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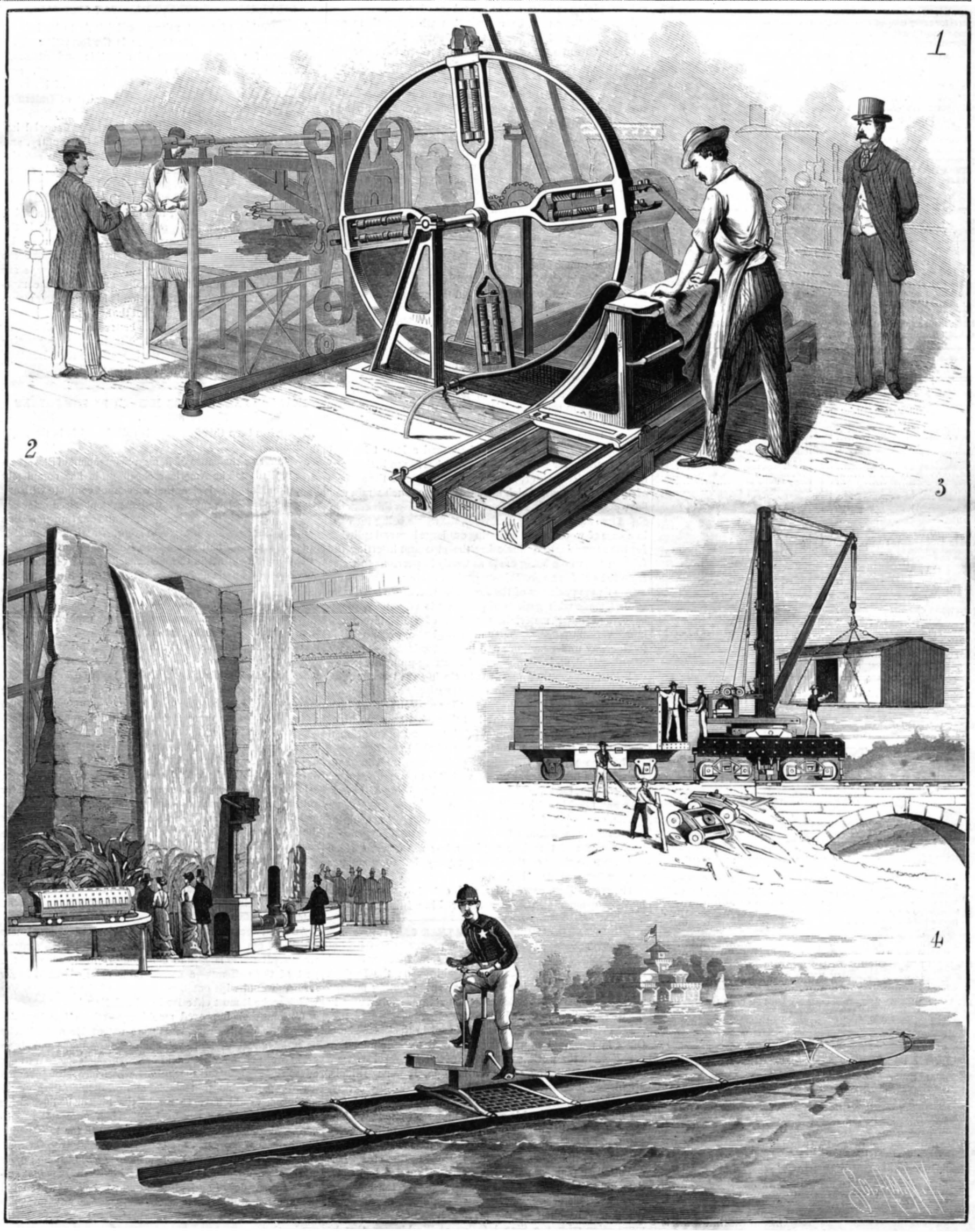

NOTABLE EXHIBITS AT THE NEW ENGLAND FAIR.—[See page 372.]

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Contents.

(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 362,

For the Week ending December 9, 1882.

Price 10 cents. For sale by all newsdealers.

PROGRESS OF THE STREET STEAM SUPPLY IN NEW YORK CITY.

The laying of steam pipes in the streets of the lower part of our city has made rapid progress the past summer and fall, almost too rapid, we think, to be substantial and free from the every-day mishaps now occurring. Defective pipe and fittings and misjudgment in the selection of material for packing the flanges, together with insufficient testing before the closing of the trenches, has resulted in the blowing out of joints, the breaking of flanges, and the digging up and blockading of the streets over and over until the patience of the mercantile community is wellnigh exhausted. The spirit of rivalry between the companies has been carried to the reckless extent of doubling the lines of pipes in many streets, to the detriment of all other franchises and interests without giving satisfaction to the takers of steam.

Although there may be competition wherever there are rival lines, as well as the cutting of rates, the gain is not equal to the nuisance of the continued disturbance of the streets and increased temperature of the water supply from the proximity of so many steam pipes.

Is there not room enough for the expansion of two live steam companies in our great city without doubling up their lines of steam pipes under our streets to the detriment of all other interests?

The blockade of the streets alone by one company is a nuisance, and what must it be when the rival company repeats it; but when packings blow out to such an extent as to fill the streets with steam and jeopardize life, it becomes time to suspend the extension of the lines, and endeavor to perfect the work already done.

The general plans of distribution of the two steam companies are nearly the same, but the details of the laying of the street mains vary somewhat. The flange packings of the New York Company are corrugated copper gaskets or washers. These have so far proved the best that have been tried, but the paper gaskets upon the valve bonnets have been the cause of several blowouts. The expansion joints of this company are disks of copper fastened by their inner edge to the end of a line of pipe, and by their outer edge to a short flanged cast iron cylinder, making a flexible joint upon the same principle as has been so long in use upon the main steam pipes of our large steamers; the same arrangement in principle being also in use for accommodating the unequal expansion in the steam and exhaust connections of large cylinders.

This class of expansion joints have had a long trial, and found faultless for small variations, but having so little range they are hardly a criterion by which to judge of the success of the copper ones, which are subjected to much strain and flexure. The line-pipe is felted or covered by a thickness of about two inches with mineral wool, the whole being inclosed in a case of wood, made by boring out large logs and splitting for the convenience of inclosing the pipe and inserting the felting; the whole being made as nearly impervious to water from the outside as possible by asphalt felting.

