injurious, and he adds that chalk mixture, infusion of capsicum, camphor in alcohol, and similar compounds are not to be relied upon. It should be remembered that it is at this stage of the disease that the infection is communicated, and hence disinfectants should be freely used with the evacuations. The diet should admit of no solid food unless farinaceous, such as bread, arrowroot, and sago. Exercise in fresh air is desirable, but fatigue is dangerous.

The following stage is collapse; and as, when the disease is thus far advanced, danger is imminent, treatment becomes most difficult. It would be impossible, with the space here at our command, to follow the author through the various symptoms laid down and the remedies advised. He describes the stages generally under three heads: The first is incipient collapse, where there is a great prostration of strength; but the voluntary life of the body is active, and the involuntary life only partially suspended. The treatment here recommended is in great measure expectant, to gain time to allow Nature to eliminate the poison through the individual secretory organs. In the second or confirmed degree of collapse, voluntary life is impaired and involuntary life is flickering. The treatment advocated consists in palliative cold drinks, hot saline enemata, and strong mustard poultices or blisters upon the abdomen. The addition of a small quantity of quinine to the water administered is useful, and the appearance of bile in the evacuations is the first sign of hope. In the last form of collapse, the powers of voluntary life are very low and those of involuntary life are paralyzed. The hope of recovery is very faint, and there is no remedy on which reliance can be surely placed.

Dr. Murray devotes the larger portion of his work to the consideration of collapse, and also to the discussion of the after effects of the disease during convalescence. In referring to hospitals, he says that those best suited to the disease are small buildings on open ground, well drained, and in the vicinity of trees, if possible. Huts may be used with great advantage, and should be located in the center of the infected district. In conclusion, the necessity of deciding on the best course to pursue *before* an epidemic actually occurs is urged upon local health authorities, as, when the disease appears, excitement ensues, and often confusion, amounting to panic.

## THE INSPECTION AND INSURANCE OF STEAM BOILERS.

The recent amendment of our State law of boiler inspection, making the certificate of inspection issued by any company authorized to insure steam boilers equivalent to an official certificate, gives occasion for more than a passing interest in the management of this department of the insurance business.

What is the basis of the business? How is the work carried on? And why should the parties engaged in it be accepted as trustworthy agents of public safety within the scope of their business operations?

In response to inquiries of this sort, the Hartford Steam Boiler Inspection and Insurance Company, the leading as well as pioneer corporation of the kind in this country, have courteously laid before us, for the information of our readers, full details as to the method, purpose, and practical results of their work.

That the use of steam power is fraught with danger is only too well known; the extent of the danger, however, as indicated by the number of explosions every year and the loss of life and property entailed, is but vaguely appreciated by the public at large. No official record is kept of such accidents, and only those of exceptional interest are reported in the newspapers; nevertheless the number so reported and brought to the notice of a single individual during the past five years is but a little short of six hundred, causing the death of 1,329 persons, and the wounding of upwards of 1,500 more! The amount of property destroyed cannot be told: any one knowing the destructive character of boiler explosions will understand that it could not have been small.

Against losses of this character, ordinary insurance offers no indemnity, since the destroying element is neither fire nor water, though both have something to do with it. The need of a special system of insurance to cover these particular risks was early appreciated by steam users in England; in this country it remained unmet until 1866, when the company above named went into operation.

Unlike other forms of insurance, this does not undertake merely to indemnify the policy holder for losses of the special nature embraced in its plan of operation, but to prevent such losses by a watchful care of the property insured. Its tendency is therefore quite the reverse of ordinary insurance in that it lessens instead of increases the likelihood of "accident."

Boilers do not explode without cause, which cause, in the great majority of cases, may be detected in its incipiency by proper inspection, and the risk removed by timely repairs. It is in this department of its work that the company becomes an unofficial guardian of public safety: a prime condition of every policy of insurance being that the company's inspectors shall at all reasonable times have access to the property insured, and be afforded every facility for a thorough examination of the boiler and its attachments: and in case defects are discovered at any time, in any way affecting the safety of the boiler, the assured is bound to correct the evil at once, or the policy dies. Should the owner choose to assume his own risk and refuse to make the needed repairs, the company's inspector is required to notify the official inspector for the district, who alone has power to compel the disuse of the dangerous boiler if in his judgment its condemnation be just. This, however, is a purely imaginary case, no instance having thus far occurred of a policy holder slighting an inspector's suggestions, or declining to correct defects to which his attention had been called.

A brief statement of the work done by the company's thirty inspectors during the past year, with the number and kind of defects discovered and corrected, will give a rough idea of the character and usefulness of its work.

The number of inspections made was within two of twenty-five thousand, more than a third of which were thorough internal inspections, including external examinations of tubes, flues, and fire sheets, internal and external of the bracing and staying, and the condition of all boiler attachments. The number of defects discovered was 11,988, of which 2,892 were regarded as dangerous, that is, of such a character that an accident was liable to occur at any moment. In 178 cases boilers were condemned outright, as so completely worn out or injured by carelessness as to be beyond repair.

In detail the defects may be classed as follows: Furnaces out of shape, with sheets contorted and buckled, 599, dangerous, 124; fractures, 1,003, dangerous, 459; burned plates, 682, dangerous, 291; blistered plates, 1,737, dangerous, 298; cases of deposits of sediment, 2,263, dangerous, 227; of incrustation or scale 2,180, dangerous, 205; of external corrosion 818, dangerous, 163; of internal corrosion 333, dangerous, 92; internal grooving 206, dangerous, 47; defective water gages 561, dangerous, 96; defective blow-out apparatus 253, dangerous, 83; overloaded or defective safety valves 321, dangerous, 107; defective pressure gages 1,470, dangerous, 280, the extremes of variation from a standard gage being from *minus* 57 to *plus* 50; boilers without gages 682, dangerous, 62; deficiency of water 113 cases, dangerous, 69; cases of loose and broken braces and stays and insufficient bracing 465, dangerous, 230.

Who can estimate the amount of peril to life and property obviated by the discovery and timely correction of these twelve thousand defects and deficiencies?

The fidelity and skill with which the inspections were made during this and preceding years, as well as the correctness of the theory on which they were based—a theory which gives small space to the mysterious in accounting for boiler explosions—are sufficiently attested by the almost entire absence of serious accidents in connection with the thousands of boilers of all sorts and conditions that are or have been in the company's care. In two cases only has life been lost by the explosion of such boilers, the victim in one being the driver of a locomotive, in the other the engineer in charge of a stationary boiler which exploded for some cause that baffled detection.

Of course it is impossible to say that any others would certainly have exploded if left in the condition of the uninsured and less frequently inspected: still a glance at the museum of boiler defects collected by the company's inspectors would convince the firmest believer in protecting providence that, without their intervention, nothing short of perpetual miracle could have kept some of the diseased subjects from sudden and violent ends.

Further evidence of the value of the company's inspections is given by the increasing appreciation of them by steam users. To a very large extent the inspection and approval of the Hartford Steam Boiler and Insurance Company is made a condition without which a boiler will not be accepted; while many leading boiler makers have all their work thus inspected, the company's certificate going with each boiler as a guarantee of its soundness and proper construction.

So far the business affects only boiler makers and boiler users. The late legislative enactment makes the community at large a party also, in that it practically entrusts the public safety within certain limits to the care of the insurance companies. It is but right and natural that the public should ask why and wherefore.

The amendment was passed in response to a petition very numerously signed by the leading manufacturing firms of the State, the reason offered therefor being substantially that the conditions of insurance implied a full compliance with the spirit of the law, the sole object of which was to lessen the danger of boiler explosions,by periodic inspections and the restriction of pressure within safe limits. To this extent the object of the Hartford Steam Boiler Inspection and Insurance Company is the same. The end and aim of the law being thus attained, it was urged that the insured might, under proper restrictions, be justly and safely exempt from the charges and delays incident to official inspections. The legislature wisely saw the point and the amendment was adopted.

We say wisely, since, without impugning in the least the honesty and ability of the inspectors appointed by the government, it stands to reason that the supervision of parties having a pecuniary interest in preventing explosions, and restrained by no care for the cost of making doubtful property safe and sound, will be quite as rigid and exacting as that of the government, which assumes no such liability. Equally reasonable is it to expect that the agents of an insurance company, directly responsible in the premises, will be quite as carefully selected for integrity and special fitness for the work as the appointees of that transitory and irresponsible thing we call the government; and the inspectors so chosen will also be quite as likely to be free from corruption or favoritism in fixing the limit of pressure or in overlooking defects, the inspector's personal liability for damage by explosions being the same in one case as in the other.

We have referred incidentally to a feature of the work of the Hartford Steam Boiler Inspection and Insurance Company, which,though not a necessary element of their scheme, is one which bids fair to prove of great benefit to steam users, and consequently merits a somewhat fuller notice. It is the study the officers are making of what may be termed the pathology of steam boilers. Every application for insurance is accompanied by an inspector's report describing the boiler and its attachments in detail, and giving full particulars as to the setting and construction of the boiler, its age and maker's name, the kind of fuel used, the source and quality of the water supply, in short everything affecting in any way the durability and safety of the property. These facts are entered in a record book, and supplemented by the facts supplied by the monthly inspection reports,so that the history of every boiler with its attachments can be ascertained in a moment. In this way boilers are taken as they are used, the practices which obtain in different parts of the country are compared, the effects of different kinds of fuel and water are studied, together with the various safeguards and corrective employed; the working of different gages is observed under all sorts of circumstances, in fact all the fruits of widely extended and thoroughly systematized observation are brought to bear on the question why boilers explode, and on the practical problem of preventing explosion. It is impossible that such an accumulation of knowledge in regard to the wear and tear, the weakness and dangers of boilers, should not ultimately lead to practical results of the highest utility.

## PATENT OFFICE JUSTICE.

In the matter of the interference case between H. H. Bigelow and S. W. Baldwin, before the Patent Office, the Commissioner of Patents, acting as it appears illegally, refused to permit the case to go before the Examiner in Interferences, who is the special officer designated by law for the hearing of such matters, thus preventing a final decision as to the question in dispute. Mr. Bigelow thereupon applied to the Supreme Court of the District of Columbia, for a mandamus to compel the Commissioner to do his duty. Judge Carter, after a full hearing of the case and of the excuses of the Commissioner, concluded that a mandamus must issue. The Court decided that the examiner in charge of interferences in the Patent Office is exclusively authorized by law to examine all cases of interference, whether between two pending applications for a patent or a pending application for a patent and an unexpired patent, and primarily to determine the question of priority of invention involved in either class of said applications; and that the Commissioner of Patents is bound by law to direct said examiner in charge of interferences to proceed to determine the said question of priority in invention.

Applicants for patents will necessarily be subject to delays, expenses and troubles, so long as the Patent Office, with its battalion of examining officials and assistants, four hundred in all, are permitted to act as inquisitors of inventors. Questions about the novelty of inventions and rights of priority between claimants must, under the American system, be finally decided by the courts. The only unsatisfactory part of our patent laws is that which subjects inventors to so many troubles at the Patent Office, before they can reach the courts. The Bigelow case is only one of many others. Had this applicant been a poor man, as the majority of inventors are, he probably would have been unable to lose time upon the case or spend money to pay lawyers in arguing for this mandamus; and the adverse whim of a Patent Office official would have stood as a permanent bar to his suit. What is needed is, to eliminate all such objections from the patent laws, and make it the simple duty of the Patent Office to issue a patent to every applicant who chooses to ask therefor, on presentation of suitable documents in proper form, leaving all questions relating to the validity of patents to the courts of law for settlement. This is the common practice in nearly all other countries in the world, and is found to work well. But in Prussia and the United States, the inventor is obliged to submit to the costs and annoyances of official inquests before he can obtain the patent certificate. In Prussia, the patent officials manage to interpose so many preliminary objections that nearly all applications for patents are rejected, while the government retains the money paid. In this country we grant more patents, but we nevertheless inflict upon inventors an immense amount of useless trouble, before issuing the certificate. Our Patent Office officials would consider their occupations gone and themselves of no account in the world if they were not privileged to hunt up objections to excite and harrass the applicants for patents.

## POLITICS IN THE BEEHIVE.

The idyllic picture of divinely appointed harmony, drawn by naturalists of the old school in describing the social economy of bees, is sadly disturbed by the prying observations of modern students. Instead of being models of industry and virtue, each and all, some of them, at least, prove to be no better than the rest of us, given to political dissensions, liable to bully royalty itself, and—tell it not to Watts—preferring theft to honest labor.

Lubbock has cast a grave doubt over their vaunted wisdom, and now Fritz Müller discovers that their virtue is as little to be depended on as that of our most pious statesmen. Happily they are not our bees that misbehave so badly, and it is only for Brazilian bees that the poet's verses will have to be amended so as to read:

How doth the naughty little bee
Improve the shining hour?
He robs his neighbor every day,
And never seeks a flower,

or something to that effect.

There is one species (*trigona liomão*), as Mr. Müller writes to Charles Darwin from the province of Santa Catharina, Brazil, which never appears to collect honey or pollen from the flowers. "It robs other species of their provisions and sometimes takes possession of their nests, killing or expelling their owners. The hives in my garden have often been invaded and two of them destroyed by these robbers; and I have seen in the forest several nests, formerly inhabited by other species, occupied by them."

Mr. Müller is making extended observations on the several species of these stingless honey bees, and expects, after a few years of study, to be able to give a tolerably complete account of them. The observations he has already reported, though briefly, give cause for expecting valuable as well as interesting results at his hands. On one occasion, for instance, he "assisted' at a curious contest well worth reporting, for the light it throws on the intellectual faculties and the political or social habits of the bees. It occurred between the queen and the worker bees in one of his hives of *trigona minim* whose peculiar custom it is to construct the cells in which the young are raised around the circumference of the two or three uppermost combs; when the cells are finished and filled with food for the grubs, the queen lays an egg in each, whereupon it is immediately shut. A set of forty-seven cells had been filled, eight on a nearly completed comb, thirty-five on the following, and four around the first cell of a new comb. "When the queen had laid eggs in all the cells of the two older combs, she went several times round their circumference (as she always does, in order to ascertain whether she has not forgotten any cell), and then prepared to retreat into the lower part of the breeding room. But as she had overlooked the four cells of the new comb, the workers ran impatiently from this part to the queen, pushing her in an odd manner with their heads, as they did also other workers they met with. In consequence the queen began again to go around on the two older combs, but as she did not find any cell wanting an egg she tried to descend; but everywhere she was pushed back by the workers. This contest lasted for a rather long while, till at last the queen escaped without having completed her work. Thus the workers knew how to advise the queen that something was as yet to be done, but they knew not how to show her where it had to be done."

Possibly the queen had some glimmering notions of royal prerogative, and did not choose to be quite so forcibly advised by her subjects, who appear to have been a turbulent lot at best, since it was in this hive that Mr. Müller found two dissenting parties among the workers quarreling about the construction of the combs, and even going so far as to destroy each other's work.

## THE LOCUST IN MINNESOTA.

The visitation of locusts in Minnesota has proved a serious calamity. The total damage, thus far done, consists in a loss of about one twelfth the usual crop, or about the same as if the average yield throughout the State were diminished one and a half bushels below the average per acre. The plague extends over one tenth of the cultivated area of the State, and involves about one thirteenth of the population.

The insects, we notice, are universally styled "grasshoppers," which is incorrect, although the mistake, owing to the confusion of names, is a natural one. The principal points of difference between the locust and the grasshopper consist in that the latter is usually of a green color and is more active by night than by day. Grasshoppers, moreover, do not associate together nor migrate in large numbers, while their flight is short and unsteady as compared to that of the locusts, beside being noiseless. The locusts which have appeared in Minnesota are, when full grown, of about an inch and a quarter in length, and of a dusky grayish color, the heads being reddish and the under wings, when spread, of a coppery hue. The eggs are gray,ovate,and about as large as a wheat corn, and are deposited in clusters in the ground and under the grass and stubble. When hatched, the insects feed on the nearest vegetation, and then rise in vast clouds, seeking other pastures. A Minnesota settler, who has suffered severely from their ravages,in writing to the Minneapolis *Tribune* describes a throng of the locusts as resembling a huge snow cloud, often completely obliterating the sun. The lower insects fly at a hight of about forty feet from the ground,and the others fill the air above as far as the eye can reach. When they settle on a field of grain, every stalk is covered, so that the entire field seems to have suddenly turned brown. They do not eat the grain but bite into the tender stock and juicy kernel, and suck out the vital sap, leaving every particle of vegetation dead, so that within a day or two the entire crop becomes dry and withered. Their appetite seems especially directed toward garden stuff and grain, but frequently the voracity is such that every living green thing is devoured before they rise.

Minnesota farmers assert that there is no remedy. Fall fires do no good and water and frost are without effect. Plowing up the ground where the eggs are deposited or burning over the grass where they are laid during the spring, it is believed, are the best known preventives. The worst enemy of the locust, however, seems to be a little red parasite, which gets under its wings and gnaws into the very vitals of the insect. Dead locusts are found covered with these worms. Various portions of Europe and the north coast of Africa have suffered greatly from the plague both recently and in the past. In France, during May and June,when the insects first appear in the fields,all the women and children turn out to hunt them. Four persons grasp the corners of a sheet, two in advance holding their ends close to the ground and the couple in rear elevating their corners, so that the sheet is held at an angle of 45°. In this position,the cloth is carried over a field several times,the insects being forced to rise, when they fall upon the sheet and thence are tumbled into bags. Some idea of the immense numbers of the locusts which may thus be destroyed may be gained from the fact that a single peasant, with a entomologist's small net, has been known to capture 100 pounds of insects in a day, equal to about 80,000 eggs destroyed.

The Arabs drive off locusts by making great bonfires, producing large quantities of smoke. In Algiers, the most effective plan is said to be spreading large nets over the insects early in the morning after they have become gorged and inert through feeding, and then collecting them in bags and bury them in lime. Leaving the dead bodies on the ground is apt to breed infection. Harrowing over the fields, where the females lay the eggs, seems, however, to be a widely followed plan of destruction, as, if the eggs be scattered, the sun soon dries them up. Birds and toads are excellent auxiliaries in disposing of the eggs after a field has thus been gone over.

## FOUR HUNDRED AND FORTY-FOUR MILES, AT OVER FORTY MILES PER HOUR, AND THREE STOPS.

An evident improvement in the direction and appointments of the principal American railways is in progress, an example of which is seen in that portion of the Pennsylvania Railway between New York and Pittsburgh. The road is provided with 60 lbs. steel rails, oak ties, broken stone ballast, and the best splice joints. The bridge work is of the most substantial character, the superstructure is smooth and solid, the cars and locomotives superior in construction, all the latest appliances for safety being likewise supplied, such as Westinghouse air brakes, safety platforms, switches, block telegraph signals, etc.

The run of 444 miles from Pittsburgh to New York is made in eleven hours, with only three stops, being an average rate of over 40 miles an hour, as follows: Pittsburgh to Altoona, 117 miles, stop 5 minutes; to Harrisburgh, 132 miles, stop 20 minutes; to Philadelphia, 105 miles, stop 5 minutes; thence to New York, 90 miles. The locomotives dip up water from side troughs at certain stations without stoppage. The trains are comprised of magnificent Pullman parlor cars. It would be difficult to name any stretch of railway in the world, of equal length, where passengers can be more expeditiously and luxuriously carried.

The railroad mileage of the United States now exceeds the combined mileage of all Europe, although the population of Europe, 282,000,000, is seven times greater than that of this country. Every year adds to the improvement as well as the length of American roads. How to make our railways better and safer is the constant study of the legion of engineers, inventors, and managers who are connected with them. The practical results of their labors will be naturally manifested in gradual changes for the better in all branches of railway service.

### The Annual College Regatta.

The annual regatta of the principal colleges took place this year on Saratoga Lake, N. Y., July 18. The winning boat was that of Columbia College, New York, which came in two boat lengths ahead. Time 16m. 42 sec. Distance three miles. Wesleyan was second, and Harvard third. The colleges which contended were Trinity, Princeton, Cornell, Yale, Harvard, Wesleyan, Columbia, Dartmouth, and Williams. The attendance of spectators was very large, and much enthusiasm prevailed.

PHOSPHORUS BRONZE.—Some of the brands will bear a considerably greater breaking strain than steel itself. It appears, also, to be suitable for sheathing ships, since, when immersed in sea water, it loses scarcely more than one third as much as is lost by the best sheet copper.