The flange packings of the American Co., as we hear, were at first made with gaskets of compounds of rubber, plumbago, and other materials, a variety of which are made under various patents. They are too plastic, and are liable to give way under pressure and heat before they become set or vulcanized, and therefore require setting up by the screws or bolts for some time previous to closing the trenches. A few hours' testing with an inadequate supply of steam upon small sections is entirely insufficient for perfecting the joints. We understand that asbestos is being tried as a packing, but we fear that it is too frail a fabric to stand the continued pressure and the flexure from large and rigid pipes.

The line pipe of this company rides upon friction rollers within a box of heavy plank, which is thoroughly treated with coal tar, the top and bottom of the box being laid crosswise and filled in with pulverized charcoal.

The expansion joints are of the sliding type, made of brass or composition, with brass bearings. They have a great range, and therefore require a less number in a given distance than those of the other company, but the packings require frequent attention.

The regulations, capabilities, and extent of steam supply by these companies, will be considered in a future article.

GENERAL AND LOCAL WEATHER SERVICE.

A convention of volunteer weather observers was held at Indianapolis, Ind., November 15. Governor Porter opened the exercises with an interesting address on the Indiana Weather Service, tracing its history and pointing out the value of the services rendered by the volunteer observers in the seventy-six counties of the State.

Lieutenant Dunwoody, First Assistant in the Chief Signal Office in Washington, who was presented to those intending to engage in the work, said that State weather services were organized during the past year in Ohio, Indiana, Illinois, Michigan, Kansas, Nebraska, Missouri, and New Jersey. The most perfect State service is that in Iowa, which was the first organized, and is operated under a State law. The object of the State service is to observe and utilize every feature of the weather that affects the prosperity of the inhabitants of the State as to crops, health, life, etc. It is essentially a plan for gathering and utilizing local climatic data, and eventually it will define precisely the localities most favorable or unfavorable to special crops, diseases, and the like. The chief of the service should be in such communication with the Signal Office at Washington that he would be able to receive and disseminate any information of importance, such as predictions of frosts, tornadoes, and floods. The service was organized in Indiana last spring, and is the most extensive of its kind in any one State. Excellent work from it is expected.

The frost warnings lately inaugurated for the benefit of the fruit, cotton, and tobacco growers have proved of great value to agriculture, and similar warnings for other interests are soon to be inaugurated. The department at Washington regards the Indiana service as one of the best of these, as the reports show great skill and proficiency in the work. These State services will soon prove of very great advantage in making deductions and predictions regarding weather conditions, and will have an important influence on agriculture.

CONVENTION OF STREET RAILWAY OFFICIALS.

A convention of street railway officials is to be held in Boston, December 12. Its purpose is the formation of an association for the promotion of scientific and practical knowledge relating to the construction, equipment, and management of street railways; an interchange of information and ideas, and the cultivation of a spirit of fraternity among those engaged in street railway enterprises.

Considering the wide extent and enormous financial importance of the street railway interests of the country, and the number of men employed, the field for such an association is manifestly a large and inviting one. Properly organized and conducted, the proposed association cannot fail to be of advantage, both to the street railway service and to the public. If, on the contrary, it is to be pervaded by a spirit of opposition to inventors and their improvements in the means and methods of the service, after the fashion set by certain other railway organizations, it had better never come into existence. From their very nature, street railways are apt to be measurably if not wholly exempt from competition, and where serious competition is lacking, their managers are not apt to be over-eager for the adoption of improvements primarily intended for the better accommodation of the public. Closer intercourse with their more progressive associates may help to stir up the laggards to the advantage of both the companies and the traveling public.

HOW OUR FARMERS ARE HELPED BY THE PATENT SYSTEM.

There has been this fall what is called a crisis in the grain trade of Russia.

When asked the cause of it, a grain merchant of St. Petersburg replied: "The American cheap grain has completely undermined us. It is clear that we cannot compete with our transatlantic friends, at least under present circumstances. Our agriculture is in a primitive state, and our transportation is in its infancy. In spite of dear labor, American grain costs the producer only half as much as Russian grain."

This great contrast in the relative situations of the grain merchants of Russia and America but faintly illustrates the contrast in the positions of the farmers of the two countries.

With American facilities for cheap and rapid transportation, the price of grain at the farm much more nearly approximates the seaboard price than is the case in Russia. In other words, while it does not cost the newly immigrated Russian farmer in the West half as much to raise a bushel of grain as it does his brother in Russia, he gets for it a far greater share of the Liverpool market price; and all other American farmers enjoy the same advantage over their chief competitors for the export grain trade of the world.

These advantages are in no way due, it will be observed, to the superior skill or thrift of the farmer himself. He has at command—thanks to the geographical position of his farm—better means for producing and handling his crops and for getting them to market. These alone give him his commanding position; and for these he is indebted entirely to the activity of our inventors and manufacturers. The concurrent testimony of all our inventors and manufacturers is that their productive activity has been greatly stimulated and sustained, if it was not originally awakened by the inducements held out by the Patent Office in moderate fees and the protection of inventors' and manufacturers' rights which the patent laws afford.

And yet, because of minute and incidental inconveniences arrising from the application of the patent laws—in many cases attributable largely to contributory negligence on the part of the sufferers—a considerable class of our Western farmers would wipe out those features of the patent system which make it most effective in stimulating invention.

Without their improved machinery—which has been invented because improvements were patentable and thereby defendable and therefore valuable—the enormous and cheap grain crops of the West could have no existence. Without our means of cheap transportation—which have been invented because patentable, protectable, and profitable—the grain, if produced, would have to rot in the bins or be burned for fuel, for it would not pay for hauling half across the continent. Without the enormous home market for ninety-nine hundredths of our grain production—due mainly to the multiplication of non-producing consumers employed in purely mechanical pursuits which have their basis in the patent system—the surplus of agricultural products beyond what could be exported would make such crops as we now raise unprofitable to the growers, even at the present low cost of production.

Whatever way we may look at it, the disposition of many

farmers to destroy the fundamental basis of the patent system is ungrateful, if it is not also suicidal.