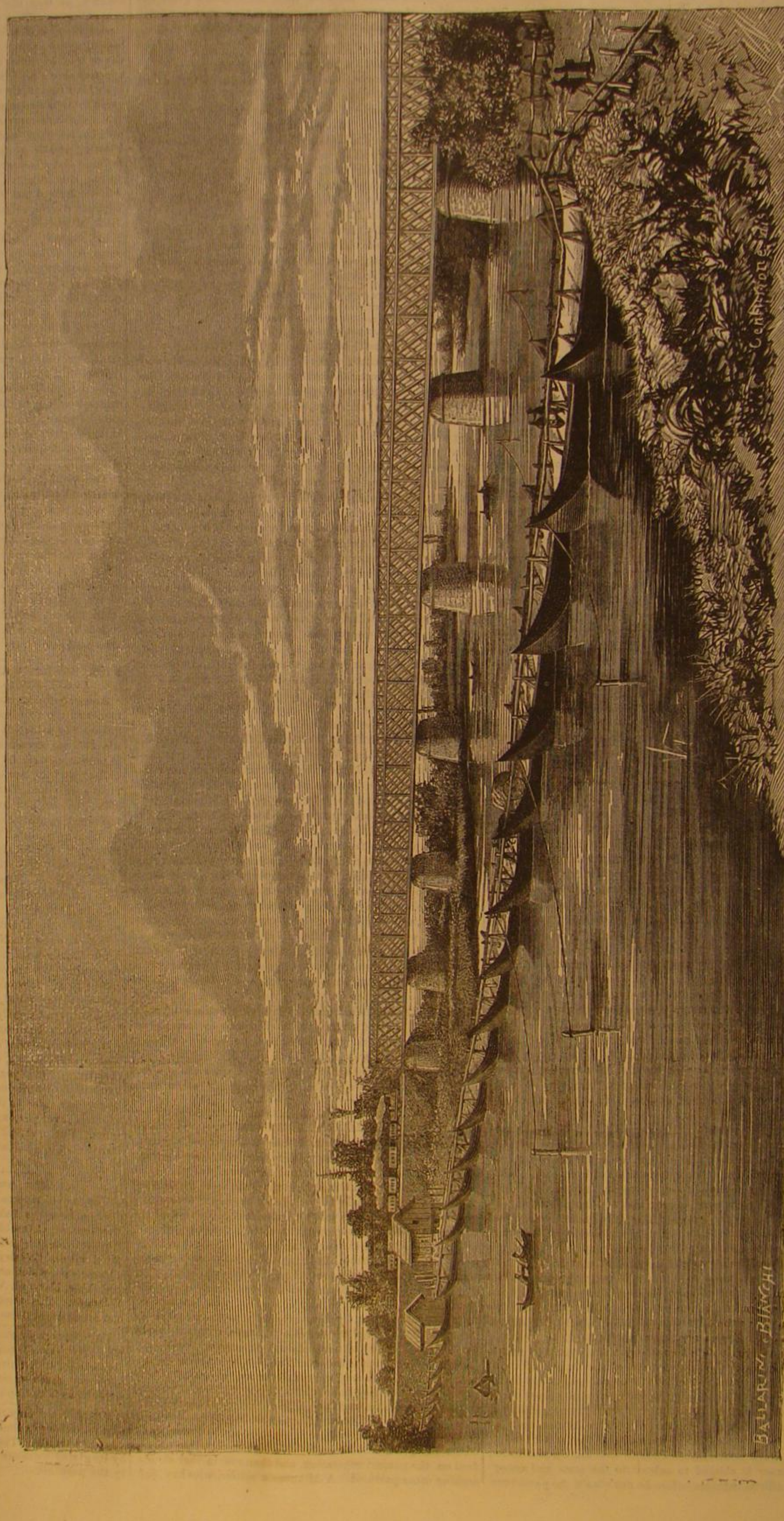
MINERAL OIL may be detected by its property of imparting a fluorescence to animal or vegetable oils, and by its aromatic odor on burning. The presence of resin may be ascertained by its giving a deeper color with nitric acid than that given by the pure oil.

## THE MEZZANA-CORTI BRIDGE OVER THE RIVER PO.

We extract from *L'Illustrazione* the annexed engraving of an iron railway bridge, which extends across the river Po, near Mezzana-Corti, Italy. It was constructed for the Southern Railway Company of Italy, by Messrs. Gouin & Co., of Paris, and its total length is 3,310 feet, comprising ten clear spans of 196·2 feet each, supported on nine piers and two abutments in masonry. It is constructed for a double line, and the upper part of the iron girders supports a carriage way 28·8 feet in width. It is calculated to support a load of 1½ tuns per 3·2 feet running, besides its own weight. The total quantity of iron employed was about 5,706 tuns.

The foundations for the piers and abutments were sunk by the aid of wrought iron caissons, closed at the top and charged with compressed air. In putting in the foundations, the excavations had to be carried down some 67 feet through the gravel, and even more, below the level of low water, so that the work was necessarily prosecuted under very considerable pressure. The caissons were eventually filled with concrete, and they remain as permanent portions of the work.

The superstructure consists of lattice girders connected at their tops and bottoms by plate iron girders, the lower series of the latter supporting the double line of rails, and the upper series carrying an ordinary roadway, having footways on each side formed over the flanges of the main girders. The two main girders of each span are 24·6 feet deep between top and bottom flanges, and they are placed at a distance apart, transversely to the line of the bridge, of 27·26 feet from center to center. The lower cross girders are connected by short intermediate longitudinal girders extending between them, under the timbers on which the rails are placed. The cross girders forming the upper series have a slightly arched form on their upper sides, and they are connected by longitudinal timbers on which the planking forming the roadway is laid. The clear hight from the rail level to the under sides of the upper cross girders is 17·8 feet, and the latter are well connected to the main girders by strong gusset stays. The bridge was completed in 1866.



IRON BRIDGE OVER THE RIVER PO, NEAR MEZZANA-CORTI, ITALY.

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### The Syrian Sponge Divers.

The English Vice Consul at Beyrout, in a report to his government, gives some interesting particulars regarding the sponge fisheries. The industry, as prosecuted upon the Syrian coast, yields sponges to the value of $100,000 annually, and employs about 300 boats and 1,500 men. Although they vary much in quality and size, sponges may be generally classified as: 1. The fine white bell-shaped sponge, known as the toilet sponge. 2. The large reddish variety, known as *sponge de Venise*, or bath sponges. 3. The coarse, red sponge, used for household purposes and cleaning. Two thirds of the produce of the Syrian coast are purchased by the native merchants, who send it to Europe for sale, while the remainder is purchased on the spot by French agents, who annually visit Syria for the purpose. France takes the bulk of the finest qualities, while the reddish and common sponges are sent to Germany and England.

Diving is practised from a very early age up to forty years, beyond which few are able to continue the pursuit. It does not appear, however, that the practice has any tendency to shorten life, although as the diver approaches forty he is less able to compete with his younger and more vigorous brother. The time during which a Syrian diver can remain under water depends, of course, on his age and training. Sixty seconds is reckoned good work, but there are rare instances of men who are able to stay below eighty seconds. The diver (naked of course), with an open net around his waist for the reception of his prizes, seizes with both hands an oblong white stone, to which is attached a rope, and plunges overboard. On arriving at the bottom the stone is deposited at his feet, and, keeping hold of the rope with one hand, the diver grasps and tears off the sponges within reach, which he deposits in his net. He then, by a series of jerks to the rope, gives the signal to those above, and is drawn up.

## ROLLING BRIDGE BETWEEN ST. SERVAN AND ST. MALO.

The towns of St. Servan and St. Malo, in France, are situated on either side of the river Rance, or, more strictly, of the arm of the sea into which that river empties. The tide is here subject to great fluctuations, retreating so that the bed of the estuary may be crossed on foot, and again rising to a hight of several yards. The mode of crossing the stream, until the construction of the curious bridge represented in our engraving, consisted in taking a wide *détour* to a point where an ordinary bridge spanned the river, or else in using boats. To avoid such inconvenience as we have referred to, M. Leroyer, town surveyor of St. Malo and architect to St. Servan, designed and had constructed the bridge we illustrate. It consists of a platform supported on wheels, which run on rails laid on the bottom of the estuary. The platform is supplied with accommodation for horses and vehicles at either side, and two classes are provided for passengers, the fares being one and two cents respectively. The platform stands level with the quay at each side, so that nothing is more easy than access to it; and, as our illustrations (from *L'Illustration*) show, it is worked at all states of the tide with perfect safety. One of the engravings represents the bridge traveling on its ways at low tide, and the other, crossing the river when the water is high.

ROLLING BRIDGE AT ST. MALO, FRANCE, AT LOW TIDE.

The bridge appears to be exceedingly popular with the inhabitants of St. Malo and St. Servan. It is novel in design, and reflects no small credit on M. Leroyer.

## THE DEGERFORS IRON WORKS, SWEDEN.

There is a marked contrast between the relations of employer and employed in Sweden, and the similar relations existing in England and the United States. In both English-speaking countries strikes and lockouts are rather the rule than the exception. Master and man are arrayed on opposite sides, each seeking to get the better of the other, and neither attempting in any very appreciable degree to lessen the existing antagonism. In Sweden, exactly the reverse is the case. The practice so earnestly advocated and followed in the past by the man most prominent in the development of the iron industry of the country, of regarding his workmen as living fellow beings, and not as mere machines from whom the utmost labor possible must at all hazards be ground for the least pay, holds in the great establishments of the present. The example of Samuel Owen was a grand one. In lieu of unions, draining upon the earnings of the industrious for the support of the lazy, flourish sick and benefit clubs and cöoperative societies—while we read besides of yearly engagements, dwellings and land provided *free* for the workman by the employer, *free* fuel, *free* medical attendance and medicines, and *free* and compulsory schooling for his children. Again, the iron masters do not concern themselves with the buildings and plant of their ironworks only. They are intimately associated with every detail of the existence of the communities of which they are the leaders; they build dwellings and schools, even hospitals or infirmaries; they own and cultivate lands, and rear crops for the maintenance of their industrial allies, or enable them to do so; they possess, directly or indirectly, their own mines for ores; they own large tracts of forest land, and burn huge quantities of charcoal. Finally, they utilize the natural resources of their country by turning to full account all the water power available.

These considerations will lend additional interest to the following description of one of the greatest Swedish iron works, the "Degefors Aktie Bolag," for the details of which we are indebted to *Iron*:

These works are most eligibly situated at the southern extremity of the Lake Möckeln, in the parish of Carlskoga, and province of Wermland. It is only of recent years that they have attained their present rank among Swedish industries. At the present time the works comprise, in addition to the residential premises, the following structures and plant: One blast furnace; one calcining furnace; seven Lancashire furnaces, which are constructed according to the patented system of Messrs. Lagerhjelm and Nanfelt, these having been found by experience to yield iron in greater quantities for the same period of time, and throughout more homogeneous in quality, than those of the usual form; two guide mills, worked by two large turbines, of 150 horse power each; one newly erected 18 inch rolling train for blooms and iron of large size, say up to 5 inch round, etc.; with all needful fitting and repairing shops. These are in operation, but they do not give the full measure of the future productive capacity of the works, for there are other important extensions which are now fast approaching completion. They comprise a complete set of cupolas, converters, and all the requisite plant for the manufacture of Bessemer steel; also another blast furnace and a calcining furnace; one 22 inch rolling train, for rolling boiler plates; one 22 inch rolling train for puddled bars; both these trains to be driven by a large turbine of 300 horse power; two shearing machines for plates and bars, to be worked by steam power; and a 4 tun steam hammer; with additional founderies and repairing shops, etc. Since the union of the two works, the upper and lower Degerfors, under one administration, both the waterfalls have been united, by the construction of a canal, giving a combined total fall of 25 feet, and producing a water power of 1,400 effective horse power, utilized in the operations of the works; this, however, is estimated to be only about one third of the total effective hydraulic power of the river Leth-elfven, which exceeds 5,000 horse power—a truly magnificent prime motor and basis for industrial operations.

The finished products of the works for the last year of operations, 1873, amounted to 5,000 tuns; but of this total quantity about 2,000 tuns were rolled for and on behalf of other ironworks, as yet unprovided with rolling mills of their own. Of the remaining 3,000 tuns the bulk was converted principally into nail rods and wire rods, a small quantity being rolled into bars of various sizes, some also being used up for axles, piston rods, etc. It is confidently anticipated that, owing to the increased facilities offered as regards the transport of ore and raw materials, the proportionate make of iron will largely increase during this and subsequent years.

There are 156 skilled hands constantly employed at the iron works; these men are mostly married, and live, rent free, in convenient and substantial cottage dwellings, provided for them by the proprietors. None of the women of the families are employed at the works, but several boys are provided with constant employment; these, however, are engaged in work for a limited period only, their attendance at school daily, for a specified time, being compulsory, until they have attained the age of sixteen years. In addition to the foregoing, about 200 daily laborers are regularly employed at Degerfors; and about the same number of hands are engaged in the pursuits of charcoal burning and the work connected therewith, and in agricultural occupations, on the proprietors' estate at Lassona.

All the male and female adults of the little community can read and write, without exception; all the children, except as above named, are kept at school until they are fifteen or sixteen years of age, when they are examined and confirmed by the vicar of the parish. Thereafter they are freed from compulsory school attendance. The school buildings are provided by the company, and maintained by them under the management of two teachers.

All the men employed at the works in any capacity are engaged by the year; but they are paid in various ways, according to the nature and conditions of the work, some of them, for example, such as the rollers and all assistants employed at the rolls, blast furnace men, and those employed at the charcoal burning furnaces, are paid at specified rates per tun, by agreement; others, such as shinglers, weighing machine men, and the like, are paid by the day, and earn from 50 cents to 75 cents and $1 per day of 10½ hours. The piece work men work in shifts or turns of eight hours, and may earn from 75 cents to $3 per day, according to circum-

ROLLING BRIDGE AT ST. MALO, FRANCE, AT HIGH TIDE.

stances. The wages are paid fortnightly. In estimating their position, it must be borne in mind, as before stated, that, over and above their wages, all the hands employed at the works are provided with houses and fuel free, and have medical attendance, with medicines, also free; their children are freely educated at the schools of the works, and for themselves a sick club has been established and maintained at the works.

These facts, in reference to the Degerfors Iron Works and their administration, are sufficient by their simple enumeration to prove the value of the enlightened policy on which they have been established and are maintained: comment thereon would be superogatory.

## Correspondence.

### Hardening and Tempering Tools.

*To the Editor of the Scientific American:*

I have read with some interest the several articles in the recent issues of your journal by Mr. Joshua Rose. Practical information, such as he seeks to impart, is of great value to the artizan, and especially to the young mechanic or apprentice. He has entered upon a field which, if well cultivated, must be productive of great good. In that part of article No. 4 which relates to the above subject, he, like almost all who have written upon it, overlooks some of the most important points in the problem.

The following, taken principally from a series of lectures delivered by me to the classes in engineering, while Instructor at the Naval Academy at Annapolis in 1868, will elucidate the points I refer to, and will, I think, add to the interest with which your readers must have perused Mr. Rose's articles:

"It is safe to say that a cutting tool cannot be too hard for any purpose whatever, so long as the edge will not crumble or break up; in other words, to make any cutting tool the most efficient, it should be made as hard as it can be made to perform its work without fracture. With many forms used for cutting metal, the solid angle required for the cutting edge is so great as to give sufficient strength, without resorting to what is known as drawing the temper. In a large majority of cases, however, the latter operation must be resorted to in some degree. The difference in the degree of hardness to be obtained simply by the different temperatures at which the tool has been originally dipped has been experimentally proved to be very slight, and results only in varying the strength or tenacity of the metal. That is to say: A tool dipped at a high temperature, as at nearly a white heat, will be more brittle and possess less strength than if dipped at a low red heat, but will not be truly harder to any sensible degree. A tool, then, dipped at a high temperature will require to be drawn more—that is, reheated to a higher temperature—than one dipped at a lower heat, in order that it shall withstand the required strains without fracture of the edge; and it will be, in consequence, really softer, when ready for use, than the low dipped tool."

In some experiments conducted by the writer, a short bar of good tool steel was so heated that in its length it had every gradation of temperature, from a white heat at one end to that which could be borne by the hand at the other, and in this condition it was immersed in its entire length. It was found that, by the most careful manipulation, small cutting tools, made by grinding from small pieces broken from the highly heated end, could not be made to scratch or mark, in the slightest degree, any piece taken nearer to the cold end, except beyond the very decided line, which will always be found in such a case, beyond which no sensible hardening had taken place. If, therefore, a tool be dipped at the lowest temperature at which it will harden at all, it will be harder when ready for use than if dipped at any higher temperature, if required to be drawn in temper at all.

It is, however, in the final operation of drawing the temper that Mr. Rose makes his greatest oversights. To give simply the certain color to which a certain tool must be drawn is to give the least of what is actually required to be known or observed. It is well known that the color produced upon the polished surfaces of steel or other metals, as their temperature is elevated, is due to the formation of a film of oxide, and the variations from the light yellow to the blue, as on steel or iron, is the effect of the increasing thickness of the film. For the formation of this film two things are necessary, oxygen and elevation of temperature; while to lower the temperature of or partially soften a tool, elevation to a certain temperature, and that alone, is required. The film of oxide is taken as a convenient high grade thermometer simply; and if the very necessary precaution is takes to observe and take into account all the conditions, it serves as a very good one indeed: but to take account of the color of the film alone is to throw out terms of the problem which will render the results of no value. The element of time and the greater or less facility for access of the oxygen of the air to the polished surface are as important to be observed and taken into account as the color produced. For instance, a tool in reheating may be raised to the temperature at which a yellow color begins to form; and if simply maintained at that temperature, it will in time assume the full blue color, and its assumption of that color without further elevation of temperature is a question of time only; while really the blue would, without taking into account the time of its formation, be taken to measure a much higher temperature. A piece of polished steel, once raised to the temperature at which oxidation is in visible progress, will continue to oxidize without further heating until the film has become thick enough to assume the blue color. Of course it takes a much longer time than when produced by the aid of continually increasing temperature. Again, the temper of tools is very often drawn over a coal or charcoal fire, in a muffle open at one or both ends, or, as Mr. Rose advises in the case of dies, by laying them upon a piece of heated iron, turning them over often to insure an equal distribution of the heat. But in either of these processes the perfect operation of our color thermometer is interfered with by the partial exclusion of the air, and consequently of the oxygen from the surface upon which the color is to appear. Over a fire of any kind the air is constantly and very much diluted with the products of combustion, and the same may be said of the muffle, while the piece lying upon the hot iron has the surface in contact with the iron in some measure excluded from the air. If the formation of the film is thus retarded, it will easily be understood that a tool so treated will be softer, when the required color is obtained, than was intended, unless this condition be taken into account. To temper an ordinary cold chisel, for instance: in the initial dipping, it may in one case be immersed a sufficient depth and length of time to require the lapse of but a few seconds for the heat to be conducted from the body of the chisel so as to bring the edge to the wished-for blue, while in another case it may have been cooled so that two or three minutes would be required. In the latter case the operative, tired of waiting for the color to appear at the edge of the chisel, will endeavor to hasten it by holding it over the clear coals; but he is surprised to find how strongly the color comes, and finally wonders, when he comes to use the chisel, how it could possibly have become so soft with such a perfect color arrived at. If he is patient and allows the color to form without the assistance of the fire, he then wonders how it can be so hard with the prescribed blue upon it, to a shade. And this is an everyday experience in shops: an unprofitable experience, wherein proper information disseminated through so widely circulated a medium as your valuable journal—read as it is now-a-days in almost every workshop in the country—will go far to save.

In drawing the temper of such a tool, the operative should be taught to be as careful as possible to dip it about far enough, and a sufficient length of time to require a moderate time only to bring the proper color: not too quick, as that would defeat his object by causing the gradation of softness from the cutting edge upward, which must necessarily be the result in this method, to be very sudden, and will leave an extremely small fraction of the chisel's length sufficiently hard for his purpose. If, however, he has misjudged in his dipping and he finds the color coming too slowly, let him be sure, in whatever means he takes to hasten it, not to interfere with the free circulation of the air around it. If the color comes slowly, but not sufficiently so as to require additional heat, he must still take into consideration the time it really occupies, and produce a deeper color if the time is unusually long; while, if very quickly brought, the color should not be allowed to arrive at so deep a point before the final cooling. An intelligent observation of all these points must be had in order that correct results may be arrived at. JOHN T. HAWKINS.

62 Cannon street, New York city.

### Raiding Ants.

*To the Editor of the Scientific American:*

I never, in reading the natural history of insects, came across a description of the ant which I designate as the "raiding ant" (I know no other or a better name); I do not know whether this little guerilla is known to naturalists; at any rate I have never met with an account of it anywhere. It is one of the most daring of all the ant tribe, but its honesty and humanity cannot be boasted of. It is about half an inch in length, of a dark brown color; in shape and in movement, it closely resembles the common large black ant, known in nearly all the Western States, and called the "black colony ant"; but the raiding ant differs from all others in his warlike disposition toward his neighbors. He is a merciless murderer and robber.

I have seen these ants in Northwestern Arkansas, but never in any other country. They are the most notorious marauders in all the insect world. They send out spies; and on a favorable report being received by the authorities, an expedition is set on foot, for the capture of a neighboring colony, and carrying off their store and their young as booty. On one occasion, I discovered a large force of these diminutive marauders on the march. There seemed to be many hundreds, all moving rapidly in the same direction, every one keeping in his place with the greatest exactness, and all very close together, in fact so close that the ground could scarcely be seen in the middle of the column. The column was near twenty feet in length and about ten inches wide. In front of the main body moved three or four who seemed to be leaders of the troop, never falling back to the main column, except to give orders, as it were. On either side of the column moved about twelve or fifteen others, who kept continually about one foot away from and a little in advance of the main column. I supposed that they were removing from one locality to another for the purpose of taking up their abode in a new or more advantageous position. I followed them for about two hundred yards, when they all came to a halt, at the command of one of the leaders. The halt was only for a moment. Those who had moved on either side of the column did not stop as the others did, but moved rapidly around a stone, about six inches in diameter, when they turned their heads toward the place whence they had come, and stopped. This seemed to be a signal, for the main column instantly rushed toward the stone, on one side of which was plainly to be seen the opening of an ant colony. These maurauders surrounded the stone on all sides, and rushed into the hole as fast as they could gain admittance, till all were in, except about fifty, who seemed inclined to stand aloof from taking any part in this wholesale murder and robbery; but it was not long before they proved themselves full brothers, for soon a poor, frightened fugitive came rushing from his home, and ran a short distance and took refuge under a friendly leaf. He had been seen by two of these fellows outside, who watched him to his hiding place; and then with all the fierceness of savages, they rushed upon him and literally dragged him from under the leaf and killed him almost instantly. Several others came moving from the hole, having escaped death inside, to meet it surely outside.

Very few who came from the hole escaped being killed. Soon these raiders began to emerge from the hole, each one carrying something in his mouth, generally the larvæ belonging to the colony they had murdered and robbed. They instantly set out on the march for their own home, not halting until they had reached their own abode, distant about three hundred yards. They seemed kind to the members of their own tribe, carrying back their killed and wounded (four or five), but none of the dead or wounded of their enemies. After pursuing the raiders home, I returned to to the stone and turned it up, and found numbers of dead and wounded, and but few left to tell the dreadful story.

I have seen several of these raiding parties in Northwestern Arkansas, but never elsewhere.

Mount Vernon, Mo. J. S. D.

### The Fireless Locomotive Accident.

*To the Editor of the Scientific American:*

I regret that a paper so ably conducted as the SCIENTIFIC AMERICAN should have given space to such a tissue of misstatements as those over the signature of Edwin Baker, 24 Atlantic avenue, Brooklyn, in your issue of July 4, page 5 entitled "Explosion of the Fireless Locomotive."

He asserts that, "on May 22, a large party of editors and reporters were invited to attend the trial trip," which is simply an untruth. He says that "none of the reporters present published an account in any paper." There were no reporters present, and it required a man like Mr. Baker, who could draw on his imagination *ad libitum*, to make such misstatements as he has done.

The facts were these: The small half inch glass tube attaches outside the stationary boiler to indicate the water line, cracked; and some steam escaped from the glass until the valves could be closed. This was the extent of the calamity so dreadfully described by Mr. Edwin Baker. Instead of the fireless locomotive having exploded, as alleged by him, she left within a few minutes, without a speck of injury, for Canarsie Bay, and returned after making seven miles of a satisfactory trip.

It is a fact that the fireless locomotive was not injured in the least, and that she performs her accustomed trips from East New York to Canarsie Bay. It is a pity that your valuable scientific paper should have become the medium of publishing all over the world the misstatements of Baker, thus aiding him in his well known spite against the fireless locomotive, which he has indulged in for the past eighteen months. Is it asking too much that you make the necessary correction by showing that the cracking of a glass water gage on a stationary boiler was a very different thing from the explosion of the fireless locomotive, as alleged by him?

East New York. JOHN M. GIBSON,
Superintendent Fireless Engine Company.

### New Remedy for Hay Fever.

Dr. Horace Dobell, Senior Physician to the Royal Hospital for Diseases of the Chest, London, has suggested a contrivance and a prescription, by the combined use of which immense comfort may be given to many sufferers from hay fever and sneezing.

The prescription is as follows: Chloral hydrate and camphor (of each) 16 grains, carbolic acid 20 grains, pure morphia 12 grains, oleic acid (enough to dissolve the morphia) 20 grains, castor oil (the clearest and finest) 7 drachms. Rub well together to make a lotion.

The contrivance is for the efficient application of the above remedy, and consists of a miniature bottle, contained in a little boxwood case so that it can be carried easily in the pocket. To the lid of the box is attached the cork of the bottle, and to the cork, in the same fashion as the spoon of a cayenne pepper cruet, is fixed a little club shaped rod of polished ivory, long enough to reach to the bottom of the bottle, and also to the upper extremity of the nostril. The little bottle is kept half full of the lotion above prescribed, and the little rod immersed in it. Directly the patient feels the tickle or other signal of a coming sneeze, he uncorks his bottle, withdraws the ivory club, wet with the oleaginous lotion, and pushes it up the nostril till it reaches the seat of the sneeze signal; there it should be gently pressed so as to apply the lotion to the part. After this the club is withdrawn and returned to its little bottle of fluid, where it becomes at once charged for a fresh application. As often as the sneeze threatens, the operation should be repeated. Very often one application will keep off a threatened fit of sneezing altogether, even though its first effect may be to excite a sneeze.

PROFESSOR KING and two companions recently made a balloon voyage, from Buffalo to Salem, in the southern part of New Jersey. The route was roundabout, the balloonists passing over parts of the States of New York, Pennsylvania, Delaware, Maryland, and New Jersey. Starting at 6 P. M., July 4, the final landing was made the next morning at 7. Distance 400 miles. Time 11 hours.

## PRACTICAL MECHANISM.

NUMBER V.

BY JOSHUA ROSE.

### CASE HARDENING IRON.

Iron may be case-hardened, that is, the surface converted into steel and hardened, as follows: First, by the common prussiate of potash process, which is as follows: Crush the potash to a powder, being careful that there are no lumps left in it, then heat the iron as hot as possible without causing it to scale; and with a piece of rod iron, spoon shaped at the end, apply the prussiate of potash to the surface of the iron, rub it with the spoon end of the rod until it fuses and runs all over the article, which must then be placed in the fire again and slightly reheated, and then plunged into water, observing the rules given for immersing steel so as not to warp the article.

Another method is to place the pieces to be hardened in an iron box, made airtight by having all its seams covered well with fire clay, filling the box in with bone dust closely packed around the articles, or (what is better) with leather and hoofs cut into pieces about an inch in size, adding thin layers of salt in the proportion of about 4 lbs. salt to 20 lbs. of leather and 15 lbs. of hoofs. In packing the articles in the box, be careful to so place them that when the hoofs, leather, etc., are burned away, and the pieces of iron in the box receive the weight of those above them, they will not be likely to bend from the pressure. When the articles are packed and the box ready to be closed with the lid, pour into it one gal on of urine to the above quantities of leather, etc.; then fasten down the lid and seal the seams outside well with clay. The box is then placed in a furnace and allowed to remain there for about 12 hours, when the articles are taken out and quickly immersed in water, care being taken to put them in the water endways to avoid warping them.

Articles to be case-hardened in the above manner should have pieces of sheet iron fitted in them in all parts where they are required to fit well and are difficult to bend when cold. Suppose, for instance, it is a quadrant for a link motion: fit into the slot where the die works a piece of sheet iron (say ⅛ thick) at each end of the slot,and two other pieces at equidistant places in the slot, leaving on the pieces a projection to prevent them from falling through the slot. In packing the quadrant in the box, place it so that the sheet iron pieces will have their projections uppermost; then, in taking the quadrant out of the box, handle it carefully, and the pieces of iron will remain where they were placed and prevent the quadrant from warping in cooling or while in the box (from the pressure of the pieces of work placed above it).

It is obvious, from what has been already said, that the heavier pieces of work should be placed in the bottom of the box.

### CUTTING SPEED AND FEED.

The term "cutting speed," as applied to machine tools, means the number of feet of cutting performed by the tool edge, in a given time, or (what is the same thing) the number of feet the shaving, cut by the tool in a given time, would measure if extended in a straight line. The term "feed," as applied to a machine tool, means the thickness of the cut or shaving taken by the tool.

Planing machines being constructed so that their tables run at a given and unchangeable speed, their cutting speed is fixed; and the operator has only, therefore, to consider the question of the amount of feed to be given to the tool at a cut, which may be placed at a maximum by keeping the tool as stout as possible in proportion to its work, making it as hard as its strength will allow, and fastening it so that its cutting edge will be as close to the tool post as circumstances will permit. In all cases, however, cast iron may be cut in a planer with a coarser feed than is possible with wrought iron. Milling machines should have their cutters revolve so that the cutting speed of the largest diameter of the cutter does not exceed 18 feet per minute, at which speed the cut taken may be made (without injury to the cutter) as deep as the machine will drive.

It is only when we treat of lathe work that the questions of feed and speed assume their real importance, for there is no part of the turner's art in which so great a variation of practice exists or is possible, no part of his art so intricate and deceptive, and none requiring so much judgment, perception, and watchfulness, not only because the nature of the work to be performed may render peculiar conditions of speed and feed necessary, but also because a tool may appear, to the unpracticed or even to the experienced eye, to be doing excellent duty, when it is really falling far short of the duty it is capable of performing. For all work which is so slight as to be very liable to spring from the force of the cut, for work to perform which a tool slight in body must be used, and in cases where the tool has to take out a sweep or round a corner which has a break in it, a light or fine feed must be employed; and it is therefore advisable to let the cutting speed be as fast as the tool will stand; but under all ordinary circumstances, a maximum of tool feed rather than of lathe speed will perform the greatest quantity of work in a given time. A keen tool, used with a quick speed and fine feed, will cut off a thin shaving with a rapidity very pleasing to the eye, but equally as deceptive to the judgment; for under such a high rate of cutting speed, the tool will not stand either a deep cut or a coarse feed; and the increase in the depth of cut and in the feed of the tool, obtainable by the employment of a slower lathe speed, more than compensate for the reduction of lathe speed necessary to their attainment, as the following remarks will disclose.

Wrought iron, of about two inches in diameter, is not uncommonly turned with a tool feed of one inch of tool travel to 40 revolutions of the lathe. With a tool feed so fine as this, it is possible, on work of this size, to employ a cutting speed as high as 27 feet per minute, providing the depth of the cut does not exceed one eighth of an inch, reducing the diameter of the work to 1¾ inches. The length of shaft or rod turned under such circumstances will be $1\frac{3}{48}$ inches per minute, since the lathe speed (necessary to give the tool a cutting speed of 27 feet per minute) would require to be about 51 revolutions per minute; and as each revolution of the lathe moved the tool forward $\frac{1}{48}$ of an inch, the duty performed is $\frac{51}{48}$ of an inch, or $1\frac{3}{48}$ inches of shaft turned per minute, as before stated. If, however, we turn the same rod or shaft of two inch iron, with a lathe speed of 36 revolutions per minute, and a tool travel of one inch to 24 revolutions of the lathe, the amount of duty performed will be $\frac{36}{24}$ inches, or 1½ inches of shaft turned per minute. Here, then, we have a gain of about 17 per cent in favor of the employment of the slow speed and quick feed. Nor is this all, for we have reduced the cutting speed to 19 feet, instead of 27 feet per minute, and the tool will, in consequence, stand the cut much longer and cut cleaner.

Pursuing our investigations still further, we find from actual test that, cutting at the rate of 27 feet per minute, the tool will not stand a cut deeper than one eighth of an inch; whereas under the cutting speed of 19 feet per minute, it will take a cut of one quarter of an inch in depth, thus considerably more than doubling the duty performed by the tool, in consequence of the decreased cutting speed and increased feed or tool travel.

Lathe work of about three quarters of an inch in diameter may, if there is no break in the cut, be turned at a cutting speed of as much as 36 feet per minute, the feed being one inch of tool travel to about 25 revolutions of the lathe. The revolutions per minute of the lathe, necessary to give such a rate of cutting speed, will be about 183; the duty performed will therefore $\frac{183}{25}$, or $7\frac{8}{25}$ inches of three quarter inch iron turned per minute. A feed of one inch of tool travel to 25 revolutions of the lathe is greater than is generally employed upon work of so small a diameter as three quarter inch, but is not too great for the generality of work of such a size; for the tool will stand either a roughing or smoothing cut at that speed, unless in the exceptional case of the work being so long as to cause it to spring away from the tool, under which circumstances the feed may be reduced to one inch of tool travel to 30 or 40 revolutions of the lathe, according to the length and depth of the cut.

It will be observed that the cutting speed given, for work of three quarter inch diameter, is nearly double that given as the most advantageous for work of two inches diameter, while the feed or tool travel is nearly the same in both cases; the reason of this is that the tool can be ground much keener for the smaller sized than it could for the larger sized work, and, furthermore, because the metal, being cut off the smaller work, is not so well supported by the metal behind it as is the metal being cut off the larger work, and, in consequence, places less strain upon the tool point, as illustrated in Figs. 26 and 27.

Fig. 26.

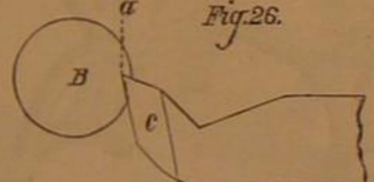
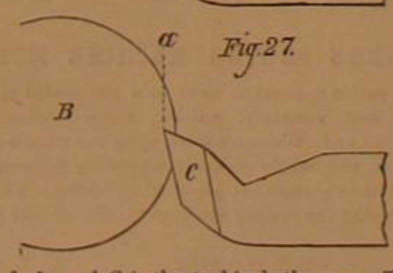


Fig. 27.



B is a shaft, and C is the tool in both cases. The dotted line, *a*, in Fig. 26, does not, it will be observed, pass through so much of the metal of the shaft, B, as does the dotted line, *a*, of the shaft, B, in Fig. 27. The metal in contact with the point of the tool in Fig. 26, is not, therefore, so well supported by the metal behind it as is the metal in contact with the point of the tool in Fig. 27, the result being that the tool, taking a cut on the smaller shaft equal in depth to that taken by the tool on the larger one, may have a higher rate of cutting speed without sustaining any more force from the cut, the difference in the resistance of the metal to the tools being equalized by the increased speed of the smaller shaft.

These conditions are reversed in the case of boring, the

Fig. 28.

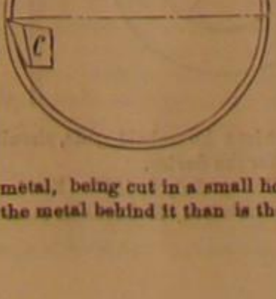
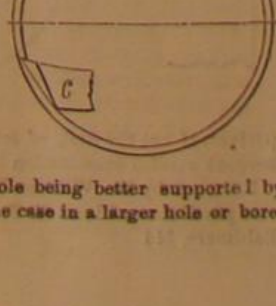
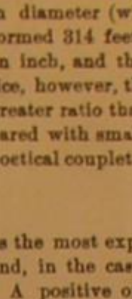


Fig. 29.



metal, being cut in a small hole being better supported by the metal behind it than is the case in a larger hole or bore. This is overcome by placing the cutting edge of the tool below the center of the work, as shown in Figs. 28 and 29, the circular lines, *a* and B, representing the cut, C being the tool in both cases. But in a large bore, the effect is not so seriously encountered, because of the nearer approach of the circle to the straight line, as shown in Fig. 30. The circular lines, *a* and B, represent the cut, and C is the tool.

Fig. 30.



On heavy work it is specially desirable to have the tool stand a long time without being taken out to grind, for the following reasons: 1. It takes longer to stop and start the lathe, and to take out and replace the tool. 2. It takes longer to readjust the tool to its cut. 3. It takes more time to put the feed motion into gear again. 4. The feed motion is very slow to travel the tool up and into its cut, and to take up its play or lost motion. 5. Lastly, the tool should take a great many more feet of cut, at one grinding, than is the case with a tool for small work.

A tool used on work 5 inches diameter (the lathe making 20 revolutions to feed the tool one inch) would perform 314 feet of cutting in traveling a foot, the lathe having, of course, performed 240 revolutions; while one used on work 10 feet in diameter (with the same ratio of speed) will have performed 314 feet of cutting when the tool has traveled half an inch, and the lathe made 10 revolutions only. In practice, however, the feed for larger work is increased in a far greater ratio than the cutting speed is diminished, as compared with small work; but in all cases the old axiom and poetical couplet holds good:

"A quick feed
and slow speed,"

as the most expeditious for cutting off a quantity of metal, and, in the case of cast iron, for finishing it also.

A positive or constant rate of cutting speed for large work cannot be given, because the hardness of the metal, the liability of the work to spring in consequence of its shape, the distance of the point of the tool from the tool post, and other causes already explained, may render a deviation necessary, but the following are the approximate speeds and feeds:

Wrought iron of about 12 inches diameter: Heavy roughing cuts, 18 feet of cut per minute; and feed, 27 revolutions of lathe per inch of tool travel. Finishing cuts, 20 feet per minute. Feed, 30 revolutions per inch of tool travel.

Cast iron of about 12 inches diameter: Heavy roughing cuts, 25 feet per minute. Feed, 22 revolutions per inch of tool travel. Finishing cuts, 25 feet per minute. Feed, 8 revolutions per inch of tool travel.

Cast iron, 10 feet diameter: Roughing cuts, 15 feet per minute. Feed, 20 revolutions per inch of tool travel. Finishing cuts, 19 feet per minute. Feed, 4 revolutions per inch of tool travel.

But these data in no wise apply to tools held far out from the tool post, nor to cutting tools used in a boring bar, concerning which latter too much depends upon the relative size of the bar to the hole to be bored, and upon the solidity of the lathe or machine driving the bar, to permit of any data being given.

Brass of small diameter may be turned at a cutting speed of 420 feet per minute, with a feed of 25 revolutions of the lathe per inch of tool travel, and work of 18 inches diameter at a cutting speed of 150 feet per minute, with a feed of 36 revolutions of the lathe to an inch of tool travel. The discrepancy in the feet of cut per minute arises from the causes explained in Figs. 26 and 27.

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### Telegraphic Crows.

At a recent session of the Asiatic Society, Mr. L. Schwendler showed a crow's nest, made of pieces of telegraph wire, twisted together in a most ingenious and knowing manner. He said that lately such nests had been frequently found, and that the crows often selected telegraph posts, between which and the telegraph wires they built those wire nests, causing what are known as "earth" and "contact," and interfering with communication. Crows, however, were by no means the only animals interfering, by their domestic arrangements, with overland telegraphy. Wasps build their mud nests in the porcelain insulators, causing, in rain and dew, leakage from the wire to the ground. Birds of prey frequently dropped dead fish and other offal upon the wires, causing contact. These were all frequent sources of temporary interference with telegraphic communication upon overland lines, and they, combined with many other facts not necessary to mention, seemed to show that it would be a very great advantage to use subterranean telegraphs instead of overland lines.

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PASIGRAPHY.—Pasigraphy is the name of a new system of writing by numbers, which, it is asserted, may be used universally, and thus obviate the difficulty of communication between nations of different languages. Dr. Anton Bachmaier, of Munich, is the inventor. A conference of gentlemen of various nationalities was held in London, not long ago, to promote the undertaking, and the result is said to have been of an encouraging character.

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THE ST. LOUIS BRIDGE has a total length of 4,462 feet, as follows: From Third street to the building line on the levee, 930 feet; thence to building line in East St. Louis, 2,107 feet; thence to commencement of the eastern approach on the dyke, 1,425 feet. This approach is 2,000 feet in length.