"But," the agricultural classes may argue, "grant that the patent system has been of great use in helping us to gain our present commanding position, we do not need it any longer; we have paid roundly for the benefits received; and may now do away with it, as one removes the scaffolding from around a completed house. It has served its purpose, well or ill; from this time forward it must be more an inconvenience than a benefit. Let it go."

Could not the same have been said as truly last year, two years ago, or five years ago? And has not the cost of production been reduced, or the scope of production increased, by inventions made since then?

A correspondent engaged in developing the transportation of Western products to Eastern markets in refrigerator cars, thus points out some facts bearing upon this question:

"Within your recollection and mine, butter made in the West did not command as good a price in Boston and New York markets as when made in the immediate vicinity of New York, or as Vermont butter in Boston. In the year 1878–79 a Western maker of creamery butter took the prize in New York at the national dairy fair for creamery butter. The next season the same party said to me: 'It is of little use for me or my neighbor to make the superior quality of butter, or to gather our eggs in summer, for we find it impossible to place them in good order in Eastern markets and command the price their quality should give us.'

"Referring to the fact that last year and the year before one-fifth of the butter that left Chicago for Eastern markets was carried in our cars, although we had only the Boston outlet for them at that time, you can see that the obstacle which had hindered Western butter makers from securing a good price for their article was largely overcome. This is specially apparent from the fact that our heaviest shipments were in the hottest months, and that in the wholesale markets at Boston this same Western butter was commanding a better price than Vermont butter from one to two cents per pound. The agent for this particular creamery said to me in Boston last week: 'Our fine grades of Western butter are sold ahead, and prices are very firm for such goods,' thirty-nine cents being the wholesale price that day.

"In view of these facts, have the patents which we have introduced for refrigerator cars done anything for the Western farmers? The butter that took the prize at the last international dairy fair in New York had been made the previous June, and kept in one of our cold storage houses for six or eight months. Eight years ago, the state of the art would have made this thing impossible. There have been, from parties not thoroughly posted in the matter, some severe attacks upon dealers in large cities who have bought, during the season when the market was overstocked with butter, eggs and such articles, and placed them in cold storage houses at the distributing points to be sold during the winter when it was impossible to get fresh made stock. I saw some eggs candled from cold storage houses in Boston, where they had been for nearly nine months, and to the case of forty-nine dozen one-half dozen to the case were all that were thrown out, and a portion of these were cracked from handling. This would make the percentage of shrinkage very small indeed. The eggs were selling for twenty-seven cents per dozen. How much could the farmer have realized from these eggs, if he had been obliged to sell them when gathered, with no chances for storage?

"The *Western Rural* might say that the middleman made this profit between the spring and fall market; but that is only the superficial view. The farmer has the same opportunity to hire storage in any of the large cities that the commission merchant has, and the same opportunity to get full price for his eggs, in the winter, and he does secure an advantage when he makes his sale at a proportionally higher price for his eggs from the fact that they can be stored until they become somewhat scarce. The newspapers have had considerable to say about shipments of dressed beef from the West, and you were kind enough to say in a recent article that our cars have had something to do with that business. An owner in the largest herd of cattle in the West tells me that the loss from cripples now made in shipping in stock cars would pay the freight from the extreme West to market on the hides, tallow, and bones of the whole shipment, if the shipments were to be made dressed. In this way it looks to us as if we had brought the market for Western products very near to the door of the farmer and producer.

"These things would not have been done without some object for parties to introduce improved refrigeration."

The influence of improved transportation in bringing the market nearer and nearer the farmer's door is shown not alone in connection with minor products. In 1878 the difference between the average price of wheat throughout Iowa and in New York is given by a Western writer as a fraction over 65 cents a bushel. By 1880 this difference had been reduced to a fraction under 40 cents. On a crop of 33,000,000 bushels and more, the difference meant something over eight million dollars to the profit of Iowa farmers. The benefits received by other farmers in the far West were proportionally great, and this is only one of the advantages reaped by the farming interests in recent years by virtue of improvements brought about mainly through the agency of the patent system.

Is there any farmer so ignorant as to suppose that an end has been reached in improvements of this nature? or that the improvements will go on in the absence of all inducements in the way of protection and profit to inventors?

SERIOUS HURTS THAT FAIL TO KILL.

A short time ago a shoemaker of Astoria, N. Y., shot himself twice with a heavy pistol, once in the ear and once in the mouth. He was brought to the Roosevelt Hospital, in this city, where it was discovered that the first ball glanced from the skull. The other is thought to be somewhere in the head, perhaps in the brain. Speedy death was expected; but the next day the patient walked away from the hospital, saying that he was sorry for the attempt on his life, but appeared to be in no immediate danger of dying.

With this case as a text, a writer in a morning paper reviews a large number of more or less marvelous cases of recovery from grievous hurts, showing that serious injuries to the main organs of the body are not always followed by death. Men persist in living, not only with bullets in their brain, holes in their stomach, dislocated vertebræ, and wounds in the heart, but even with open wounds clear through the body. During the civil war, General H. A. Barnum, of Brooklyn, received in battle a wound which still remains an open passage through the body. For years the treatment of this wound has been simply to wear in it a roll of prepared lint, which is renewed daily. The suppuration of the wound is constant though variable.

General Shields, of Missouri, had a similar wound extending through his body, and open in front and behind. His wound, it is said, was received in the Mexican war, and he wore, not lint, but a silk handkerchief in it. This he could draw directly through his body.

ALCOHOL SUGAR AND PAPER PULP FROM WOOD.

Braconnot's process, as described in an Austrian paper, consists in mixing sawdust carefully with an equal weight of sulphuric acid, not allowing the mixture to get hot; and after a while diluting the paste mass with water and heating to boiling. When decomposition is complete, the acid is neutralized with carbonate of lime, and the glucose thus obtained is fermented in the usual manner by adding yeast to it. Owing to the large amount of sulphuric acid required, the results hitherto obtained do not favor its introduction on a large scale. But, on the other hand, the manufacture of spirits may perhaps be profitably combined with paper making.