## IMPROVED SEWING MACHINE MOTOR.

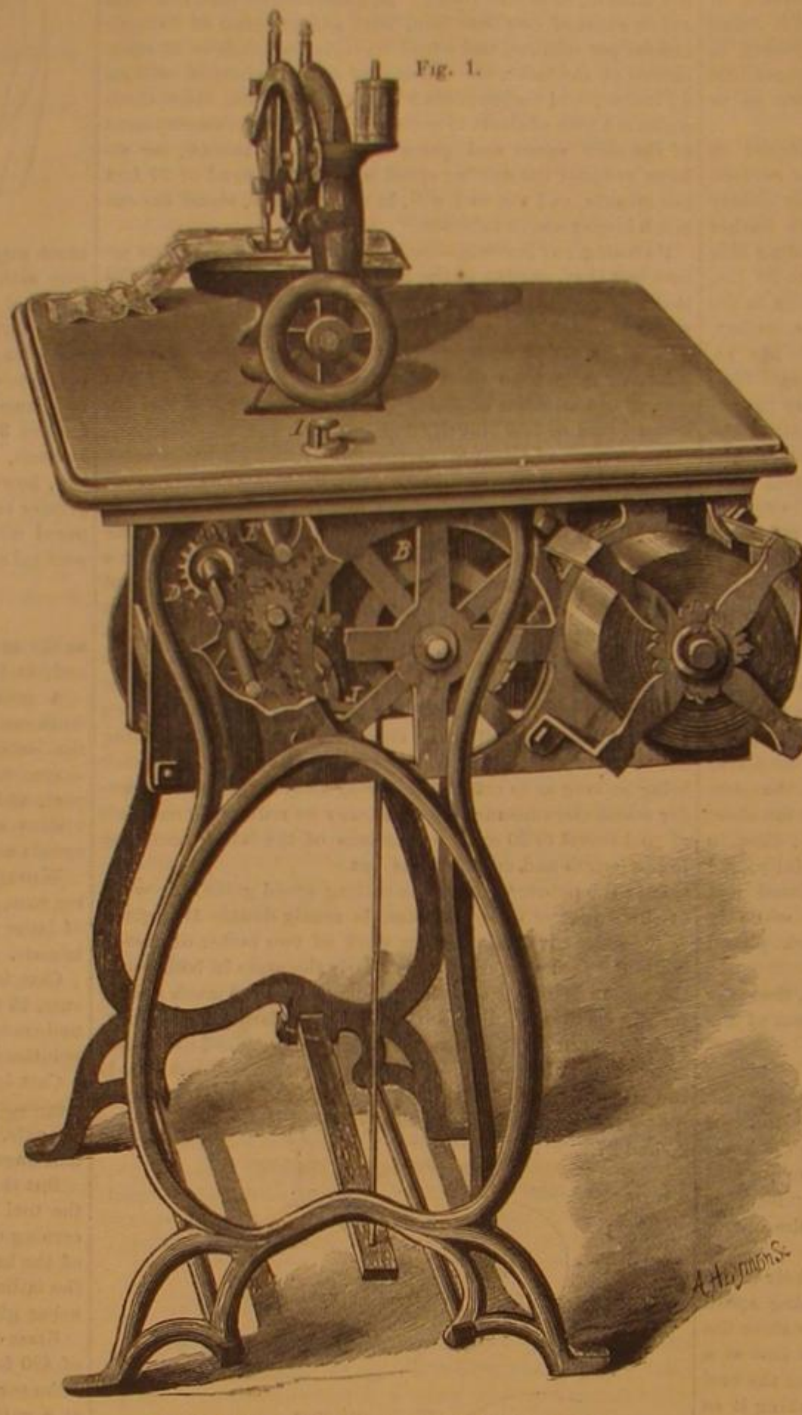
Domestic motors, unless they present the three elements of safety, simplicity, and cheapness, stand little chance of gaining popular favor. We are inclined to believe the same is true of apparatus which, apparently filling the above conditions, is nevertheless of a nature intrinsically against which prejudice exists. Thus, we doubt if any woman would charge herself with the care of a boiler and steam engine, however small its dimensions, or would undertake to manage the battery of an electro-magnetic machine; the one she has connected in her mind with explosions and similar casualties, while of the other the average female is, as a rule, totally ignorant, and hence timorous. Every woman, however, has some idea of clockwork—knows that it runs when wound up, and is not liable to sudden freaks in the way of bursting and giving disagreeable shocks; and consequently, if she finds she can drive her machine for some time by turning an exaggerated clock key a few revolutions, the chances are that she will do so rather than tire herself over the treadle, simply because, in the case of clockwork she is familiar with the power she deals with, while in the case of steam or electricity she is not.

The inventor of the device illustrated in the annexed engravings has produced an arrangement of spring mechanism for actuating sewing machines, which, judging from a recent inspection of its operation, is capable of giving excellent results. Every one, it is presumed, is reasonably familiar with the general principles of such apparatus, and hence an allusion to them is not needed, nor is it deemed necessary here to enter minutely into the inter-engagement of the various transmitting wheels. Suffice it to state that the connection between the parts is simple, and readily understood from a glance at the device itself. The points to which attention is especially directed are the mode of insuring an equal and uniform power during the entire period that the spring is unwinding, and the brake mechanism by which the motion is controlled.

To insure the best application of power throughout, the inventor has recourse to an arrangement very similar to the ordinary fuzee. On the spring shaft, A, Fig. 3, is a cylinder to the periphery of which a chain is attached. The latter is also secured to the larger portion of the spirally grooved drum, B, so that the motion thereby transmitted to said drum rotates the large cog wheel, C, and thence passes to the other mechanism, and finally, to the belt pulley of the machine. The winding is done by a winch applied to the shaft, D, Fig. 1, with the pinion on which and also with the main wheel, C, an idle wheel, E, may be slipped into and out of gear (by a longitudinal motion of its shaft in its bearings) at will. By this means not only is the powerful coiled spring, represented at the right of Fig. 1, wound, but the chain tightly wrapped in the grooves of the drum, B, Fig. 3. It will be noticed that, during the first turns of the winding, which require but little power, the chain winds about the larger portion of the drum, B, between which and the diameter of the driving wheel, C, there is less difference of leverage; but toward the end, when much more power is needed to finish the work, a greater leverage is afforded through the decrease in diameter of the portion of the drum on which the chain then winds. When the spring begins to unwind, and so to drive the mechanism, the exact converse of the above takes place. The power, at first strong, is applied to the smaller portion of the driving drum, and then, as it diminishes, its point of application gradually changes so as to work with proportionally increased leverage. The drum being properly shaped, the result is to cause strong power to act upon short levers, and light power on long levers, effecting a uniform transmission of force. The same end may be reached by replacing the cylinder with another conical drum.

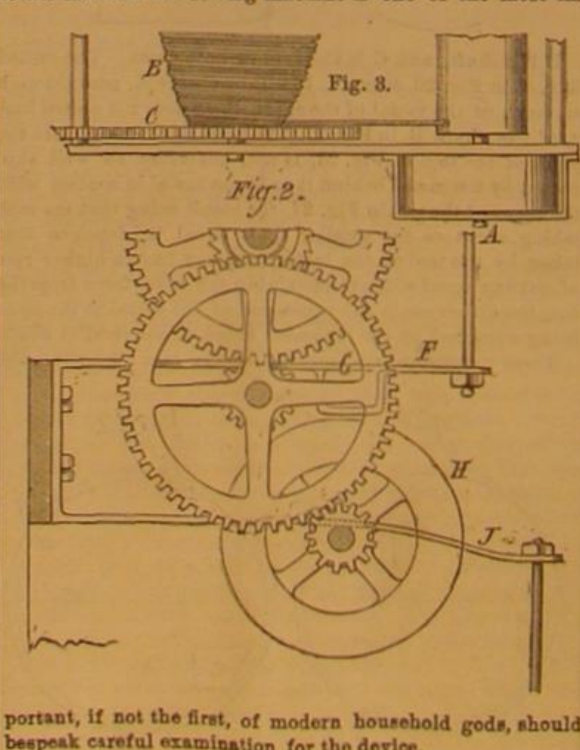
The brake mechanism is represented in Fig. 2. F is a flat elastic bar, to which is attached a cushion, G, which acts as a brake shoe against the fly wheel, H. To the outer end of the bar, F, is secured a rod which passes up through the table, and ends above in a button, I. By raising the latter, the cushion is removed from the fly wheel and the works allowed to operate; by lowering the button, the brake is again applied, and stoppage results. A brake at J presses upon the belt wheel shaft, and is held down upon the latter by the pressure of the foot upon the bar, K, under the table. By increasing the pressure, and consequently the friction of brake, J, the machine is caused to travel more slowly; and by relaxing the same altogether, full speed is permitted.

Sufficient being now said to convey an idea of the construction of the device, we may state that its general appearance is excellently shown in Fig. 1. It may be applied to any machine, requiring no other modification of the latter than the replacing of the table, if of ordinary size, by a larger one. Eight turns of the crank—which, owing to the interposition of the idle wheel, are made in direction from the operator—suffice to wind the spring and set the machine in operation at full speed, estimated at about 720 stitches per minute for twenty minutes. This, though very much faster than is ever necessitated in actual practice, was accomplished several times in our presence, the needle in one instance piercing many thicknesses of muslin or linen. Probably once in every half hour would be all the winding required for continuous work, and this, as we have above explained, is an operation of little difficulty, done in a very few seconds, and controlled by the ratchet wheel and pawl shown in Fig. 2.




YOUNG'S SEWING MACHINE MOTOR.

The invention appears to us to be a successful application of simple and, certainly, not expensive mechanism, to a much needed end. Women's work upon the treadle is none of the lightest, and, while always temporarily fatiguing, sometimes results in permanent physical suffering. This, added to the fact that the sewing machine is one of the most important, if not the first, of modern household gods, should bespeak careful examination for the device.




Patented by Mr. William Young, July 8, 1873. For further particulars address C. T. Crawford, 43 Franklin street, Baltimore, Md.

### Music by Telegraph.

Mr. Elisha Gray, of Chicago, a gentleman well known as an inventor and manufacturer of telegraphic apparatus, has perfected an instrument by which, says the *Journal of the Telegraph*, sounds produced at one end of a wire can be conveyed to the other end by electricity, over circuits of great length. It has, says the *Journal*, already been tested upon the wires of the Western Union Telegraph Company over a circuit of 2,400 miles, with the most satisfactory results. Tunes, played upon the keyboard of the transmitting portion of the apparatus, were distinctly audible and unmistakably reproduced, note for note, at the distant end of this long circuit.

The apparatus has been named by Mr. Gray the telephone. The transmitting apparatus consists of a keyboard having a number of electro-magnets corresponding with the number of keys on the board, to which are attached vibrating tongues or reeds, tuned to a musical scale. Any one of these tongues can be separately set in motion by depressing the key corresponding to it. To this transmitting instrument the conducting wire is attached, the other end being attached to the receiving apparatus, which may be anything that is sonorous so long as it is in some degree a conductor of electricity. A violin, with a thin strip of metal stretched between the strings at a point where the bridge of the instrument is ordinarily placed, will, on receiving the sound transmitted through the conducting wire from the piano, give out a tune very similar in quality to that of an ordinary violin.

### Preservation of Iron Ships.

A few weeks ago (22d of May) we summarized the instructions issued by the Admiralty relative to the preservation of boilers by the placing of unslaked lime in those boilers which could be kept empty, and, in those cases where they were liable to leakage from the sea, by filling them with a solution of lime in sea water. The result of the experimental application of the solution of lime has been so satisfactory that its use is to be extended to iron and composite ships, under the circumstances described in the following circular, No. 36 of 1874, lately issued by the Admiralty: "Experiments having shown that the destructive action of bilge water on the iron frames, etc., of iron and of composite vessels may be reduced or altogether obviated by the use of lime, my Lords Commissioners of the Admiralty are pleased to direct that in all cases where it may be found impossible to dry out completely any of the compartments, bilges, or wings, in order to coat them with composition paint, or cement, as prescribed by circulars 28 of 1872, 22 of 1873, and 31 of 1874, lime well slaked is to be placed in the water contained in such places. As unslaked lime would injure coatings of composition, paint, or cement, care is to be taken that the lime used is thoroughly slaked."—*Engineering.*

### The Sczaroch.

The Russians have lately adopted a new shell which, according to recent experiments, seems to be a formidable projectile. It is well known that with the ordinary elongated bolt a ricochet fire cannot be maintained; and as this species of firing is very effective against masses of troops, the loss is a matter of considerable moment. The sczaroch, for such is the name of the new projectile, is either a percussion or time shell and a shot, the latter of which ricochets beyond the point of explosion of the bursting charge. The shell portion is a simple iron cylinder, to one end of which is secured, by a thin sheet of lead, a spherical shot.

On leaving the gun the combined projectile acts like an ordinary elongated shell; but as soon as the explosion of the charge takes place, the cylinder of course flies in pieces, while the shot, impelled by the additional velocity and by reason of its form, ricochets for hundreds of feet ahead. In firing at batteries, the double effect of this projectile comes into excellent use, as the shell might be exploded among the guns, while the ball would strike far in the rear among the reserve troops; or while the shell might burst in the front rank of an advancing column, the ball would continue plowing its way through several succeeding ranks.

### Another Dam Disaster.

The bursting of the Mill River reservoir has been very closely followed by the breaking of another dam in Massachusetts, thirty miles northwest of Springfield and on the line of the Boston and Albany Railroad. Twelve bridges, four manufactories, and several dwellings, valued at about half a million dollars, were destroyed, beside the vegetation in the path of the flood being generally devastated. Happily no lives were lost, warning being given in time.

From all accounts, the casualty was due to the imperfect construction of the reservoirs, which appear to have been mere mud banks built some forty years ago. The recent heavy rains probably proved too much for the sustaining power of the soil, and hence the barriers gave way.

### THE SUNDRIDGE PARK CONSERVATORY, ENGLAND.

Our illustration represents one of the most beautiful of English conservatories, that of Sundridge Park, Kent. The house is 100 feet in length by nearly 40 feet wide, and 35 feet in hight, and is constructed almost entirely of iron and glass, having perpendicular sides and a curvilinear lanthorn-shaped roof, of pleasing proportions, supported on light iron work pillars, which also serve as supports for rare graceful climbers. The present engraving, says the *Garden*, beautiful as it is, gives but a very faint idea of the interior, which would require at least half a dozen such views to do it full justice.

The central portion of the house is laid out in beds, in which palms, ferns, cycads, camelias, and other rare exotics luxuriate with something of their native vigor. Around the sides, substantial stone benches have been erected for smaller decorative plants in pots, and beneath these the hot water pipes are placed and concealed from view by a neat and ornamental cast iron grating. The hot water apparatus is of the latest and most approved kind, while the genial temperature maintained is amply sufficient for the choice blooming orchids and stove plants, which are grown for the purpose of decoration in ranges of plant houses to the rear of the conservatory. A notable feature is a pair of lean-to curvilinear roofed houses behind the conservatory, and connected with that structure by doors opening into an alcove, very tastefully decorated with virgin cork, and planted with orchids, filmy ferns, and other choice exotics, the effect of which is considerably hightened by a large mirror which extends the whole length of the alcove behind. These very agreeable adjuncts to the conservatory are very tastefully and systematically arranged in the natural style and planted out with ferns, orchids, and choice foliage plants, all of which luxuriate in the most vigorous manner possible. The doorways are fringed with masses of virgin cork, over which lygodiums, *ficus stipulata*, fresh green selaginellas, begonias, and bright veined eranthemums ramble in rich profusion, and with a vigor only attainable by planting them out in good fresh soil with ample room to extend themselves in all directions. Conservatories, arranged in the natural style, and having the finest specimens planted out, are specially to be recommended, as they are not only effective, but much less trouble is entailed on the gardener than when pots or tubs are employed.

SUNDRIDGE PARK CONSERVATORY, KENT, ENGLAND.

### THE BRITISH INTERNATIONAL EXHIBITIONS.

The series of splendid International Exhibitions inaugurated by the British Government, and carried out with so much effect in London by Her Majesty's Commissioners, are to be brought to a close with the termination of the present year. These exhibitions were intended to extend over a period of several years, a new exhibition being opened each year with some special characteristic to render it prominent or attractive. But the world appears to have become surfeited with exhibitions, and even the British Government is unable to induce the people to attend or take interest in them. This may in part explain the apathy of our own people in respect to the approaching Centennial Exhibition at Philadelphia. The people are tired of such shows; they are regarded in the popular mind as tame, insipid, and nothing but advertisements after all. This is a very incorrect notion, especially when we consider the remarkably excellent and in some respects wonderful collections of industries and objects that have been brought together at these British International Exhibitions. We have heretofore described some of the branches of the present exhibition, and now give the following from *The Engineer*:

If there is a lively place in the whole exhibition, it is the French annexe. If anything could have turned the scale in favor of the exhibition, it would have been the *foreign* element, especially the French. India, which is part of our own empire, is worth a good deal; but France is especially valuable for exhibition purposes. Whatever the Frenchman touches he seems to adorn. Going into the French annexe, we are struck with the beauty of the engineering models. The very sewage apparatus has an air of elegance. The wood is polished beech, the metal is the finest brass, and everything has the finish of decorative work. There may be a lack of faithfulness and reality in all this brilliancy, but doubtless the construction is correct. These, and other models, are sent by the Municipal Council of Paris, and are further elucidated by admirable photographs and drawings suspended on the adjacent walls. Models of waterworks, bridges, and other structures, are all very good. There is likewise a steam roller and a diagonal sweeping machine. In another division of the annexe we meet with some splendid models of educational institutions, so perfect that nothing is wanting but the actual "flesh and blood." The rooms are there, all duly fitted up, and everything laid open to view by the substitution of glass for woodwork and masonry. Upstairs in the art gallery of the exhibition we meet with architectural drawings lent by the Commission which has charge of historical monuments in France, of which M. du Sommerard is the inspector-general. In the arcade near the French garden are shown some fine specimens of ornamental screenwork cut out of metal by the steam sawing machine at the mills of Delong & Company.

The ingenuity of the French is shown in the mechanical singing birds of M. Bontems and the marvelous watches of M. Haas. Some of these watches wind up by the mere process of opening and shutting the outer case. One watch gives the day of the week and the date, besides showing the phases of the moon, striking the hours and quarters, and marking time to the sixth of a second. Another watch strikes hours, quarters, and minutes. In the mechanical section of the exhibition the Siebe-Gorman diving apparatus was brought into working order a few weeks back, and the operations of the diver in the raised tank with its glass panels are of general interest. Close at hand Messrs. Chance Brothers & Co., of Birmingham, have erected their dioptric holophotal revolving light—of the first order—a splendid example of mechanical engineering. As we have before stated, this is intended for the South Stack Lighthouse, Holyhead, and has only just been made.

Cut short at the end of its first Olympiad, the exhibition sees its programme shorn of its fair proportions. In 1875 we were to have woven, spun, and felted fabrics, in relation to printing and dyeing. At the same time we were to have had a display of norological instruments, brass and copper manufactures, and all that relates to water supply. In 1876 there was to have been a collection of works in precious metals and their imitations, together with philosophical instruments and agricultural machinery. The plan for 1877 was poor, consisting of furniture and upholstery, "health manufactures," and machine tools. The list for 1878 looked better, including glass, tapestry, military engineering, naval architecture, and lighting by all methods. Iron was to be the leading feature in 1879, while 1880 was to be famous for chemistry and articles of clothing, supplemented by sewing machines and railway plant—a droll assortment, confounding our ideas of the druggist and the draper with the general liveliness of a railway station. Many persons still think that there is something in this annual International Exhibition scheme which ought to be taken up and carried out. We are not, we confess, of the number. We trust that the present failure may be looked upon as final, and that, if we have not seen the last of International Exhibitions elsewhere, they may at least be regarded as defunct at South Kensington.

### Railway up the Volcano of Vesuvius.

The plans of the line which is to ascend Mount Vesuvius are now complete. The route will be 16·1 miles in length. The grades are 20 and 35 per hundred, and the road terminates at a few feet from the crater. There will be one station, protected by a sort of break lava, which will divert the flow, in case of eruption, away from the building and rails. The road is so laid out as to be naturally sheltered at every point, except for a distance of about 60 feet.

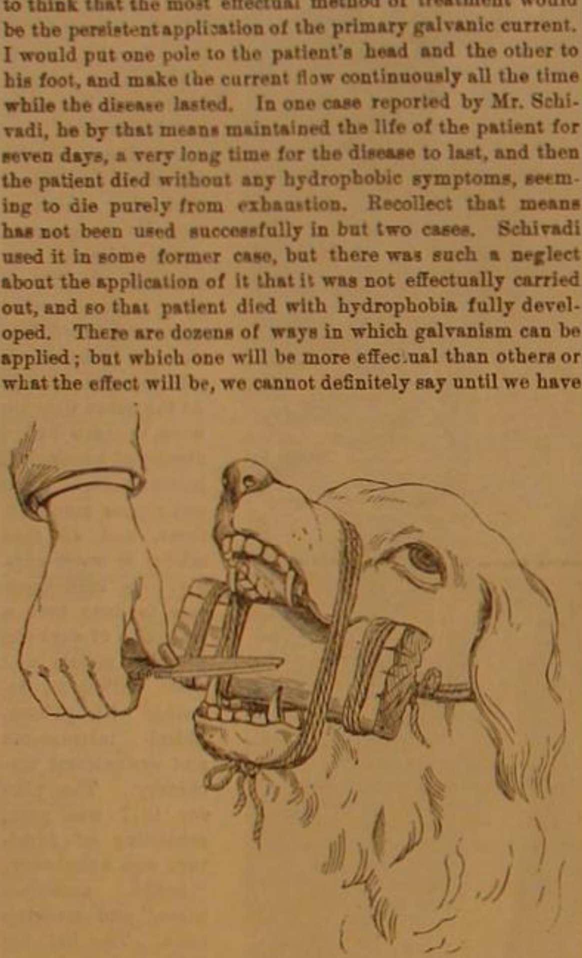
THE *Revue Industrielle* states that apples may be preserved in perfect condition by packing them in dry plaster.