Very satisfactory results were obtained by Bochet and Machard by treating wood shavings with hydrochloric acid under pressure. They treated 4,000 pounds of wood with 8,000 pounds of water containing 800 pounds of hydrochloric acid for ten or twelve hours in wooden vats, the mass being kept boiling by live steam. The hot acid dissolves off the incrusting material from the wood, which is thereby converted into a dry mass that is easily converted into paper after being washed with water. The acid liquid contains from 20 to 22 per cent of grape sugar to 100 parts of the dry wood. The liquid is then saturated with chalk, and fermented at 24° to 25° C. (75° to 77° Fahr.). One cubic meter of pine wood weighing 435 to 440 kilos is said to yield 780 to 790 liter per cent of alcohol (equal to 39 or 40 liters of 50 per cent spirits), which is worthy of consideration.

CONDENSED WHEY.—A NEW INDUSTRY AND A NEW FOOD PRODUCT.*

BY PROF. ALEXANDER MUELLER.

Whey, which is a by-product in the manufacture of cheese, contains about an equal quantity of milk, sugar, and albumen, as well as a considerable quantity of salts and particles of caseine and butter fat that have escaped being made into cheese. Only a very small percentage of all the whey produced in Germany is utilized directly for human nutriment, either as drink or as an addition to food and pastry, nor is much used for making milk-sugar. The greatest part of it is fed to animals—hogs, calves, cows, and even horses—at least among country cheese makers. Where large cheese factories are situated in cities, a considerable quantity runs off in the gutters and sewers!

The value of whey for feeding cattle and hogs is scarcely higher as an average than half a cent per gallon; its value as human food, on the other hand, is at least six times as high. This disproportion between supply and demand has frequently attracted the attention of milk producers and economists generally, without, as yet, however, having met with any satisfactory solution.

The chief difficulty lies in the great dilution of nutriment in the whey, and the consequent tendency to sour or putrefy. The first step toward a better utilization of whey must be taken in the direction of concentration. As in the case of most other kinds of food, concentration will improve its keeping qualities.

It is a fact that the small dairymen of Norway have been wont, from time immemorial, to boil down the greater part of their whey, sweet as well as sour, more or less, to a "mesost" or "prim," sometimes alone, sometimes with the addition of buttermilk, or even of cream. The boiling down in open vessels over an open fire of course demands the most painful attention to prevent burning, which would spoil the taste of the whole lot, and make it uneatable, for us at least. Then, too, the consumption of coal is so great as to make the product unreasonably costly. The use of a water or steam bath would overcome the former of these objections, but not the latter. A solution of the problem must be sought in the use of a vacuum apparatus, which, assuming the operations to be conducted on a large scale, guarantees at once the cheapest and best preparation.

After many fruitless attempts, an opportunity was afforded me last autumn, at the Cismar condensed milk factory in Eastern Holstein, to evaporate whey in a vacuum. But before the experiment had been made there, the firm of Heckmann, in Berlin, kindly placed at my disposal a suitable vacuum apparatus with an arrangement to prevent foaming over, and all its attachments and service. I first made use of it last January. Part of the whey was evaporated until it just began to crystallize when cold; another part to a stiff dough, which in a few days hardened to a solid cake.

In both cases, but especially in the latter case, a very permanent product was obtained, which could be kept for months in pure dry air without spoiling or moulding. Whey condensed *in vacuo* is better for making milk-sugar than any other preparation.

For daily use in the household it is capable of the greatest variety of uses for food and drink, the most important of which, it seems to me, is in making different kinds of pastry, for which purpose its milk-sugar and milk salts especially fit it, and this is the easiest way to utilize them in nourishing and sustaining large classes of the people. C. Becker made experiments on baking with whey concentrated on a water bath, while Bolle used a portion of the whey extracts obtained by me in Heckmann's factory here. These bakery experiments were so satisfactory that Bolle decided to have a vacuum apparatus set up in his own place, and to offer his whey to the Berlin public in the form of bread or cake.

In the course of the following winter and spring Bolle put up the necessary apparatus, and having secured regularity in working the process, he began the regular manufacture of whey-rye bread, and of two kinds of wheat bread, one a fine article in rolls, made of the best wheat flour, with the addition of milk, butter, eggs, etc., the other plain bread in round loaves for daily use, without the addition of the more expensive ingredients. The public seems to have a taste for this new form of bread, and the example is worthy of imitation in other places.

By careful treatment of the whey, and if the bakery were properly conducted, I have not the slightest doubt that all large cheese factories which are situated in towns could make a profitable use of their now worthless whey by evaporating and baking it, and at the same time contribute to the sustenance of the people.

Besides this, cooks and housekeepers would soon learn to use extract of whey in the preparation of their daily food, both to improve the flavor and render it more digestible.

The fear that there will soon be too much whey-extract made and offered to the public is met by the idea that the larger cheese factories will, in time, cease to make use of thin or skimmed milk, but to sell it as condensed skimmed milk, as this would be more profitable than condensing the whey.—*Chemiker Zeitung.*

* Read before the fifty-fifth meeting of German Naturalists, etc., in Eisenach, in 1882.

Facts about Stoves.

In the manufacture of stoves the patterns cut a very important figure in the column of expenses. The wood and iron patterns cost about the same; and the total cost of a wood and an iron pattern for a stove of any one size is about $1,000. Sometimes they cost a good deal less, and sometimes more. One manufacturer in this city, says *The Age of Steel*, published at St. Louis, has a set of patterns for a stove of three sizes which cost him $6,000. The "life" of a pattern used to be longer than it is now. Twenty-five years ago a certain style or make would last about ten or fifteen years before it became obsolete; now styles change more frequently, and the life of a pattern is, accordingly, much shorter. The desire of customers for stoves of new styles and bright and fancy finish has necessitated a greater expenditure for patterns larger stocks of them, and a more profuse use of nickel plate. The result of all this has been disastrous to large profits. A quarter of a century ago, sixty and seventy per cent profits were as easily realized by the manufacturer as thirty and thirty five per cent are now. Then a comparatively small number of patterns would answer for the largest establishment; now several hundred are required.

Stoves turned out by Western works are heavier by some fifty pounds than Eastern stoves, owing to their having larger flues and thicker plates. Flues are made large in the Western stove on account of the general use of bituminous coal in the West. A small flue would soon choke up, and the stove would be unserviceable. In the East, anthracite coal is largely used, for which reason the flues are made small. The advantage claimed by Western stove manufacturers in making thicker plates is that the percentage of those spoiled in the mould is not so large as when the plates are made thin. Thus, of each day's total melt of iron in a Western stove foundry, about fifty-five or sixty per cent is saved in good plates, the remainder, in the shape of defective plates, sprues, gates, etc., going back to the furnace to be remelted. In the East, fifty-two per cent saved is considered a high average. The result is, Western stove makers save more time and more iron in the furnace and the mould than Eastern manufacturers. Stoves made in the East for the Western trade are called "staddles" from the fact that the flues are made with a view to burning either anthracite or bituminous coal in the stoves.

ELECTRIC lights have been largely introduced in the government establishments at Yokohama, Japan.

Arrowroot Manufacture in Queensland.

The machinery used for the manufacture of arrowroot is simple in the extreme, and is chiefly manufactured on the place, the shafts, pulleys, and engine work being, of course, foundry-made. The first process shown was the roots being tipped, by two boys, into a long trough, through the length of which a shaft slowly revolved, and by means of wooden projecting pegs the dirty roots were stirred up, and so cleaned, there being a constant stream of water running through the trough. These revolving pegs have a screw pitch, so that the roots are gradually moved toward the far end of the trough, where they are caught up by a sort of bucket pump, which elevates them some 12 feet, and drops them regularly into a hopper. As they fall to the bottom of this, they meet the grater, which is a drum of perforated galvanized iron, driven at great velocity. A small stream of water pours into this all the time, and the roots are quickly grated up into a brown colored pulp. This mass of fiber and pulp falls into a cylinder of perforated iron, about 9 feet long and 2 feet in diameter; through the length of this runs an axle, on which are two beaters, like the drum of a thrashing machine; these smash up the fibrous pulp, exposing it to the action of the water, so as to enable all the starch and fine pulp to be washed out and squeezed through the perforations of the cylinder, while from the one end is discharged a constant stream of the dirty looking fibrous refuse. The finer pulp, as squeezed through the perforations of this cylinder, is received in a precisely similar one below; here, again, the mass, now only pulp, is beaten up; but the perforations around this second drum being very small, only the starch and dirty looking water passes through, the pulp being again discharged from the cloaca at the end. The stream of water and starch pouring from these cylinders is received in troughing, extending for 100 feet around the shed, and, as it runs along, the starch, being heavier than the water, all sinks to the bottom, and the water runs away. So far the work goes on automatically, no one but the two boys throwing in the roots troubling themselves about it. But toward the end of the day the stream of water is stopped, and the arrowroot starch scraped up out of the trough, where it has accumulated in a layer some inches in thickness, and is placed in large vats and tubs, all ranged in regular rows. Before being put into these tubs, it is passed through fine muslin sieves, and at the same time another stream of water is turned on. These fine sieves effectually clear it of any foreign matter, and it settles by the morning at the bottom of the vats, clean and white as snow. The water is drained from it, and the starch put into a centrifugal machine similar to what is used for sugar; this soon forces out the surplus water, but perfect dryness is essential to its keeping qualities, so it is now carried to the drying-room, which is some 60 feet long by 12 feet wide. Round the whole length of this runs a flue, heated by a special furnace, and over this are shelves of galvanized wire-netting; on this netting is placed calico, and on this is spread out the starch. In this hot-house the moisture is quickly evaporated, and the arrowroot becomes crisp and grain-like. On fine days it is spread out in the sun on similar wire stages. All operations are now finished, and the flour is stowed away in bins in the storehouse, and there made up into the packets usually seen in the shops.—*Queenslander.*

Soda in Commercial Potash.

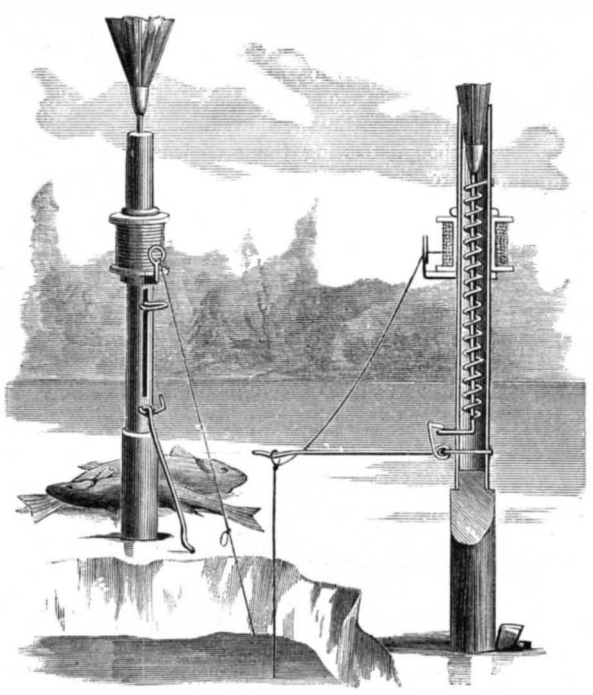
A Belgian chemist gives the following method for detecting the presence of soda in samples of carbonate of potash. It is based on the fact that chloride of sodium is much less soluble than chloride of potassium in strong hydrochloric acid. A solution of the potash to be tested is prepared, the potash being dissolved in ten times its weight of water. One ounce of this solution is saturated with diluted hydrochloric acid, and then evaporated until it is dry. The residue, which is a fine powder, is introduced in a bottle of 10 oz., hydrochloric acid of 1·189 specific gravity, which has been previously saturated with chloride of sodium, being then added. The mixture is well shaken, then left to settle, and after five or six hours, all the chloride of sodium will have settled to the bottom while the chloride of potassium will be in solution. The whole is now filtered through asbestos, and the deposit is washed with hydrochloric acid saturated with chloride of sodium. It is then dried at 150° C., weighed, and will consist entirely of chloride of sodium, an accurate result being obtained if the operation has been carefully executed.—*Weekly Drug News.*

A PLANER has been constructed at Pittsburg capable of planing a piece of iron or other metal ten feet wide, ten feet high, twenty-four feet long, and so arranged that four cutting tools may operate on the work at one time, two being on the crosshead and one on each upright.

WHITCOMB'S FISHING APPARATUS.

This apparatus is designed to be set after the fashion of a trap for fishing through holes made in the ice in winter, so that when a fish bites at the hook a signal will be automatically displayed.