## HYDROPHOBIA—PRACTICAL SUGGESTIONS FOR ITS PREVENTION AND CURE.

At a recent meeting of the New York Neurological Society, which was largely attended by prominent physicians and surgeons of this city, Dr. Hammond made an address in which many interesting facts and experiences pertaining to the dreadful malady of hydrophobia were presented. He also produced diagrams of highly magnified sections of the brain, spinal cord, and pneumogastric and other nerves, of McCormick, the expressman, taken soon after his death here from this disease. All of the parts exhibited showed a deficiency of cell structure, and it was evident that a striking change from the normal condition had taken place. The gray matter had passed into a state of fatty degeneration, mainly in the form of oil globules. This discovery was considered important, as indicating the particular members of the system that were affected and the changes therein, congestion of some of the parts being especially shown as a primary condition. The knowledge gained might assist the physician in future treatment of the disease.

Among preventives, Dr. Hammond thinks that the cutting out of the wounded parts is the best, and that it will be effectual if done at any time prior to the development of the symptoms of the disease, although the sooner it is done after the bite the better. He had performed this operation of excision some thirty or forty times, upon persons supposed to have been bitten by mad dogs, and in no case has hydrophobia ensued.

"In regard to the treatment," Dr. Hammond observes, "there is not much to say; but I have one or two ideas about it which I would like to mention to the Society. I am inclined to think that the most effectual method of treatment would be the persistent application of the primary galvanic current. I would put one pole to the patient's head and the other to his foot, and make the current flow continuously all the time while the disease lasted. In one case reported by Mr. Schivadi, he by that means maintained the life of the patient for seven days, a very long time for the disease to last, and then the patient died without any hydrophobic symptoms, seeming to die purely from exhaustion. Recollect that means has not been used successfully in but two cases. Schivadi used it in some former case, but there was such a neglect about the application of it that it was not effectually carried out, and so that patient died with hydrophobia fully developed. There are dozens of ways in which galvanism can be applied; but which one will be more effectual than others or what the effect will be, we cannot definitely say until we have



FILING THE TEETH OF THE DOG.

more experience upon the subject. There is some ground, likewise, for thinking that, in the application of the primary galvanic current in that manner, we have one of the most if not the most effectual means of treating disease known to us. And then, in addition, I would apply ice to the spinal cord and to the whole length of the spine, and keep the patient immersed in it, you may say, the whole time. I have used ice quite extensively in the treatment of tetanus four times in this city. In one case in particular, in which I was in consultation with Dr. Lewis Smith, the ice was kept at the spinal cord during the whole course of the disease, and the patient got well. Another case, induced by a wound, likewise in this city, in the person of an eminent musician, I treated in the same way—with ice—and he recovered. And I am inclined to think that in ice we have another very effectual means of treating hydrophobia, which I would feel disposed to rely upon; but I should say galvanism more than anything else. As regards the administration of internal remedies, I have nothing to say. Those cases in which they are reported as being successfully used, rely upon it are not authentic cases of hydrophobia."

Dr. Hammond then presented resolutions, which were adopted by the Society, against the muzzling of dogs, in favor of killing all vagrant dogs, and also the following:

*Resolved*: That in the opinion of this Society the most effectual means of preventing the origination and spread of hydrophobia is by the imposition of a tax upon all dogs kept for use or pleasure; requiring the canine teeth or fangs and the incisor teeth to be blunted, as proposed and effected by Bourrel, and the destruction, under proper regulations and by duly authorized persons, of all dogs not licensed, or which may be found with the teeth unblunted.

In the absence of any legal enactment, the New York Neurological Society recommends to all owners of dogs to have the teeth of the animals blunted in the following manner, as detailed by Fleming in his "Treatise on Rabies and Hydrophobia": "The operation is a simple one. For a large dog, two assistants are necessary; for a small animal, only one. The creature is seated on a table, a gag is fixed in the mouth between the molar teeth by a band passed behind the neck; another band or piece of wide tape fastened around the muzzle at the back of the gag prevents any movement of the jaws. To blunt the incisor teeth a file is used, and to expedite the operation the longer canine teeth or fangs are shortened by sharp nippers and then smoothly rounded by the file. The gag, of course, must be proportioned in thickness and length to the size of the animal."

Dr. Hammond then placed a dog in view of the audience on which the operation of blunting the teeth had been performed. The Doctor said: "You will see how impossible it is for him to bite so as to break the skin even—it is utterly out of the question. This is the manner in which it is done: Place this stick between the molar teeth of the dog, and keep the stick in position by a cord attached to both ends of it. Then while the stick is in his mouth, and a cord placed so as to prevent his opening his mouth any wider, this operation could be done within eight minutes. When the operation of filing is performed he cannot bite, and he is not injured in the slightest degree for any purposes. He can do just as well as ever. He does not use his canine teeth to tear his food, and there is no reason why the operation should not be performed upon him, and it makes him altogether a more useful portion of society. We have performed various operations on animals to make them subservient to our uses, and there is no reason why this operation should not be made obligatory upon all owners of dogs."

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THERE are 5,000 miles of telegraph line in Mexico, according to the latest official returns. Of the total, the government owns about half, and the balance is in course of construction or is controlled by States and private companies.

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A CORRESPONDENT, Mr. D. B. Snow, of South Lancaster, Mass., reports the appearance of a perfect lunar rainbow at that place on the evening of June 29. Naturally the colors were not so vivid as those of a solar rainbow, but the arc was complete.

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THE ST. LOUIS UNDERGROUND RAILWAY TUNNEL is 4,800 feet in length, and extends from the great bridge to Poplar street.

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A LARGE portion of the rails on the Great Western Railway, England, were lately reduced from the broad to the narrow gage, of 4 feet $8\frac{1}{2}$ inches. Two thousand men did it in eighteen hours.

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M. F. DE CANDOLLES has been elected Associate Member of the French Academy of Sciences in place of Professor Agassiz. M. Candolles is a Swiss naturalist of considerable reputation.

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THERE is to be an International Geographical Congress held in Paris in the spring of 1875. A committee is now at work, arranging details and classifying the various subjects to be considered.

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THE Chicago *Railway Review* appears in a new dress, enlarged in size, and full of interesting railway information. It is one of the best periodicals in the country.

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## DECISIONS OF THE COURTS.

### United States Circuit Court---Southern District of New York.

PATENT WATCHMAN'S TIME DETECTOR.—JACOB E. BUERK *vs.* WILLIAM IMHAUSER *et al.*

WOODRUFF, *Circuit Judge:*

I have re-examined the decision heretofore made by me in Buerk *vs.* Valentine (9 Blatchf., 479), so far as it bears upon the contest in this suit. In that case, the patents and patented devices, including the patent for the infringement of which this suit is brought, are fully described. The additional evidence here introduced does not alter my conviction that the invention now in question, and secured to the complainant by his patent of June 5, 1865, was not anticipated by any of the devices to which the evidence relates; nor by John Buerk, upon whose invention that of the complainant was an improvement.

Is the defendants' detector an infringement? I think it is. The only difference between it and the complainant's detector is that instead of forcing points upward to perforate, the defendants force the paper downward upon and to receive an impression from stationary projections from the surface below. Both indent the dial upward; one makes a perforation, the other an upward indentation. I do not think an inventor can be robbed of the fruits of his invention by such a variation, when the whole structure of his machine is in other respects the same.

Without deeming it necessary to discuss the subject more minutely or fully, my conclusion is that the complainant's patent is valid, and that the defendants infringe it.

Let a decree be entered for the complainant awarding an injunction, directing an account, etc.

[*J. Van Santvoord*, for complainant.
*Keller & Blake*, for defendants.]

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PATENT SUBMARINE DRILLING APPARATUS.—CAMMEYER AND SAMUEL LEWIS *vs.* NEWTON *et al.*

[In equity.—Before Blatchford, Judge.—Decided June 10, 1874.]

Blatchford, *Judge:*

This suit is brought on letters patent granted July 28, 1868, to William H. Cammeyer, as assignee of Samuel Lewis, as inventor, for an "Improved Portable and Adjustable Still Water Dam." The specification states that the invention is an "improved portable and adjustable dam for the purpose of producing still water in which to operate for the blasting and removal of obstructions in rivers and other water courses, etc."

The answer of General Newton denies the infringement alleged, and avers that, during the year 1869, he invented an apparatus for use as a caisson, coffer dam, and diving bell, in excavating and taking out rock in the harbor of New York; that it was constructed by and at the expense of the United States, and has since been used exclusively by the United States in the prosecution of the work undertaken by the United States, of improving the harbor of New York; that General Newton, being an officer of the United States and a lieutenant colonel of engineers in the army of the United States, has been heretofore assigned to the duty of directing the said improvement of the harbor of New York, and, in pursuance of his aforesaid duty, and acting for the United States, has used the aforesaid apparatus; that the other defendants, during all the time they, or either of them, have had any connection with the use of the said apparatus, have been employed and paid by the United States, and have acted in connection therewith solely as employees and agents of the United States; that neither he nor any of the defendants have derived any profit or emolument from the construction or use of said apparatus; that in the year 1867, in Boston harbor, Massachusetts, one George W. Townsend put in operation a method of drilling and blasting rock under water in a rapid tide way, using therefor a drilling platform, supported by anchors and adjustable legs, combined with a boat and a system of windlasses, anchors, and chains, together with suitable machinery, by means of which a system of drills might be operated, substantially like the apparatus claimed by the plaintiffs; that the apparatus and dam claimed to have been invented by Lewis was not in fact the invention of Lewis, but the same had been invented and described by the defendant Newton prior to its invention by Lewis; that such invention and a description thereof were printed and published in a letter from the Secretary of War of the United States to the House of Representatives in the Congress of the United States, dated Washington, February 11, 1867, containing a report made by the defendant Newton, which gave a full and complete description of said machine so invented by the defendant Newton, together with the mode of constructing and using the same, which said letter and report were, on the 14th of February, 1867, ordered by said House of Representatives to be printed, and were printed and published at Washington, and are known as Executive Document No. 90, House of Representatives, second session Thirty-ninth Congress; that the said Lewis unjustly and surreptitiously obtained a patent for the said apparatus, which was in fact invented by said Newton, who was using reasonable diligence in adapting and perfecting the same.

Lewis testifies that, having read General Newton's reports from time to time, particularly the one of 1867, setting forth the difficulties of accomplishing anything in submarine drilling in strong currents, he turned his attention to inventing a machine for that purpose. The patent sued on was taken out July 28, 1868. It discards the idea of a rigid platform supported from the rock to hold the drill tubes, but adopts the idea of a dam in sections suspended permanently from a float, and attaches the drill tubes to the dam. It is in direct antagonism to the ideas developed by General Newton. He proposed to work from the rock in drilling, so as to work as on dry land. Lewis proposed to work from a float in drilling. Newton proposed to use a dam merely to protect divers in removing blasted pieces of rock, and for this purpose a dam in flexible sections, deep enough to lie on the bottom, could well be suspended permanently from a float. Lewis proposed to suspend a sectional dam from a float, and affix the drill tubes to the dam, and subject the drilling to the contingencies of the movements of the float.

The allegations of the bill, so far as they assert that General Newton proceeded in constructing his apparatus in intentional imitation of Lewis', are not sustained either as to the intention or imitation. General Newton appears to have considered Lewis' plan, and to have deliberately rejected it, and to have proceeded on one directly opposite. The latter has proved successful. General Newton, in all he has done, that is complained of in this suit, has acted as an officer of the Government, in its service, and for its interests, judiciously, carefully, and without failure. He has not used Lewis' invention. He has done nothing for his own profit. There is nothing developed in the evidence to warrant the suggestions contained in one of the arguments submitted on the part of one of the plaintiffs that General Newton put forth a snare to entrap the unwary by inviting Lewis to invent an apparatus; that he announced to Lewis his intention of taking and using any patented invention which it might suit his purpose to use in the work; that he did not intend to waste any sentimentality on nice points in relation to the rights of patentees, so long as his own purposes were served, or to allow any scruples to interfere with his taking other people's property for the accomplishment of his own ends; that the infringement complained of was a matter of deliberate intention from the beginning; that General Newton has been robbing a poor man; and that the court has never had occasion to deal with a more unscrupulous, wanton, and cruel infringement. Some ideas are found in Lewis' patent, which, if worked out in such a manner as to produce a successful practical result, are valuable—a current breaker inclosing the working drills, and drill guides near the rock affixed to the current breaker. But these ideas are so hampered in construction as to make the drill guides dependent on the boat. General Newton took up, as any inventor had a right to do, the complete invention of Lewis, and, on examining it, found that it proceeded on an entirely wrong principle, if designed to accomplish the result of having a dam to act at the same time as a current breaker and a fixed support for drill guides near the rock, and he organized it on a new principle. He took up the apparatus where Lewis left it, and discarded Lewis' arrangement. These views are sustained by the experts for the defendants, General Tower and Professor Peck, and by the other evidence in the case.

A decree will be entered, dismissing the bill with costs.

[*George Gifford* and *Thomas P. How*, for the plaintiffs.
*Charles M. Keller* and *Henry E. Davies*, for the defendants.]

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## Recent American and Foreign Patents.

### Medical Compound for the Cure of Coughs, Colds, etc.

Henry M. Hoyt, Knight's Landing, Cal.—This invention consists in a compound made of ingredients whose properties are peculiarly adapted to reach the seat of disease in throat and lung complaints. In cases of colds that had settled on the lungs, this compound has given relief in a few days, loosening the matter and, in cases of consumption, the tubercles from the lungs. It is stimulating and healing, enabling matter to be thrown off without severe fits of coughing or unusual exertion. Moreover, it is entirely without opium or other stupefying ingredients, which merely deaden the sensations and temporarily relieve the patient.

### Improved Railway Car.

John Coyne, Baltimore, Md.—This invention relates to modes of constructing the frames of railway cars that are to be rubber-covered on the inside and outside, and consists in sheets of metal jointed together and re-inforced at the bottom.

### Improved Velocipede.

Moritz Nowak, Jeffersonville, N. Y.—This invention relates to improvements in velocipedes which are propelled by the action of the occupants, and it consists of a carriage body or frame placed on wheels, and driven by means of a pivoted foot board or treadle, which communicates motion by a fly wheel, belts, and pulleys to the hind axle, while the front wheels serve for steering the vehicle. Suitable devices for retarding and arresting the motion of the vehicle are applied in connection with the same.

### Improved Revolving Horse Hay Rake.

Clarence E. Peckham, Columbia Cross Roads, Pa.—Levers are connected by a cross bar, and to a platform is attached a loop to receive the operator's foot, so that he can raise the said platform by lifting with one foot while he presses against the cross bar with the other. By this construction, by raising the platform above a horizontal position, bars will be pressed down upon the rear ends of the pins, so as to raise the points of the teeth; and by pressing the platform below a horizontal position, the bars will be pressed down upon the forward ends of the pins, and the bars will be raised from the rear ends of said pins, causing the forward ends of the rake teeth to catch upon the ground, revolving the rake and discharging the collected hay.

### Improved Tumbler for Permutation Locks.

Henry W. Covert, New York city, assignor to Marvin's Safe Company, same place.—The general operation of this lock is similar to the combination locks now in use, that is, having a spindle, dial, and driving wheel, with one or more revolving combination wheels. The changeable pin has a stem and two jaws, with an open slot between the jaws, which receives the rim of the wheel. The stem fits into and fills the lower portion of the slot in the wheel, and the jaws project on each side of the wheel, so that when one of these pins is placed in any one of the slots of the combination wheels, the first wheel will be revolved by a stationary pin in the driving wheel, which pin will strike one of the jaws. The opposite jaw of this pin in the first wheel will strike the pin in the next wheel, and revolve that, and so on for any number of wheels. This pin may be changed to any of the slots, and the combination is altered by such change. By making these pins with jaws projecting on each side of the combination wheels, those wheels may be reversed, and by making the pins changeable the number of combinations is greatly increased. The same is effected by changing the pin from one slot to another, and by reversing the wheel.

### Improved Drum.

Thomas Rawson, Williamsburgh, N. Y.—A two pronged hook hooks over the edge of a hoop, and in the shank is formed a hole to receive a screw, which is swiveled to said hook, and its end is squared off to receive a key for turning it. The screw passes through a screw hole in the body of a bracket, i. e. outer part of which projects upward at right angles to extend along and rest against the screw. The inner end of the bracket passes in through the shell of the drum, and is slightly bent to take hold of the edge of the lining, so as to be firmly supported. By this construction, by turning the screw in one or the other direction, the drum may be strained to any desired extent, or slackened, as may be desired.

### Improved Cultivator and Marker.

Amos Barker, Nebraska City, Neb.—The tongue is attached to the middle part of a curved bar, the end parts of which are horizontal, and carry coupling blocks. The latter are secured in place by the ends of a curved brace. Small wheels revolve upon the journals of the axles, which are bent twice at right angles, and the ends of which pass up through the forward parts of the connecting blocks, and are squared off to receive the lever blocks, the forward parts of which receive hooks formed upon the forward ends of rods. The rods have hooks upon their rear ends, which enter holes formed in the plow beams, so that the movement of the plow beams may control the wheels. By suitable construction, by detaching the plow beams and attaching two devices, four rows may be marked at a time.

### Improved Plow.

Michael Barry, Valparaiso, Ind.—The plow beam is extended to the rearward, and is curved upward to form the landside handle. Upon the beam is the standard, the lower end of which is attached to the head. The forward end of the head fits into a socket formed upon the base of the share, which share is kept in place without any other fastening. The moldboard is curved, and the point is beveled off and fits into a groove beneath the cheek of the share, which holds it in place, prevents the said point from wear, and allows it to scour readily. The heel of the plow is bolted to the standard, and its rear part inclines upward, and is bolted to the handle. The rear part of the heel has a lug formed upon it, which is bolted to the rear end of the head. The moldboard is secured in place by braces. One brace is curved outward, and to its middle part is bolted the moldboard. The other brace is bent at a suitable angle, and its outer part is bolted to the moldboard, and its inner part to the moldboard handle. The forward end of the handle is bolted to the standard and head by the same bolt that secures said parts to each other.

### Improved Ore Separator.

Herman Schafer, Chicago, Ill.—This invention relates to an improved apparatus for use with blast and other furnaces in condensing, from the fumes of certain metals, as gold, silver, and lead, the fine particles which they otherwise carry off. The fumes, etc., entering through pipes, vaporize water, so that a tank is filled with steam or vapor, which condenses the fine particles of metal, and causes them to drop into the lower part of the tank. The fumes, etc., that enter through the pipes must pass beneath the lower edge of partitions before they can enter the escape pipe; and as they are entering the said escape pipe, they are exposed to the spray from a sprinkler, by which any particles that may have passed beneath the partitions are removed and caused to drop into the lower part of the tank. In some convenient part of the latter is formed a door, through which the solid particles from the bottom may be raked out.

### Improved Hay Loader.

George W. Kidwell, Elwood, Ind.—A suitable carriage is made to receive the lower end of a post, to the upper part of which a lever is pivoted. The rear part of the latter is branched, and to the rear ends of its branches is hinged a shaft, to which are attached the curved rake teeth. A base is secured to the rake head and hooked to the post to sustain the draft when collecting the hay. By suitable arrangement, by turning a crank and winding a rope upon a shaft, the forward end of the lever will be drawn down raising its rear end and the loaded fork attached to it. When the loaded fork has been raised to the proper hight, the post is turned to bring the loaded fork over the wagon at the side of the machine, upon which the hay is dropped. The loaded fork may be held in any position into which it may be raised while the post is being turned to bring it over the wagon. There are also devices for turning the rake to discharge the hay and for pushing the latter off the teeth.

### Improved Alarm Attachment for Measuring Cans.

Edward A. Temple, Chariton, Iowa.—This is an improved alarm attachment for the automatic measuring can described in letters patent issued to C. M. Bridges, September 19, 1871, to give notice when the desired amount of liquid has been drawn from the can. A float in the can is connected with a ratchet disk by suitable mechanism. To a rock shaft is attached the end of a bell hammer, so that, each time a pawl drops into a notch of the ratchet disk, the hammer may strike a bell and give notice that one measure has flowed from the float tube of the can.

### Improved Currycomb.

Benjamin F. Williams, Federalsburgh, Md.—This is a durable and convenient comb for cleaning horses, having a comb for the mane combined therewith, and it consists of a frame of malleable cast iron, to which are attached wire teeth. These teeth are formed by bending, in serpentine form, pieces of wire which are attached to the sides of the frame by means of holes in the latter, and turning over the ends. Four of these corrugated wires may thus be attached to the frame, each forming five teeth. The mane comb is formed of one or more pieces of wire attached to the sides of the frame in the same or similar manner to the other wires. The wire for this comb is doubled at intervals, each tooth being formed of two wires, which are perpendicular to the top of the frame, and on the opposite side from the other teeth. These teeth are long, so as to penetrate the mane.