A round tube, forming the body of the apparatus, is mounted on a stick, which serves as a standard. On the outside of the tube there is a spool, to hold the fish line. The lower end of this spool bears on a stop, and the spool is kept in place on the upper side by an elastic clasp, which can be moved up and down on the tube, and set to bear



NOVEL FISHING APPARATUS.

against the end of the spool with sufficient friction to prevent the spool from turning easily. Inside the tube is a rod the upper end of which is furnished with pompon, flag, or other suitable device as a signal, which comes down into the tube when the device is set, as seen in the sectional view, but which shoots up into sight when the device is sprung, as seen in the perspective view. This rod is impelled upward by a spring, one end of which is attached to the tube, the other end being attached to the rod. The rod is bent out laterally at the lower end, projecting through a vertical slot, made in the wall of the tube, forming a tappet for receiving a tripping lever, which is pivoted to the outside of the tube, with its outer end, when the device is set, projecting laterally for connection with the fish line. A loop is tied at a convenient point in the line, and hung upon the outer end of the tripping lever, and drops down into the water, with a hook suitably baited hanging from it.

When a fish takes hold of the hook, the hook of the tripping lever is detached from the lateral projection of the rod, which, being thus freed, flies up and displays the pompon at the top. This is the invention of Mr. M. H. Whitcomb, of Holyoke, Mass.

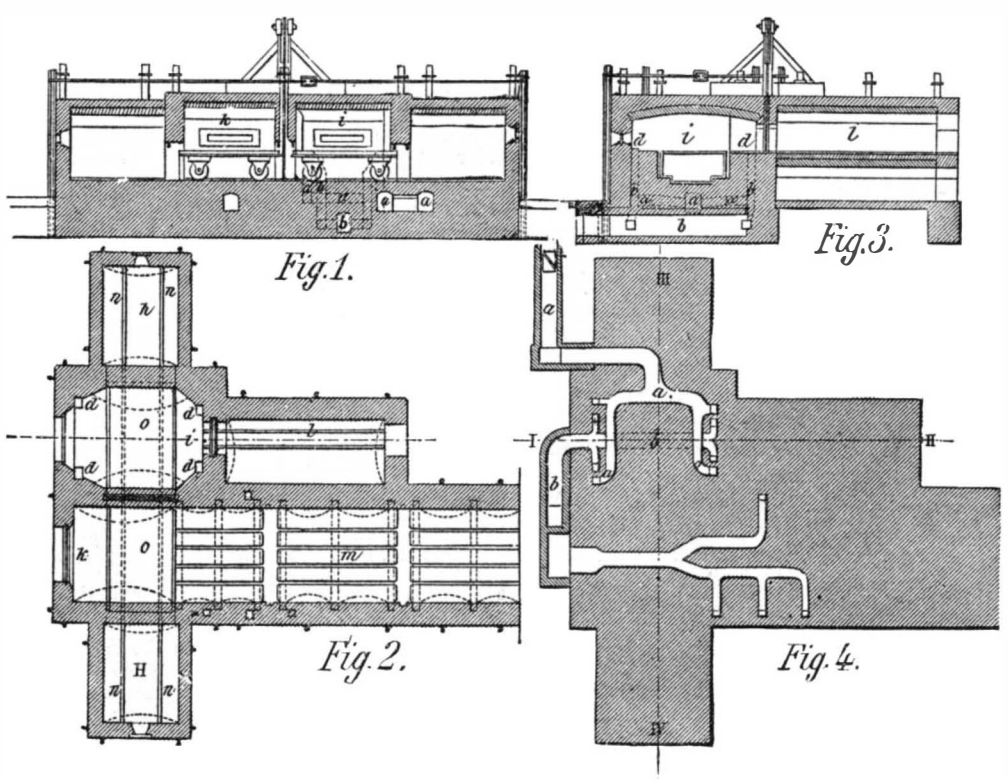
THE FASTEST ATLANTIC STEAMER AFLOAT.—The steamer Alaska left New York on the 19th of October last, and arrived in Queenstown in the surprisingly short time of 6 days 21 hours and 46 minutes. Her log showed as follows: 10, 380, 389, 381, 388, 401, 403, and 436 knots, or a total of 2,788 knots.

Birds.

Professor Ewart last week gave an account of the structure of birds. After explaining the main features of difference between the flying and the running birds at present existing, he went on to say that the running birds of the Tertiary period had a much wider distribution than the same class had now. Among the flying forms there were a number which could not fly; and the flightlessness was always accompanied with modifications of the limbs and the sternum, and those modifications so mimicked the form of those structures in the running birds that some zoologists believed that all the running birds were only modified flying birds. In the Eocene beds was found the remarkable odontopteryx, which had peculiar bony projections, not true teeth, along both jaws. The chalk beds showed a great abundance of flying reptiles, and while those beds were being deposited there were a large number of aquatic birds, some of which were highly specialized, closely resembling our flying birds, while others more resembled our running birds. The ichthyornis of the chalk period had true teeth, and the vertebræ were like those of fish. The hesperornis, a running bird, had merely rudimentary wings, while the posterior limbs were enormously developed. It had well-developed teeth, which, however, instead of growing from sockets, were set in a narrow continuous groove, as in some of the extinct saurians. The brain was like that of a lizard, and the vertebræ like those of ordinary birds. The rocks of the Jurassic period presented enormous flying reptiles, along with remains of birds allied to ostriches, but which had teeth and fish-like vertebræ. The archæopteryx seemed to have had a more or less complete covering of feathers, and it had true teeth and fish-like vertebræ. It was an exceedingly generalized form, closely resembling some of the American Jurassic dinosaurs. Apparently some of the smaller dinosaurs were arboreal in habit, and probably differed from archæopteryx in that they had no feathers. It might be inferred that archæopteryx was descended from a still more primitive creature, which, besides being the ancestor of archæopteryx and the birds, was also the ancestor of the dinosaurian reptiles.

HIRSCH'S CONTINUOUS FURNACE FOR FLATTENING WINDOW GLASS.

In Hirsch's furnace for flattening window glass, shown in Figs 1, 2, 3, and 4, the operation is rendered continuous by the addition of the two chambers, *h* and H, at the sides of the flattening furnace, *i*, and annealing furnace, *k*, and by employing the channel, *n*, and the stones, *o* and O. The flattening of the cylinders coming from the heating channel, *l*, takes place on the stone, *o*, while the flattened sheets are raised from the stone, O, of the annealing furnace, *k*, and conducted into the annealing channel, *m*. The stone, O, is then pushed into the chamber, H, while the stone, *o*, passes into the annealing furnace, *k*, to deliver its sheet into the channel, *m*. The two stones are afterward pushed back, *o* to *h*, and O to *i*; and then the operation begins again. The work can likewise be regulated in such a way that the stone, *o*, shall pass into the chamber, *h*, after flattening, while the stone O, shall serve for flattening in furnace *i*, to pass from thence into chamber, H; the stone, *o*, being afterward pushed from *h* to *k*, where its sheet is discharged into the channel, *m*, and this stone being then brought into the furnace, *i*, while O passes from H to *k*.



HIRSCH'S CONTINUOUS FURNACE FOR FLATTENING WINDOW GLASS.

The gas and air conduits, *a* and *b*, debouch in the four angles, *d*, of the flattening furnace, *i*, so that the air and gas combine and burn in those places. After the cylinders have been brought into the flattening furnace the ingress of air through the conduits, *b*, is shut off, so that the complete oxidation of the flame ceases; but as soon as the sheet of glass has passed into the annealing furnace, the air is allowed to enter again, so that the desired temperature may be obtained.

Poisoning from Red Stockings.

Dr. J. Woodland writes to the *Lancet* that, having had his attention directed to several cases of great irritation of the feet and legs, causing small pustules to arise and the skin to subsequently exfoliate, and suspicion being fastened upon red stockings which the patients wore, he carefully analyzed them. He found a tin salt which is used as a mordant in fixing the dye. He succeeded in obtaining as much as 22·3 grains of this metal in the form of the dioxide, and as each time the articles are washed the tin salt is rendered more easily soluble, the acid excretions from the feet attack the tin oxide, thus forming an irritating fluid.

IN the ten years from 1870 to 1880 the value of the silk production of the United States rose from $12,210,662 to $34,410,463.

Hydrogen Peroxide.

This pure concentrated body is perfectly colorless, transparent like water, but a little less volatile; it has a peculiar smell, will not freeze, and is decomposed at ordinary temperatures, and by a great variety of bodies. It dissolves readily in water, and this dilute solution may be kept for months; a little hydrochloric acid renders it still more stable, while stronger sulphuric acid effects decomposition into water and oxygen. The chemical action of this body is most singular. Chemists generally distinguish between reducing agents, which deprive other bodies of their oxygen in order to become themselves oxidized, and oxidizing agents, which give off oxygen and oxidize other bodies. Hydrogen peroxide fills both functions, and the action is often so energetic that explosions occur. Spongy platinum, gold, and silver instantaneously decompose it into water and oxygen, while they themselves remain unchanged; several organic bodies, blood fibrin, and animal albumen act in a similar manner. Certain oxides and peroxides are reduced, the metal itself, or at least a combination less rich in oxygen, being formed.

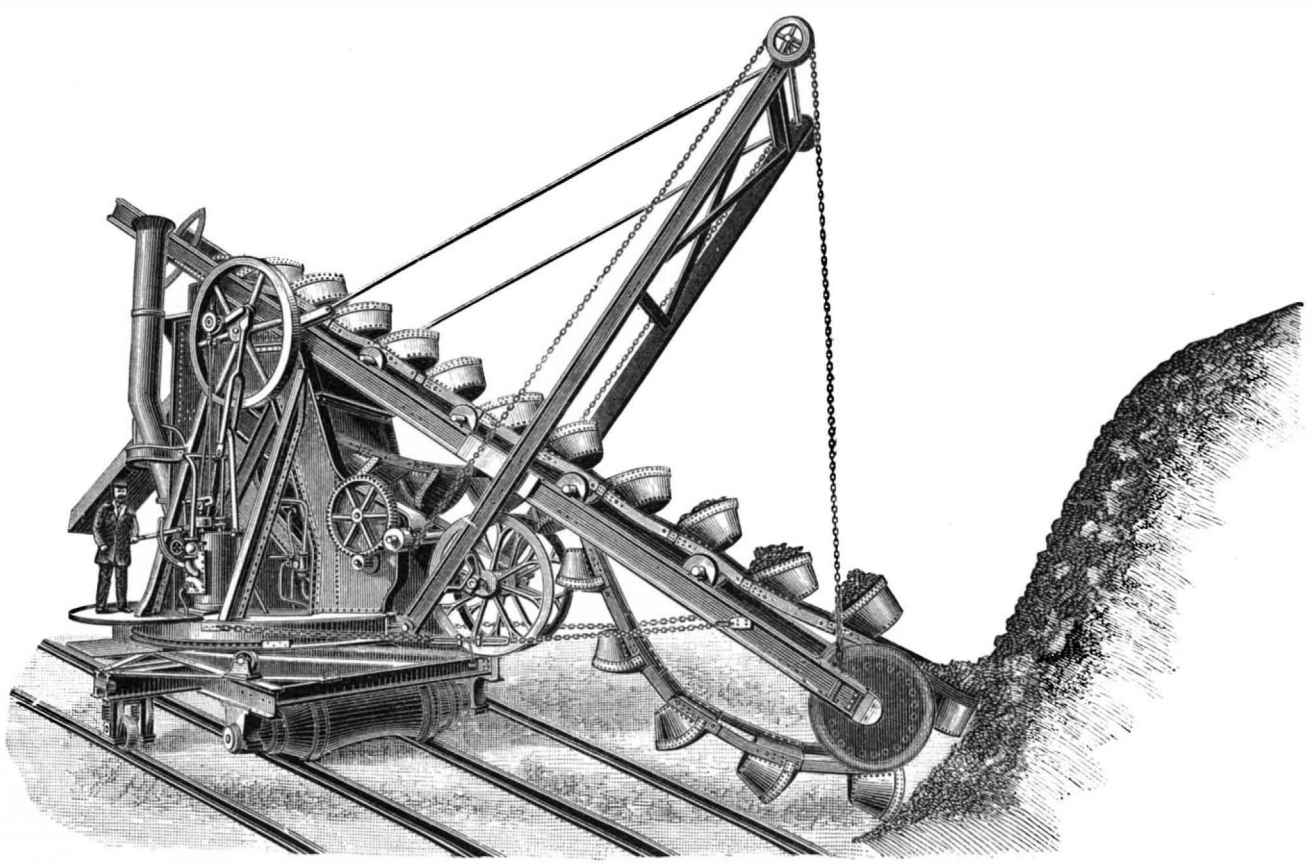
Other bodies, on the contrary, and metals, like iron, are oxidized, arsenious and sulphurous acids being transformed into arsenic and sulphuric acid, while, strangely enough, phosphorus, so easily oxidized, is not attacked at all, and blue indigo sometimes, under certain circumstances, is reduced to white indigo, and the latter reoxidized to its original state. Hydrogen peroxide thus forms one of the strongest reducing as well as oxidizing agents, and its effects in the latter capacity are entirely similar to those of ozone. In fact, of the various tests that have been proposed by Schoenbein, Houzeau, and others, for the determination of ozone, there is hardly one which might not work as well in the presence of small quantities of hydrogen peroxide; and whether the air in general, or at particular periods, contains either one or the other of these bodies, or both together, is by no means certain. The concentrated hydrogen peroxide itself, however, cannot be mistaken. Some years ago, great hopes existed as to its value as a bleaching agent; further researches, however, made its usefulness in this capacity very doubtful. There was a somewhat large demand for it at one time for bleaching hair, and Thénard introduced it as an effectual means of restoring pictures, the lead paints of which had suffered under the influence of a sulphureted atmosphere; but it is as yet much too expensive to be largely used.