### Improved Hemmer.

James M. Terry, Williamsburgh, N. Y., and Enos Waterbury, Stamford Conn.—There is a supporting plate, a tongue over which the cloth is folded, an adjustable guide for regulating the width of the hem, a curved guide for turning the edge of the cloth down, and a flanged wheel for folding it under the tongue. This wheel turns with the cloth, and the fold of the hem runs in the groove of the roller. The roller and curved guide are mounted on a swing plate which can be swung away to the left for convenience in introducing the cloth. It has a catch stud for holding it back and a spring for holding it in the working position and to regulate the roller and turning plate to the irregularities of the cloth. As the supporting plate extends under the presser foot, it is provided with a stud rising a little higher than the plate, and on this the presser foot rests. The supporting plate is connected to the removable slide plate by a spring, which allows it to rise and fall with the feed, and also to rise from the table when passing over seams.

### Means for Connecting Soldering Irons to Gas Pipes.

Thomas R. Gannon, New York city.—This invention is so contrived that simply placing the soldering tool upon a pipe with its lower end resting upon a collar will open the valve, and allow the gas to escape and be ignited, heating the tool in a very short time. As the tool is removed, the escape of the gas is stopped by the upward movement of the pipe, caused by the action of a spring.

### Improved Milk Cooler.

Kossuth E. Bunnell and Albert H. Brown, Guilford, N. Y.—This is an improved milk cooler by which the milk is rapidly cooled, being surrounded at the bottom and sides by cold water, and readily drawn off without leakage by a watertight pipe joint passing from the bottom of the milk pan through the bottom of the water tank to the outside. The milk pan and cooling tank are fastened by clamps, attached to the top rims of the same, for preventing the lifting off of the pan from the tank by the water.

### Improved Scraper.

Peter H. Carey, New York city.—To operate the machine the scraper is lowered, by a hand crank and gearing, enough for it to scrape up a load by depressing the front end and raising the rear. Then it is raised sufficiently high to be transported to the place for discharging; the frame is disconnected from the tongue, the back end board is unfastened, and both the frame and box are tilted down behind, which allows the load to escape.

### Improved Turpentine Tool.

Walter Watson, Fayetteville, N. C.—This is a convenient tool for gathering turpentine from trees, having two blades, one for a scraping or down motion and one for pushing or upward motion.

### Improved Cultivator.

John McGee, David W. McGee, and William J. McGee, Farley, Iowa.—There are outside and inside plow beams. To the forward ends of the outside plow beams are attached iron straps having eyes to receive a long staple attached to the front cross bar of the frame. To the inner side of the outside beams are attached braces which incline inward, project forward, and have eyes to receive the staple, so as to hold the outer plows vertical. To the forward end of the inner beams are pivoted iron straps having eyes to receive the inner vertical arms of the staples. Upon the rear end of the straps are formed curved straps, the upper ends of which are pivoted to inner arms of the staples. To the rear ends of the beams are attached the standards, the draft strain upon which is sustained by the brace rods.

### Improved Roller Skate.

John H. Fenton, Indianapolis, Ind.—A bracket with two rollers is placed at the toe, and also at the heel of the skate, the two pairs being duplicates of each other, and fastened to the sole in the same manner. The bracket consists of a plate having four pendent arms, through which the spindle passes on which the rollers revolve. The plate is provided with two pivots, one on each side and opposite to each other. A spring of rubber is placed between the plate and the sole. The brackets are placed transversely across the sole, and the boxes on the pivots are so formed that the bearing or weight of the person skating is received by the springs, the elasticity of which springs gives a flexibility which allows the foot to turn in or out to guide the skates, while the pivots confine the bracket and rollers to their places.

### Improved Hood for Smelting Furnace Chimneys.

John R. Egar, Corinne, Utah Ter.—The object of this invention is to provide a simple and improved means for saving the mineral which now escapes from the furnaces for smelting silver and other valuable ores; and it consists in a hood to be placed on the furnace chimney, which arrests the whole products of combustion. The smoke and gases will escape and ascend, while the dust, some twenty or thirty per cent of which is mineral, drops down and is caught in a space, from whence it is discharged through a series of tubes, and conducted into a reservoir of water for separation.

### Improved Folding and Rocking Crib.

Oliver Nailer, North Lawrence, Kan.—In this crib the side pieces are pivoted together, and the rockers fold up alongside when the crib is not in use. The device consists chiefly in pivoting the uprights together at the top, and arranging end pieces to hold them apart when the crib is in use. Folded in this manner, the crib takes up but little room, and may be transported or stored away when not in use.

### Improved Governor Valve for Steam Engines.

Elijah K. Eversol, Springfield, Mo., assignor of one half his right to Cyrus M. Eversol, same place.—The steam chest is provided with a horizontal partition having flat valve seats. The valves are made with flat projecting heads which close over the valve seats at both sides of the partition and are connected by a guide part. The valve stems are pivoted to a lever, which is attached to a regulating spring, and the steam supply adjusted by means of the same together with sliding weights. The weighted spring lever is further connected with the governor of the engine, so that the balanced valves indicate instantly the changes of speed, shutting off entirely the steam supply as soon as the governor belt breaks or flies off, or the limit of speed is reached by the governor.

### Improved Sewing Machine.

John Steinbach and James Ready, Brooklyn, E. D., N. Y.—The feed plate is connected to the free end of a long lever, which is pivoted to a stud projecting downward from the cloth plate. Motion is communicated to said lever and feed plate, for throwing it forward, by a lever which is pivoted to a stud projecting downward from the cloth plate, and connected, at the other end, to an eccentric rod worked by the main shaft. The return motion of the feed plate is effected by a spring. The lever acts on the long lever through a block, which is arranged between them, and connected to a bar which has a binding screw, which extends up through the slot of the plate of the machine, near the back end, for shifting said block along between the levers, to vary the stitch; and it may be fastened at any point.

### Improved Type Setting Machine.

John A. Reynolds, Danville, Pa.—This invention relates to that class of machines which are used for setting type, and is a new and improved arrangement for doing the same which enables an operator to set type by a simple manipulation of keys as rapidly and much in the same manner that a performer on a musical instrument reads his notes and renders the music upon the keyboard, the printer's copy corresponding to the musician's notes, and the keys of the machine to the keyboard of the instrument. It consists in an arrangement of type (including letters, figures, spaces, and reference and punctuation marks) in vertical cases, which vary in number and hight, according to the number, variety, and demand for said different classes of type. Said cases have lateral openings at their lower extremities, corresponding in size to the different sized type. Through these holes the types are pushed out upon a table by fingers of a corresponding size, said fingers being actuated by a cam groove in an endless hinged sectional metallic belt revolving around pulleys. To said belt is attached an arm which glides along the surface of the table, carrying the type with it to a slot in said table, down which it falls with its lettered end up, passing down a curved chute into a recess, whence it is forced laterally by a slide into the composing stick. The line which has thus been set up is then moved forward into column in the composing stick by the automatic operation of levers, cams, and pins. The operation of this machine is thus reduced to five mechanical motions: 1st. Taking the type from the cases 2d. Carrying it along the table. 3d. Dropping it down the chute. 4. Pushing it laterally into line. 5. Sliding the line into column.

### Improved Machine for Splitting and Dressing Hoops.

David Murray and John Lamont, Annawan, Ill.—The splitting knife is set with its edge parallel with the line on which the two splitting rolls meet, and said rolls are provided with several grooves of different sizes One roll is geared with a driving shaft. The other roll is held in bearings and provided with springs to allow it to shift to the inequalities of the poles to be split. While the hoop is confined by the feed roll in advance of the shaving knife, it presses down on the guide so as to throw the shaving knives out of action; but when it escapes, so as not to press down on the guide, the frame is drawn down at the other end so as to cause the shaving knives to taper the end sufficiently to form the lap. Springs are employed, in connection with the feed rolls, to cause them to gripe the hoop sufficiently to force it along. The shaving knife is provided with adjusting screws to regulate the knife for shaving off the requisite amount.

### Improved Tobacco Packing Press.

Marcellus J. Farmer, Lynchburgh, Va.—This invention consists in a novel means for compressing tobacco or other articles into bags and then relieving it of the mold, and in a peculiar means for operating the compress and mold holder.

### Improved Carriage Spring.

J. H. Gould, Rutland, N. Y.—This invention is a spring adapted to all classes of vehicles, and possessing superior qualities of elasticity, durability, etc. It consists of a series of spring plates or leaves, tapered from centers to ends and of equal thickness longitudinally. They are placed at such relative distance apart as not to touch when compressed, and are either applied to recessed and bolted central blocks, or run through from socket to socket with intermediate separating pieces. Some of the springs are made detachable, and the ends of all are supported on separated pins in the sockets and lubricated in suitable manner.

### Improved Rein Terret.

John J. Wightwick, Brooklyn, N. Y.—This terret is made of a single piece of metal, having one or more rein orifices or openings, according to the number of horses in the team. In the bottom is a swivel pin which passes through a bed piece. The latter is screwed or riveted to the head strap of the bridle. The terret may, therefore, turn in either direction, and prevent the lines from tangling, besides supporting their weight and rendering it much less laborious to drive four or more horses or pairs of horses.

### Improved Ferrule and Hook for Whiffletrees.

William Starling, La Prairie, Ill.—Upon the forward side of the ferrule is formed a slotted lug to receive the eye of the hook, which is secured to said lug by a pin. The part of the lug in front of the pin hole, and upon its inner side, may be made thin. When used in plowing, the iron pin may be replaced with a wooden one, so that, should the plow strike an obstacle the said pin may break, and thus prevent the plow from being broken.

### Improved Sausage Meat Cutter.

Jacob Knopp, Columbiana, Ohio.—In the lower part of the case are formed inclined slots, in which are secured notched or slotted plates. The two forward plates extend from the opposite ends of the case nearly to its other ends, so as to overlap each other and leave spaces at their alternate ends for the passage of the meat. The rear plate extends entirely across the case, and its upper end terminates a little above the discharge orifice. The toothed plates thus form a zigzag inclined plane, along which the meat passes from the hopper to the discharge orifice, being all the time operated upon by the knives fastened to the rotary head. The knives being of triangular form have straight cutting edges, so that they can be readily sharpened. They can also be readily reversed when dull, so as to present new cutting edges, and thus avoid delay and loss of time from having to wait so often while the knives are being sharpened. They can also be cut from plates of sheet steel, to avoid waste of material.

### Improved Treadle.

Joseph Lee, West Chester, Pa.—This is a centrally pivoted rock lever, operated alternately by two treadles, pivoted at the center, and the lever at its ends in the flanges of the treadles. Either heel or toe may be employed to alternately operate the crank rod.

### Improved Derrick for Pumping and Boring Oil Wells.

John Schellcopf, Tidioute, Pa.—The object of this invention is to construct, for boring and pumping oil wells, an improved rig, which is made up of lighter timber, dispensing with the use of the heavy timber required at present for the band wheel blocks, Samson's post, and walking beam, and admitting that the rig may be taken apart, put up, and transported from place to place, with greater facility and a saving of timber, time, and labor.

### Improved Gas Purifier.

Marie Eugene Paul Audouin and Eugene Philippe Pélouze, of Paris, France.—The object of this invention is to eliminate, by a new and improved process, the liquefiable matter held in suspension by gases and vapors. The mode of action of this apparatus is as follows: The gas coming from the generator through the pipe enters the top of a casement, and passing downward through perforations strikes against an opposing plate, moves laterally to the next set of perforations, passes through them and strikes the next plate, and so on through an entire series of plates. The holes being so numerous and small bring the volume of gas into a finely divided series of jets, which, by striking repeatedly against the opposing plates, sooner or later precipitate all of the impurities in suspension by condensation and liquefaction, it being partly effected by cold, and partly by the mechanical motion of the particles in suspension on their passage through the apparatus. The liquefied portions drip down, and are forced through the apertures into the tar well below. The gas next passes up into a receiver through the perforations, with opposing plates in an inverted cup-shaped purifier, and out into the large holder, competely purified. For further particulars regarding this invention, see page 282, Vol. XXIX. of the SCIENTIFIC AMERICAN.

### Improved Windmill.

George A. Myers, Schoolcraft, Mich.—The vanes are connected in groups of four to short cross bars. The outer cross bar is pivoted to a wheel arm, and the inner bar is yoked to said arm, so that the section can swing around out of the wind when the force of the wind rises above the limit which it is to bear. This is governed by a weighted lever, whose office it is to hold the vanes in the wind. Each section is connected by a double-cranked rod, with a sliding hub or collar on the crank shaft. The latter is mounted on the top of a hollow casting, which rests at the shoulder on the top of a cast metal socket piece, and has a tubular extension fitting in said socket piece, and secured against being lifted out by the wind, so as to allow the casting to turn freely. The casting has a cap fitting on it above the crank shaft, to exclude snow and rain from the tubular part of the casting.

### Improved Egg Beater.

William O. Crocker, Turner's Falls, Mass.—This egg beater consists of a stock, which has an arbor pin thereon, carrying a driving wheel which engages with a pinion. The pinion revolves on a spindle, and a rotary beater is attached thereto. The stationary frame is rigidly attached to the spindle, and is prevented from turning. The egg beater rests on bows on the bottom of the vessel. The spindle, the stationary frame, and the rotary beater are readily removed from the stock for cleaning or for other purposes. The frame surrounds the rotary beater, and serves to cut the egg as the beater revolves within it, and greatly to facilitate the operation of beating eggs.

### Improved Foundery Molding Machine.

Gavin R. McGregor and Edgar Penney, Newburgh, N.Y.—In this machine, end-forked lifters extend up through slots in the table and support side studs of the flask. The lifters are attached to a sliding cross head, to which power is applied to lift the flask when the same is to be turned.

### Improved Harness Saddle.

Edward Edwards, Hawkinsville, Ga.—The check hook and terrets are attached to plates, which are each bent or formed with a recess, which admits the back strap, and is fastened to the top of the saddle by means of rivets through their ends. This arrangement allows the back strap to render or slide on the top of the saddle, as it is kept securely in position by the loop plates and by leather loops on the side of the saddle. The back strap is made round. By this construction, the bearing of the thills is equalized on the saddle, as either one of the thills can rise or fall. They are also self-adjusting independently of each other.

### Improved Mechanical Movement.

Emanuel Swartzwelder, Chaneyville, Pa.—This invention relates to a mechanical movement, by which a continuous rotary motion of the shaft is produced from the rocking motion of a lever pivoted loosely to the shaft. The invention consists of a rocking lever frame, which intermeshes, by intermediate gear wheels and alternately acting, toothed friction rings, with a central double cog wheel, keyed to the shaft, so that by the strokes of the levers the continuous rotation of the shaft is produced.

### Improved Sound Insulating Attachment for Pianos, etc.

William R. Miller, Baltimore, Md.—This invention relates to that class of attachments for musical instruments which are used for insulating the sound vibrations, and rendering the same more clear and full by causing them to react instead of allowing them to be conducted away and deadened upon the floor. It consists in a core of glass or other similar substance for arresting sound vibrations, placed in a nicely fitting cavity in the bottom of the piano leg, fastened therein by buttons, and having in its center a socket to receive the revolving plate of a suitable caster.

## Business and Personal.

*Charge for Insertion under this head is $1 a Line.*



## Answers to Correspondents

A. C. L. will find a good recipe for cement for leather on p. 119, vol. 29.—H. will find directions for making skeleton leaves on p. 123, vol. 29. The question as to the tank full of water is a schoolboy's problem, and the other is incomprehensible.—D. G. N. can cleanse iron for soldering by using sulphuric acid much diluted with water. We never heard of using an acid to prevent the splitting of wood.—W. S. E. will find directions for a good silver wash on p. 187, vol. 30.—F. B. M. will find directions for cleansing coins on p. 217, vol. 26.—J. F. G. is informed that Körting and Morton are two different persons.—W. M. S. will find a recipe for violet ink on p. 58, vol. 30, and for oil boot polish on p. 73, vol. 26.—F. C. R. can enamel his steel apron supporters by the process described on p. 107, vol. 30.

G. W. McB. asks: 1. Does the magnetic meridian move from east to west and from west to east at regular periods? For what length of time does it move in one direction? What is the movement per year? At what dates have the changes taken place as far as known? A. The needle moves irregularly. The oscillations to the east and west of the true meridian require several centuries for their completion. For instance, at Paris in 1663 the variation was 0°, and it moved west till 1814, when it reached 22° 34′ W.

L. H. D. asks: Can you give me some simple method of preparing sensitized paper for exposure in the camera? A. Take chloride of ammonium 200 grains, water 5 fluid ozs., albumen 15 fluid ozs.; beat the whole to a perfect froth. As the froth forms, transfer it to a dish and let it subside. When partially subsided, transfer to a tall, narrow jar and let it settle for some hours. Pour off the clear solution for use. To apply it, pour a portion into a flat dish to the depth of ½ inch. Cut paper to proper size, hold it by the two corners, bend in a curved form (convexity downwards) so as to touch in middle first; and gradually lower the corners. Let it rest on the bath 1½ minutes, then take it off and pin it up by the corners. To make the paper sensitive, work by the light of a candle. Take nitrate of silver 90 grains, distilled water 1 oz. Take a sufficient quantity, pour into a porcelain dish. Lay sheet on in same way as before; allow 3 minutes contact for thin paper and 4 to 5 minutes for thick. Raise the paper with tweezers tipped with sealing wax, hang up to dry, and protect from the light.

I. S. D. asks: How can beeswax be dissolved in ether? A. It is soluble in the usual way, but sparingly, that is, a large body of ether is required to dissolve a comparatively small quantity of the wax.

C. O. K. asks: 1. Is grape sugar an important article of trade in the United States, and for what use is it chiefly employed? A. Grape sugar is largely manufactured in the United States. It is largely employed in wine making and in the brewing of beer. That its use is extensive may be gathered from the fact that to 8 cwts. of malt, 1 cwt. of sugar is employed. It is also used instead of honey in confectionary, for coloring liquors and vinegar brown, and in making rum and cognac, beer and wines. 2. Is there a treatise on grape sugar manufacture published? A. We know of no such work. 3. Are there any patents on the process? A. Yes.

C. H. F. asks: 1. In extracting essential oil from flowers, how much salt by weight should be used to a pound of flowers? A. We know of no method of extraction in which salt is used, nor do we see how common salt can possibly extract an essential oil. 2. Is there any better way to obtain the perfume of flowers? A. The essential oils in flowers, being present in very small quantities, are best obtained, by digesting the fresh flowers with pure olive oil, or with cotton wool soaked in sweet olive oil, the fresh flowers being placed in alternate layers with the cotton saturated in oil; in some cases pure lard is used. The flowers should be renewed till the oil is saturated with the odor. The cotton is pressed to extrude the oil. The essential oil may be recovered from the sweet oil by agitation with strong and highly rectified alcohol.

W. H. M. L. asks: 1. What will make the cream rise on milk, to get all the cream there is in the milk? A. There is no better way than the old-fashioned one of getting the cream from milk by letting it stand. In winter you might set the pans in warm water. 2. Is there an instrument made to detect water in milk? A. The water in milk may be detected by an instrument called a lactometer. It can also be detected by taking a glass tube and dividing it into 100 equal parts, then filling it and let stand 24 hours. The cream, if milk is pure, will rise and occupy 11 to 13 divisions of the tube. 3. How do they tell the speed of vessels at sea? A. The speed of vessels at sea is determined by an apparatus called a log. It is a small piece of wood of a peculiar shape, weighted and attached to a line which is divided into equal spaces called knots. When the log is thrown into the water, the latter keeps it from being drawn forward, and the speed of the ship is found by the number of knots run out in a certain time.

F. W. R. asks: What is the best method of making a heavy cloth waterproof? A. Dissolve soft soap in hot water and add a solution of sulphate of iron. An insoluble iron soap falls to the bottom; separate it from the liquid, wash and dry it, and mix with linseed oil. The addition of dissolved India rubber to the oil improves the paint.

E. B. says: It may not be generally known that wrought iron, by repeated heating and cooling, follows a different law from cast iron, in that, as the latter expands, the former contracts. My attention was first called to this by the foreman of a foundery, who found that rings, set around the hub of a pattern as anchor to lift the sand, soon became too small and had to be sent to the blacksmith for enlargement. Since then I have had occasion to use this knowledge in practice, and have reduced the size of a ring about one thirtieth of an inch by heating and cooling four times. The ring was one fourth by one inch, with one inch internal diameter. The process does not seem to injure the iron, as the rings were drawn about one inch in ten and were made of the common round rod in use for such purposes. A. That wrought iron shrinks by being heated and quenched is a well known fact, which has been employed for years to shorten the length of rods, etc., requiring to be very exact. But if the heating and cooling are equal all over, the first application only is effectual. That cast iron expands by repeated heating and cooling is not known, and is, to say the least, doubtful. If heated once and quenched, it hardens and expands (as does wrought iron and steel from hardening). If heated and cooled in one place at one time, and in another place at another time, your gradual expansion is explained; if otherwise, the phenomenon, if true, is new.

J. M. C. asks: What will be the pressure on the staves at bottom, middle, and top of a tub 9½ feet in diameter and 9 feet high, holding a liquid weighing 12 lbs. to the gallon? A. The pressure on the staves at bottom will be 5·6 lbs. per square inch, at the middle 2·8 lbs. per square inch, and at top nothing.

J. E. B. says: I enclose you one of two eggs laid last week by the same hen. I think it is empty or nearly so. A. The egg weighed about one eighth of one of the same size. Upon breaking it open the yolk was found at one end, perfectly dry and hard. Your supposition that the egg is a fresh one is incorrect, it having been laid months before and become dry by heat. The shell of the egg when first formed is soft, and adheres closely to the solid contents; consequently the egg could not have been laid in the condition that you found it in. The egg was almost empty, no white of the egg being present, which shows conclusively that it was an old one.

T. C. P. asks: Is there a quick method of tanning small bits of rawhide? A. There is a method of quick tanning by the use of alcohol.

W. S. J. asks: How can I soften common machine steel so that I can cut it off easily with the parting tool? I want to make rollers ¾ inch in diameter 3-16 inch thick. I have made it blood red, and let it cool off in lime and charcoal; and the steel is so hard it takes on an average 5 minutes to make each roller. A. There is no process to soften steel which will give you any practical benefit over the lime and charcoal process. Your trouble probably lies in the parting tool, which should be made of the best steel, about ⅛ inch thick, and given plenty of clearance at the point; it should be hardened right out, and placed to cut at the center. One minute is sufficient time to make such a roller, if it is made of any ordinary steel. Try using oil with the parting tool; it may assist it.

G. F. J. says: In your issue of July 11, J. W. asks if a true cylinder can be bored by a boring bar not having a sliding head (the cylinder being fed up by the lathe carriage) if the bar is not true or parallel with the ways of the lathe? He contends that the bore will be straight, but will not be round. You answer that the bore will be true, whether the bar is true with the shears or not. The only result of the bar being out of true is that the cylinder will be thinner at opposite ends on opposite sides. I think that, with a little consideration, you will be convinced that your answer is wrong, and J. W. is right. Your answer is correct where the cutter head feeds longitudinally upon the bar, but not for the case where the cylinder feeds up to the cutter. In the latter case, if the bar were not parallel with the ways (transversely; for instance), the bore would be straight with the ways, because the circle described by the cutter does not change in its relative position to the ways, consequently the cylinder would not be thinner on opposite sides at opposite ends as you stated. But the bar not being parallel, the circle of the cutter would not be upon the same plane as the diameter of the cylinder, but at an angle with it, consequently the transverse diameter of a cylinder, bored with a cutter revolving in such a direction, would be less than the perpendicular diameter. The relative position of the circle of cutter to diameter of cylinder might be shown by placing a ring inside a true cylinder of the same size, and then twisting one side of the ring toward one end of the cylinder, and the other side toward the other end. With a cutter running at a considerable angle, the bore might be made quite elliptical. A. The plane in which the cutter of the boring bar revolves is the plane of the diameter of the bore, and your ring, placed in the same plane, will show the cylinder to be round, as stated in our answer to J. W. on this page.

J. W. says: You state that the cylinder will be bored true but not parallel with the outside. If this be the case, will the ends of the cylinder be faced off truly with the central line of the bore, or with the outside of cylinder, supposing it to be done with the same tool? A. The end face of the cylinder will be true with the center line of the bore, that is, at a true right angle with the center line.

F. D. asks: What are the dimensions and details of Gramme's electric machine? A. It is impossible to answer this question, as there are none of these machines as yet in this country, the one ordered for the Stevens Institute having not yet arrived. When it does, we shall be glad to furnish the information desired.

A. B. E. L. asks: How can butter be kept fresh? A. The usual method employed is that of keeping the butter in a cool place in a receptacle, airtight or nearly so. A highly accomplished housekeeper says: Put the butter into a stone jar, cover it thickly with salt. Put a linen cloth over the top, and then fit on tightly a stone cover. Of course, keep in a cool place.

J. J. K. asks: 1. How can I get the greatest power in a steel horseshoe magnet, and what kind of wire should the electro-magnet be wound with? A. By touching it with your electro-magnet as near the base or curve as possible, and gradually drawing it out towards the poles; repeat the operation several times, taking care not to reverse the poles. 2. I have a battery of 12 pairs of Grove cups and an electromagnet made out of ¾ inch iron, wound with about 300 yards of silk-covered copper wire of No. 20 gage; all the power I can impart to a magnet of steel (3 inches long, 1¼ inches broad, ¼ inch thick) is to lift itself; it should lift more, but I am stuck; all I can do, it remains the same. A. Your electromagnet, if properly constructed, ought to answer the purpose. The trouble may be due to poor quality of steel of which your horseshoe is made. 3. Was the English man of war sunk at Hell Gate, New York harbor, about the year 1747, ever visited by a diver, and can it be got at?—[Will some reader, versed in local history, answer this?—Eds.]

L. B. asks: What is a cone pendulum, such as is said to be used for regulating the great telescope at Washington? A. A contrivance resembling one arm of a steam engine governor. It is driven by a turbine and revolves once in two seconds. A 6 inch flywheel is attached to the clockwork, and a brake is applied, by electricity, whenever the tendency is to revolve too fast.

F. A. S. asks: What is the correct proportion of the French meter to the United States foot? A. The meter = 3·2808992 feet.

C. W. K. asks: 1. How can I make wax into sheets for making wax flowers, and how can I give it the different colors? A. See p. 50, vol. 30. 2. Does the sun radiate light? A. Yes.

R. A. B. asks: 1. How is blood albumen prepared? A. See p. 41, vol. 24. 2. When is it best to drink blood, as soon as drawn from the ox, or after it has been stirred and the clot removed, as done for manufacturing purposes? A. It is customary to use the blood directly after it is drawn, though the remedy is not prescribed by physicians of standing.

G. B. D. asks: 1. How near does the best electromagnetic motor approach the best steam motor in point of economy? A. Steam is many times the cheapest. 2. Is it true that Dr. Page constructed a carriage and propelled it through the streets of Washington by means of electricity? A. Yes. 3. In answer to H. L. C., p. 346, vol. 30, you say the coil should not exceed an inch and a half in diameter; are your readers to understand from this that electromagnets cannot be successfully made larger than 1½ inches, everything being in proportion? A. The question was for a very small motor. 4. How much more per horse power would it cost at the present day to use electricity? A. It has been variously estimated from five to ten times in favor of steam.

R. L. says: I am constructing an astronomical achromatic telescope, but wish to make a terrestrial telescope instead. The achromatic object glass is 2½ inches diameter, and 30 inches focus, and the Huyghenian eyepiece is of a half an inch focus. What should be the dimensions of the other two lenses to make this into a terrestrial telescope, and where should they be situated? A. Place, about 2 inches in front of your eyepiece, two plano-convex lenses half an inch in diameter, one inch focus and two thirds of an inch apart, the convex sides facing each other, as in the Ramsden or positive eyepiece. 2. Could I use this astronomical for a terrestrial telescope? A. Yes. 3. Would there be any objection to it other than that of the objects being inverted? A. No.

G. T. W. asks: 1. Can you tell me whether sugar dissolved into sirup can have its power of crystallization destroyed, so as to remain uncrystallizable again? How may it be done in a simple way? A. If a solution of sugar be long boiled, it irrevocably loses its property of crystallizing. This prejudicial alteration is effected still more rapidly by the addition to the sugar of 1-20 of its weight of oxalic, citric, malic, or any of the stronger acids. 2. How is printer's gold size made? A. Take ½ lb. linseed oil, 2 ozs. gum animi; powder the gum and add gradually to the heated oil. Strain, and mix with vermilion till it is opaque. 3. What is fuchsin? Is it such a substance that it is practicable to apply it to the preservation of meat in a hot climate? A. Fuchsin is the hydrochlorate of anilin, and is used in dyeing. It very frequently contains arsenic. It is not suitable. 4. Is boric acid in small quantities added to food injurious in any way to health? A. Probably it is.

W. M. K. says: 1. There is a difference between a degree of longitude and latitude at the poles; but how much is that difference in miles, and what is the difference at 10° from the poles? A. Longitude is the distance east or west of a given meridian. All meridian lines pass through the poles, consequently there is no such thing as longitude at the poles. Latitude is the distance north or south of the equator; and as the plane of the equator is at right angles to the axis of the earth, the poles are a quadrant's distance (90°) from the equator. A degree of latitude is invariable. A degree of longitude is $\frac{1}{360}$ of the earth's circumference at the equator, and constantly decreases as we go towards the poles. At 10° from the poles the diameter of a curve whose plane is perpendicular to the earth's axis is $2(3970 \times \sin.10°) = 1378$ miles. ($3970$ = radius of earth approximately.) $1378 \times 3·1416 = 4331$ miles, or circumference of the circle. $4331 \times \frac{1}{360} = 12·04$ miles, or the length of a degree longitude. 2. What is the best proof that the earth revolves on its axis? A. There are several ways of proving that the earth revolves on its axis. Perhaps the simplest way is to fix a telescope in position on a clear night and watch the stars cross the field of view. Or else place yourself behind a pole or other fixed object and notice the stars as they seem to pass behind the object and re-appear on the other side. 3. At what place is the Mississippi river the broadest? A. At the mouth. 4. Why are the polar circles and the tropics drawn upon the globe? A. The tropics are two parallels of latitude, one on the north and the other on the south of the equator, over every point of which, respectively, the sun in its daily course passes vertically on the 21st of June and 21st of December in every year. Their latitudes are about 23° 28′, respectively north and south. The arctics are two small circles or parallels of latitude 23° 28′ from the poles. They indicate the limit or boundary of that region about each pole where the sun is above the horizon during the entire day (24 hours) once in a year. 5. Can there be thunder and lightning without a cloud in the sky? A. There may be thunder and lightning from clouds which are not seen. In that case we see simply the reflection of the lightning upon the sky. 6. What is the proper temperature of a schoolroom or dwelling to promote health and comfort? A. From 55° to 70° is a good temperature for a schoolroom. 7. Is there any substance that will remove stains of whitelead paint out of carpet or clothing without injuring the fabric? A. Benzine or turpentine will remove white paint stains.

W. N. W. says: 1. I am desirous of heating to redness a piece of platinum wire, ¼ of an inch and $\frac{1}{100}$ of an inch in diameter, by the electric current. I am familiar with the heating effect of the battery current, but do not wish to use this plan. Can I heat the wire by a frictional machine operated by hand? A. Not without considerable expense and large apparatus; besides, they are never free from danger. 2. As I wish to be able to heat the wire in a few moments at any time, I think a magneto-electric machine would be the thing. Economy of space is very important. What are the required dimensions for such a machine? Which method of developing the current will occupy the least space? A. You might use a magneto-electric machine, but we think a small battery would answer your purpose better, such as a Smee, with carbon plates about 10x12 inches. 3. What is the very smallest surface of zinc that will heat the wire? A. About 500 or 600 square inches. 4. How small a magnet and armature revolved by hand will answer the purpose? A. About two feet, and an armature containing about fifty yards of wire; of course the temperature of the wire would depend upon the number of revolutions per minute made by the armature.

R. W. C. asks: 1. What size are toy balloons? A. About 6 inches in diameter. 2. How many pounds will one that contains one cubic foot of hydrogen raise from the ground? A. About 495 grains, supposing the india rubber to have no appreciable weight. 3. How often must they be replenished, if at all? A. There is no rule. It depends upon the rate at which diffusion takes place through the india rubber film. 4. Which is the cheapest way of preparing pure hydrogen, and what is the proportionate yield? A. From zinc and dilute oil of vitriol. Sixty-five pounds of zinc should yield two pounds of hydrogen.

O. O. O. asks: How can I make ordinary exploding powder to hiss or burn slowly? A. Mix powdered charcoal with it.

C. T. asks: How can I clarify beer? A. Take isinglass, finely shredded, 1 lb., sour beer, cider, or vinegar 3 or 4 pints; macerate together till the isinglass swells, and add more of the sour liquid until a gallon has been used. Strain and further dilute. A pound of good isinglass should make 12 gallons finings, and 1½ pints finings is enough to clear a barrel of beer.

W. N. J. says: A certain philosopher states that "the moon has either no atmosphere at all, or one exceedingly rare, and not extending more than a mile from its surface. Hence it must be destitute of water, for any liquid on its surface would long since have been dissipated by the heat of the lunar days, there being no atmospheric pressure to check evaporation. If there were any water on the surface of the moon, clouds would certainly be observed at times dimming its face." 1. I ask for information through the SCIENTIFIC AMERICAN. Supposing water in the shape of lakes to exist on the surface of the moon, how could evaporation take place, and clouds float, to dim the moon's surface, if there were not an atmosphere having a certain pressure through which vapor could rise and form clouds? A. The elastic force of a vapor which saturates a space containing air or gas is the same as in a vacuum. 2. Does evaporation check by atmospheric pressure, or does this pressure assist evaporation? If the moon has no atmosphere, and water exists to a considerable amount, it would certainly not be dissipated, but heaped up mountain high by the expansion of particles during a day of three hundred hours of intense solar heat, and then subside again during the following long night, and of course escape detection by the closest observers. A. The rapidity of evaporation is inversely as the pressure upon the surface of the evaporating liquid, that is, pressure diminishes evaporation.

P. R.—B.'s cheap telescope, described in No. 1, vol. 30 of the SCIENTIFIC AMERICAN, is an interesting experiment. You had better buy an achromatic objective, if you can afford it; if not, save your eyesight and money.

F. asks: 1. Of what diameter ought a double acting force pump to be for a 2 inch supply pipe? A. Four inches. 2. Should the discharge pipe be of the same diameter as the supply pipe? A. Yes. 3. Must the air chamber of a pump stand upright if the pump be placed at an angle? A. Yes.

E. P. F. asks: 1. If a globe made of sheet metal, 10 feet in diameter, weighs when full of air 1,000 lbs., how much less would it weigh after exhausting the air so to form a perfect vacuum? A. About 40 lbs. 2. What outside pressure would it have to sustain after the air was exhausted? A. 14·7 lbs. per square inch of surface, or about 650,000 lbs. in all.

L. D. says: 1. The balls we have been using in a ball mill are of cast iron, and weigh on an average 24 lbs. each, diameter being 5¾ inches. What should be the weight of a solid ball of cast iron of that size? A. About 24 lbs. 2. Is there any difference in the weights of steel and cast iron balls of the same dimensions? A. The steel ball would be about 2 lbs. heavier. 3. Is a life of Robert Fulton published in the United States? A. There are several works on this subject. See our advertising columns for booksellers' addresses.

S. R. asks: How can I cut window glass to an oval shape? I have a glass cutter, but find it will not cut without several failures, breaking plenty of glass. A. Use a good diamond.

D. asks: What will be the volume of steam at atmospheric pressure, evolved in the conversion of any given volume of water, and what the volume of oxygen and hydrogen at same pressure, evolved in the decomposition of the same quantity of water? A. Supposing that a cubic foot of distilled water at 212° Fah. is converted into steam, and also decomposed into its constituent gases at the same temperature: The volume of the steam formed from this water will be 1,572 cubic feet; the volume of oxygen, 823 cubic feet; the volume of hydrogen, 1,621 feet.

J. E. asks: I saw in your journal a description of a wonder camera; and I have been endeavoring to make one, using an opera glass objective of about 7 inches focus and 1½ inches diameter for a lens, and an argand gas burner. It will throw upon the screen an ordinary card photograph of about 3 feet high pretty fairly, but the image is not distinct enough. What kind of lens and of what size and focus should I use to obtain the best results with an argand gas burner? Will such a burner give light enough, with a proper lens, to make a clear, distinct picture on the screen 5 feet in high? A. Lantern objectives and condensing lenses are described in back numbers of the SCIENTIFIC AMERICAN. Place a number of burners in a straight line, one behind the other, as flame is nearly transparent.

S. N. M. asks: What astronomers have observed any solar eruptions, having an upward velocity of 600 miles a second? When were such observations made? I suppose that 166 miles a second (Professor C. A. Young's statement) is the greatest observed velocity. A. The observations of Professor C. A. Young, September 7, 1871, indicate more than this velocity. At each explosion we see an eruption of hydrogen. Masses of other metals may precede or accompany it, in a semi-liquid or gaseous condition. They are not seen in the spectroscope while we look at one of the hydrogen lines with a wide slit.

A. F. C. says: I have a 3 inch achromatic telescope of 48 inches focus; and with the Huyghenian eyepiece I get a power of about 120. How high a power will it stand, and how must I construct the eyepiece? A. Probably 200. Then 48 inches ÷ 200 = 0·24 inch = equivalent focus of eyepiece. Focus of field lens will be twice this, or 0·48 inch. Focus of eye lens will be one third of focus of field lens, or 0·16 inch, and the two plano-convex lenses will be 0·48 − 0·16 = 0·32 inch apart.

I. G. W. asks: 1. I have an achromatic object glass 2 inches in diameter and 36 inches focus. Of what focus and what distance apart should the eye lenses be to obtain the strongest power compatible with distinct vision for a celestial eyepiece? A. Field lens, of three fifths of an inch focus. Eye lens, one fifth of an inch focus. Distance apart, two fifths of an inch. Equivalent focus, three tenths of an inch. Power, 120. 2. What additional lenses, and what distance apart would it be necessary to add to make a terrestrial eyepiece? A. Two Huyghenian eyepieces make a good terrestrial one. The lowest power is placed about twice the sum of the equivalent foci of the two eyepieces in front of the other. 3. In your answer to N. B. in your issue of May 9, you mention the two eye lenses as being respectively ¾ and ½ inch focus, and the ½ in its own focal distance within the focus of the other, and further say they will be ¼ inch apart. Is this an error, or should the measurement be from the glass instead of the focus? A. In our reply to N. B. May 9, we should have written "eye lens, ¼ inch focus," as is evident from the context.

A. P. W. asks: 1. Can the vapors of coal oil be condensed by cold water? A. The vapors of coal oil can be condensed by passing them through a tube surrounded by cold water. 2. What kinds of gases are used in gas engines? A. Common illuminating gas mixed with air has been used in gas engines. The mixture is ignited by an electric spark. Some of the hydrogen formed by the ignition united with oxygen of the air, forming water; this produces heat, which expands the gases and drives a piston.

W. M. B. says: I want to paint a disk, 2 feet in diameter, with the seven prismatic colors, in such a manner as to make the surface appear white when I revolve it fast. What proportion of each color must I use? How shall I divide the disk in a proper manner? A. Divide the circumference of your disk into 6 equal parts. Then draw radial lines from the center to each of the 6 points. In the center of the disk, paint a round black spot about 3 or 4 inches in diameter; also paint a narrow black rim on the edge of the disk. In each of the six spaces formed by the radial line, paint the seven prismatic colors; you will thus have six spectra. In a spectrum, the orange occupies the least extent; if, therefore, you make this the unit, the extent occupied by the colors will have the following relation: Violet 4·16, indigo 2·40, blue 2·50, green 2·87, yellow 1·08, orange 1·00, red 3·33.

D. I. F. asks: 1. What is best to kill the effects of nitric acid on the teeth, so as not to hurt the enamel? I have been using said acid on my tongue. A. When the enamel is gone, the dentine is rapidly affected by the secretions of the mouth, especially when the system is not in a healthy condition. Soda is too powerful in its alkaline reaction. Repeated gentle rubbing with a soft brush and a harmless dentifrice like precipitated chalk would be better. 2. How can I detect cider which is not made from apples? A. If you suspect that it is made from oil of vitriol, the latter may be detected, with proper precautions, by chloride of barium.

B. M. K. Jr. says: 1. I constructed a telescope according to the plan given on p. 7, vol. 30, of the SCIENTIFIC AMERICAN. For the object glass I have a meniscus of elliptical form, 1¼ by 1¾ inches in diameter and 3½ feet in focus. The eye glass is a plano-convex lens of 1½ inches in diameter and 1 inch in focus. So far I have failed to produce a perfect object. There is a great deal of prismatic color, and the rays of light seem to produce different foci. What do you think is the matter? A. An elliptical lens cannot be properly figured; besides, your objective is not achromatic. 2. As the hole in the tube is circular, does it make any difference of what form the object lens is? A. A diaphragm which cuts off any part of the aperture of an object glass reduces the amount of light passing through it. 3. Can you tell me how to polish a lens that has become scratched? A. To polish a lens, turn a wooden disk with broad handle to the proper curvature; paint the disk with a mixture of pitch and rosin just dented by the thumb nail when cool. Cut grooves across the pitch, dividing it into one inch squares with diagonal grooves across the squares. Warm, and press quickly on the lens with a piece of paper between them. Wash off adhering paper if necessary. Then coat with moist rouge and rub the lens with hypocycloidal polishing strokes while walking round it. Five minutes rubbing will suffice to destroy the figure of any object glass. Herr Steinheil showed us a scratch on a two inch lens which he said would take the workman half an hour to polish out. 4. Will the so-called furniture polish spoil the varnish on a pianoforte? A. No.

C. K. asks: 1. Of what could I make a box, to keep matches on a sheet iron mantle from catching fire? A. Of some poor conductor, such as china, porcelain, glass, plaster of Paris, etc. 2. What is the specific gravity of a piece of elmwood weighing 2 ounces, with a piece of lead attached to it weighing 4 ounces, and how can I find the specific gravity? A. The specific gravity of your piece of elmwood can be found by the following equation: Specific gravity $= \frac{2}{6 \div (x + 56)}$, where $x$ equals the sum of the weights of the wood and lead in water. 3. Why is it that some lenses show objects upside down? A. Because their action on light is to bring its rays to a focal point where they cross each other, and for this reason the image appears inverted. 4. How can I make a good battery? A. See p. 379, vol. 30.

S. T. asks: How can I bore a journal box to fit a V-shaped journal, and have it quite true, so that it will be exactly the same angle in each half of the box, and one angle true with the other? Are there any special machines for such purposes? Having only a compound rest lathe, the box must be chucked twice, and cannot be set quite true. A. There are no special tools for such a purpose, but your lathe will answer the purpose by the following method: Set the head of the compound rest to the required angle and bore out the front end of the journal box. Then cross the belt of the lathe so that it will run backwards. Use a tool bent round to the right and bore the back half of the box from the right hand side of the box (that is, the opposite side from which the front end was bored), by which method of procedure the box will only require one chucking and is certain to be quite true. Another method is to turn the tool upside down without crossing the lathe belt, and turn the back end of the box from the right hand side as before, but this renders the tool more liable to spring and jar; the first method is therefore preferable, but the rest requires in either case no alteration of its angle to perform the duty on both angles.

H. P. says: I have a cedar tank for rain water for washing purposes, and the water is foul, smelling principally of cedar, mixed with stale or stagnant smells. What shall I do to renovate it? A. We have seen the following recommended: Sprinkle a tablespoonful of powdered alum in a hogshead of water, stirring the water at the same time, then let the water stand for a few hours. If, upon trial, this should not be satisfactory, let us know what results you do obtain, and a method suited to the requirements of this case will be recommended.

J. A. asks: Can you tell me of any preparation (except bismuth and rose water) that can be used for whitening a clown's face, and which will not be injurious? A. We do not know of any that will answer as well.

C. P. says: I am a manufacturer of paper goods and use many different knives. Can you favor me with a recipe for a mixture that I can apply to the interior of the knives that will cause the paper to leave them freely, and yet not soil the paper? A. We have applied to a number of paper houses but find that they use nothing for this purpose. You had better apply to some practical chemist.

J. N. H. asks: 1. Can you give a recipe for making white ink to write on colored paper with a steel pen? A. One part muriatic acid and twenty parts starch water. Very dilute oxalic acid may also be used. 2. How are rubber hand stamps made? A. A number of manufacturers have been visited, and they all decline to explain their processes.

O. C. K. asks: Can you give me a recipe for a wash, to be applied externally to the skin, to keep mosquitoes away? A. Make an extract of pennyroyal, by boiling in a limited quantity of water for a short time, and when cool add a small quantity of glycerin. We do not know of anything that will remove tattoo marks without injuring the skin.

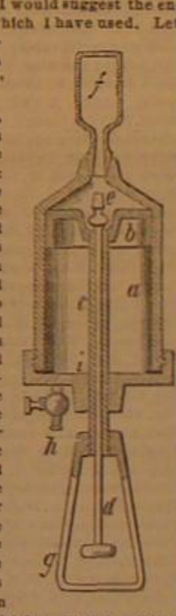
W. F. asks: How can I make the adhesive fly paper? A. A mixture of molasses and linseed oil will answer.

R. K. asks: Can you give me a good shape of furnace for heating locomotive springs to reset and temper them? A. Make a brick furnace somewhat longer than the spring plates, with the blast entering at the bottom, and the chimney having communication with each end of the furnace. Make coke (for use in the furnace) by banking up coal on a blacksmith's fire and burning the gas out of it, which coke will give you a clear fire in your furnace. The top of the furnace may be made to remove, so as to set thereon a tank of oil for tempering the plates.

J. S. H. asks: 1. What is a cheap, simple, and speedy method of utilizing bones on the farm as manure? A. The following plan has been suggested for utilizing bones: Place them in a large kettle filled with ashes, with about one peck of lime to a barrel of bones. Cover with water and boil. After twenty-four hours, nearly all the bones will be soft enough to be pulverized by hand. The rest may have to be boiled ten or twelve hours longer. When pulverized they will be in the form of paste, and suitable to mix with other manure. 2. What is a good process for converting molasses into vinegar? A. Vinegar may be made by mixing 16 parts of pure water, 1 part of sirup of molasses, and 1 part of baker's yeast at a temperature of about 80° Fah., and keeping the compound in a warm atmosphere from ten to thirty days. A little old vinegar added on the second or third day will aid the process.

C. J. M. asks: What will make and keep rain water sweet in a clean wooden cistern? I put one bushel of charcoal in each cistern, but it does not sweeten the water. If charcoal is good, how much and how often should it be renewed? A. If your cistern is clean, and the water also when it goes into the cistern, the impurity is due to the vegetable matter taken up from the wood of the cistern. If you use charcoal to purify it, the best way will be to filter the water through it. Alum is a more effectual agent for purifying the water. A drachm of pounded alum to a gallon of water is sufficient. After twenty-four hours the water will be cleansed. All wooden vessels to hold water should be charred inside.

A correspondent says, in reply to W. C. L., who asked in our issue of June 13, how to procure a vacuum in a common bottle: "I would suggest the enclosed plan, a modification of which I have used. Let *a* represent a cylinder, *b* a piston, *c* a hollow piston rod, *d* a sliding rod for holding stopper, *e* a stopper, *f* a bottle, *g* a stirrup for withdrawing piston, *h* a discharge cock, *i* a cap which screws on to the cylinder. The mode of operation is as follows: Remove the cap, *i*, and fill the cylinder with water, replace the cap (which should be packed with rubber) and, while in this position, withdraw the piston until water appears all around it on the opposite side; also open the cock, *h*, and allow all air to escape. The apparatus should then be reversed, and placed upon a bracket for convenience in operation, and the space over the piston should be filled to overflowing. The bottle may then be filled and the stopper dropped in and pressed tight enough to keep its place when reversed. The stopper should be ground, as also the bottle, to fit their places. The bottle is then inserted in the cylinder, expelling the surplus water as it enters: and when





firmly set, the stopper may be withdrawn by the sliding rod, *d*, which has a recess at the end to fit it. Now the piston may be withdrawn as quickly as convenient, the cock, *h*, being opened until the water has all left the bottle, when the stopper may be inserted by the rod, *d*, and the bottle removed. Solids may be introduced during this operation, and fluids at any time. The success will depend upon the scientific and mechanical accuracy of the operator, as the air must be expelled from the water, and care in manipulating must otherwise keep it out."

H. writes to corroborate I. F. B.'s statement concerning the water in the Humboldt and other valleys of Nevada being of a uniform level at various points in the valley, and that, if the streams were straightened and the level lowered by drainage, the frosts and damp and chilly nights would disappear, and farming be much more successful. "I have often observed the same fact in every portion of Nevada and in some parts of California; while here in Montana, we find that the water is never found lower than our streams, rising and falling with them, and in no month of the year can we be sure that we will not have frost. My experience, however, would lead me to differ from him very materially as to the cause and use of different means for the protection of vegetable life. I claim that the air is too dry. It allows the heat from the land to radiate into space with very little or no resistance. I think that I. F. B. will bear me out in this, that we are more liable to have severe frosts after a hot, dry day than after a cold and damp one, and more liable in a clear, still night than a cloudy or windy one. I have suffered intensely from heat two hours before sundown in some of those Nevada valleys, while two hours after it I was suffering just as much from cold. The air was very dry, allowing the heat of the sun to pass through it without resistance, and making the earth very hot; and when the supply was cut off, it would return with equal rapidity over the same free road. I think this is in accordance with Professor Tyndall's thorough and carefully conducted experiments on the subject (See Lecture IX, p. 373, of his work, "Heat as a Mode of Motion"), and I think that he gives us the true theory of frosts in the same work, p. 413. I would say it is the custom here when we anticipate a frost to irrigate or run the water quickly over the surface if possible. I have frequently saved my garden from frost when everything was cut down more or less around it, and that under circumstances that cannot all be accounted for in any other way than that the vapor rising forms a mantle or covering, preventing rapid radiation and thus saving the plants. There are many of your western readers that are deeply interested in this question. Agriculture in the mountains is fast becoming an important industry, and our great banes are early and late frosts. Perhaps some other readers could throw additional light upon the subject."

S. P. says, in answer to S. C. H., who wishes to mount a drawing on a paper background, and then varnish the surface: Paste the drawing on the background. Flour paste is as good as any; and when it is dry, size the surface with a solution of gum arabic or white glue. When that is dry, use any varnish you please. For a delicate picture or drawing, dammar varnish is the best; but it must be applied rapidly to secure an even surface.

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M. R. H. asks: How can I render hard, and unaffected by heat, beechwood lasts which are daily subjected to 12 hours dry heat at a temperature of 200° Fah.? Common wooden lasts, undergoing this treatment, in a few months become dry and almost charred the edges break off and they are unfit for use.—C. L. asks: What is the best way to can green corn and green peas?—H. J. asks: Is animal life visible, by the use of the microscope, in the water from hot springs as well as in cold water?—A. E. B. asks: 1. How can I cover the glazing on potter's ware with silver or mercury, so as to make it a reflector of light? 2. Of what is the ash which remains after lead has been heated above melting point for about twelve hours, composed?—H. D. M. asks: How can I apply paraffin to make canvas waterproof? What shall I put in the paraffin to make it of a dark color?—S. C. H. asks: How can I prepare mocking birds' food?—J. A. J. asks: How can I make an aquarium?—W. E. L. asks: How can I line iron water tanks, to prevent rust in the water?—G. O. C. asks: How can I remove the blue color from polished steel?—H. D. M. asks: How can I clean petroleum barrels, so as to make them fit for holding cider, etc.?

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## COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

On Feathered Arrow Heads. By F. E. M.
On Aerial Navigation. By G. W. M.

Also enquiries and answers from the following:

O. D. O.—E. T.—M. P.—C. S.—G. J.—W. C. L. G.—J. M. G. B. A.—E. P. W.—A. W. H.—O. S.—J. B.

## HINTS TO CORRESPONDENTS.

Correspondents whose inquiries fail to appear should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them. The address of the writer should always be given.

Enquiries relating to patents, or to the patentability of inventions, assignments, etc., will not be published here. All such questions, when initials only are given, are thrown into the waste basket, as it would fill half of our paper to print them all; but we generally take pleasure in answering briefly by mail if the writer's address is given.

Hundreds of enquiries analogous to the following are sent: "Please to inform me where I can buy sheet lead, and the price? Where can I purchase a good brick machine? Whose steam engine and boiler would you recommend? Which churn is considered the best? Who makes the best mucilage? Where can I buy the best style of windmills?" All such personal enquiries are printed, as will be observed, in the column of "Business and Personal," which is specially set apart for that purpose, subject to the charge mentioned at the head of that column. Almost any desired information can in this way be expeditiously obtained.

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[OFFICIAL.]

# Index of Inventions

FOR WHICH

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WERE GRANTED IN THE WEEK ENDING

## June 30, 1874,

AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

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## APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

30,191.—Paper Bag Machine.—H. G. Armstrong. Sept. 16.
30,233.—Martingale Ring.—D. W. C. Lockwood. Sep. 16.
30,360.—Propeller.—H. Stanley. September 23.

## EXTENSIONS GRANTED.

29,012.—Horse Rake.—F. Seidle *et al.*
29,085.—Sewing Machine.—J. First.

## DESIGNS PATENTED.

7,504.—Pitchers.—J. B. Atterbury *et al.*, Pittsburgh, Pa.
7,505.—Collar Box.—E. J. Frost, Philadelphia, Pa.
7,506.—Frame Corners.—P. J. Hardy, New York city.
7,507.—Hanging Baskets.—A. H. Hews, Cambridge, Mass.
7,508.—Show Cases.—A. Lange *et al.*, St. Louis, Mo.
7,509.—Monuments.—A. E. Perrin, Central Falls, R. I.
7,510.—Paper Clip.—D. F. Smith *et al.*, Haverhill, Mass.
7,511 to 7,513.—Fountains and Vases.—W. Tweeddale *et al.*, Brooklyn, N. Y.
7,514 & 7,515.—Stoves.—J. Benner, Philadelphia, Pa.
7,516 & 7,517.—Labels.—J. D. Frary, New Britain, Conn.
7,518.—Thermometer Back.—G. Gano, Cincinnati, Ohio.
7,519.—Range.—J. Martino, Philadelphia, Pa.
7,520 to 7,522.—Oil Cloths.—C. T. Meyer *et al.*, Bergen, N. J.
7,523.—Head Lights.—J. Radley, Brooklyn, N. Y.
7,524.—Band Comb.—W. Mullee, Chesterfield, Pa.

## TRADE MARKS REGISTERED.

1,852 to 1,854.—Glue, etc.—Baeder & Co., Philadelphia, Pa.
1,855.—Wearing Apparel.—Caswell & Co., Hartford, Ct.
1,856.—Tobacco.—Frishmuth & Co., Philadelphia, Pa.
1,857.—Lubricating Oil.—A. B. Hinman, Detroit, Mich.
1,858.—Horse Brushes.—C. W. Maguire Brush Co., Brooklyn, N. Y.
1,859.—Iron Ores.—York Co. Iron Co., Pa.
1,860.—Wrought Iron & Steel.—York Co. Iron Co., Pa.
1,861.—Refined Lard.—W. J. Wilcox & Co., N. Y. city.

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## CANADIAN PATENTS.

List of Patents Granted in Canada

July 6 to 8, 1874.

3,590.—J. Corbett, Hartford, Hartford county, Conn., U. S. Improvements in registering ticket punches, called "Corbett's Improved Registering Ticket Punch." July 6, 1874.

3,591.—A. Jeffery, Guelph, Wellington county, Ont. Improvement in looking glass holder, called "Jeffery's Improved Looking Glass Holder." July 6, 1874.

3,592.—P. Trudeau, Ottawa, Carleton county, Ont. Améliorations aux établis de ménuisiers, dit "Etablis Trudeau." (Improvements in Joiner's Bench." July 6, 1874.

3,593.—R. B. Underhill, Corinth, Alcorn county, Miss., U. S. Improvements in apparatus for extracting coffee, called "Underhill's Improved Coffee Extractor." July 6, 1874.

3,594.—J. Young, Goderich township, Huron county, Ont. Improvements in couplers for coupling the rods or shafts of threshing machines and other machines, called "Young's Safety Coupling." July 6, 1874.

3,595.—J. E. Sanders, New Bedford, Bristol county, Mass., U. S. Improvement in flower pots, called "Sanders' Improved Flower Pot." July 6, 1874.

3,596.—J. Davis, St. Paul, Ramsey county, Minn., U. S. Improvements in pipe stems, called "Davis' Pipe Stem." July 5, 1874.

3,597.—M. Bryant, Northport, Suffolk county, N. Y., U. S. Improvement in windlasses for presses, called "Bryant's Improved Windlass Press." July 6, 1874.

3,598.—L. B. Bishop, Horton, Nova Scotia. Improvement on a machine for spinning wool and cotton, called "Bishop's Improved Spinning Wheel." July 6, 1874.

3,599.—J. H. Steiner, Albany, N. Y., U. S. Improvements on fire extinguishers, called "Steiner's Repeating Fire Extinguisher." July 6, 1874.

3,600.—F. R. Smith, Bennington, Bennington county, Vt., U. S. Improvements in bed springs, called "F. R. Smith's Bed Spring." July 6, 1874.

3,601.—J. Brooks and A. Bourassa, Coaticook, Stanstead county, P. Q. Washing machine, called "Brooks & Bourassa Lightning Washing Machine." July 6, 1874.

3,602.—W. Clark, Brampton, Ont. Useful clothes line, rope, and other fastener, called "Clark's Clothes Line, Rope, and other Fastener." July 6, 1874.

3,603.—J. H. Wentworth, Boston, Suffolk county, Mass., U. S. Improvement in stoves, called "Wentworth's Improvements in Stoves." July 6, 1874.

3,604.—Mrs. H. R. Tracy, New York city, U. S. Improvements in sewing machine cabinets, etc., called "Mrs. H. R. Tracy's Sewing Machine Cabinet." July 6, 1874.

3,605.—D. Ashbury and E. A. Osborne, Charlotte, Mecklenburg county, N. C., U. S. Improvements on apparatus or process for bleaching, washing, making extract, and for other analagous purposes, called "Ashbury's & Osborne's Apparatus and Process for Bleaching, Washing, Making Extract, etc." July 6, 1874.

3,606.—H. M. Skinner, Rockford, Winnebago county, Ill., U. S., and L. W. Doty, Marengo, McHenry county, Ill., U. S. Improvements on sulky or riding plows, called "The Skinner Riding Plow." July 6, 1884.

3,607.—M. May and F. May, Springfield, Clark county, O., U. S. Improvements on clothes wringing machines, and benches therefor, called "May's Wringing and Wash Bench." July 6, 1874.

3,608.—C. Wheeler, Jr., Auburn, Cayuga county, N. Y., U. S. Improvements on combined or interchangeable reaping and mowing machines, called "Wheeler's Combined Reaping and Mowing Machines." July 6, 1874.

3,609.—W. N. Whiteley, Springfield, Clark county, O., U. S. Improvements on machines for reaping and mowing, called "The Champion Harvester." July 6, 1874.

3,610.—J. W. Cuthbertson, Brantford, Brant county, Ont. Improvements on the mops used for scrubbing floors, etc., called "Cuthbertson's Self Wringing Mop." July 8, 1874.

3,611.—A. Burbank and H. E. Shafler, Rochester, Monroe county, N. Y. Improvements on lamps, called "Burbank's Kerosene and Air Light." July 8, 1874.

3,612.—J. Hughes, Bloomington, McLean county, Ill., U. S. Improvements in machines for repairing boiler flues, called "Hughes' Machine for Repairing Boiler Flues." July 8, 1874.


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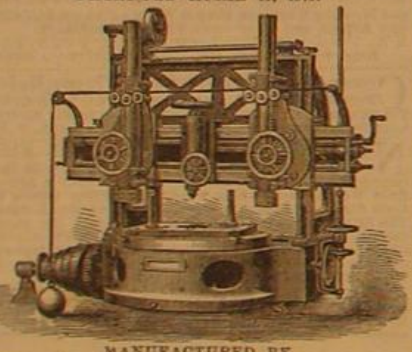

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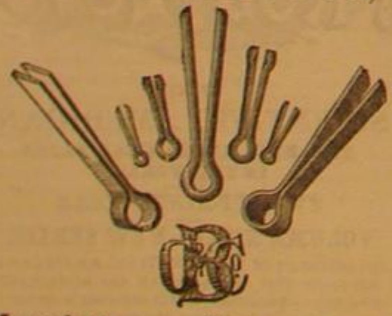

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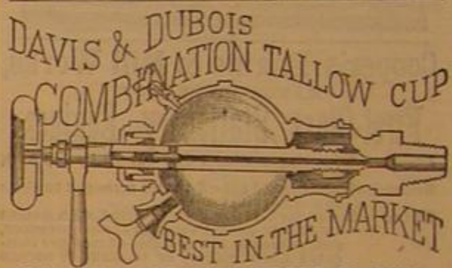


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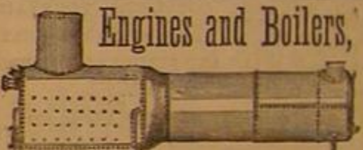

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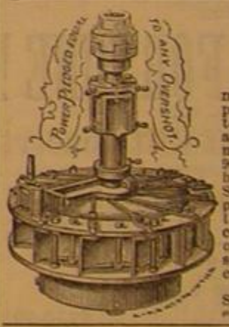


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