GABERT'S UNIVERSAL EXCAVATOR.

This machine is adapted for the mechanical excavation of any trench or ditch whatever by attacking the earth from below. In certain cases it is capable of rendering great services, because it permits of digging out the earth in front and throwing it out behind into cars running on the very same rails that it does. The apparatus consists of two very distinct parts, to wit:

1. The truck, or lower part, which rests, by means of bearings, against the collars of the axles, and which carries the small engine that causes the backward, forward, and rotary motions, and likewise the rollers on which rests the movable crane serving as a base to the whole upper part of the apparatus.

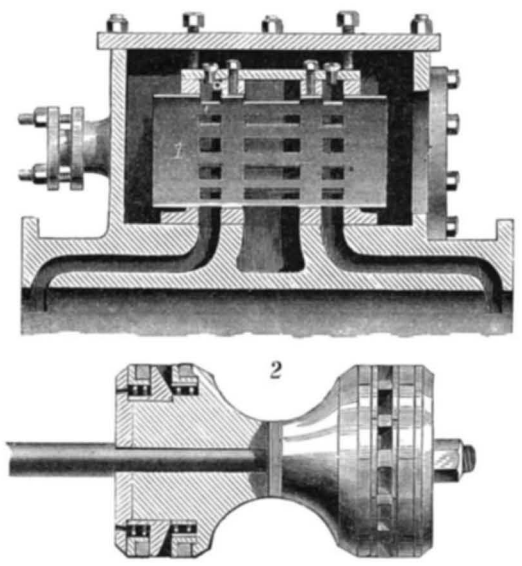
2. The upper and pivoting part of the excavator, which includes the principal engine with its boiler, the dredging chain, the chute, and the bucket frame and its windlass. This pivoting part can be given a fan motion during the excavating, thus permitting the apparatus to dig up the ground in front of it to the width desired. The bucket frame may even be placed in a position perpendicular to the tracks, if it be desired to work in widening as with ordinary excavators. A double spring placed at the upper part of the bucket frame permits it to rise parallel with its axis whenever an insurmountable obstacle, such as a large stone, tree trunk, etc., presents itself under the buckets. Under the impulse of this same spring the frame again descends, and the following bucket attacks the obstacle in its turn until it gives way and falls into the buckets. The application of this spring prevents breakages in the mechanism when the resistance of the earth is abnormal. On putting in a longer bucket frame and a dredging chain like that of M. Couvreux, the apparatus will work in a downward direction from the track. It is this faculty of adapting itself to all the positions demanded in practice that has given the apparatus its name of Universal Excavator. Two of these machines are already operating in France, and giving excellent results. Several others are being constructed either for France or the Isthmus of Panama.—*Annales des Travaux Publics.*



IMPROVED UNIVERSAL EXCAVATOR.

IMPROVED PISTON VALVE.

The advantages gained by the use of a balanced valve are undisputed; but the construction of a perfectly balanced valve possessed of the qualities of durability and perfect action under all conditions, is a matter of difficulty, and has been the subject of a great deal of experiment. We give an engraving of a recently patented balanced steam piston valve, which has proved itself thoroughly practicable in actual use, and in tests on locomotive and stationary engines has, during continued use, shown a marked economy in the use of steam, as well as in the matter of repairs.



PHELPS' STEAM PISTON VALVE.

A valve case or shell is secured to the cylinder over the ordinary supply and exhaust ports, and is provided with passages corresponding with the ports. A hollow cylinder passes longitudinally through the shell, and is provided with apertures opening into the passages of the shell. The piston valve is fitted to the hollow cylinder and connected with the valve rod. The valve in its general construction consists of heads separated by an annular groove or exhaust steamway. The heads are packed to fit the cylinder steam-tight, so as to prevent leakage of steam into the exhaust space, and the reciprocation of the valve connects the openings in the cylinder and casing and the supply ports with the central opening of the valve and the exhaust port, first at one end and then at the other. The piston heads are made up of beveled collars on the rod, by which the exhaust is made adjustable. The collars have sleeves that receive split compression rings carrying packing rings which are held between the collars forming the central portion of the valve and outside washers. A nut at the outer end of the valve rod retains the parts securely. There are two compression rings and packing rings in each head, separated by a follower ring, which is grooved radially on the sides toward the middle of the piston. Between the inner ring and the sleeve on which it is placed is a space connecting with the grooves in the follower ring, so as to admit steam behind the compression ring; the space contains a coiled spring, for retaining the parts concentric. The outer compression ring receives steam behind it directly through holes in the outside washer, or follower. These rings serve to prevent leakage while the piston is passing the ports. The follower rings cut off the live steam from passing behind the inner compression rings, so that while the outer rings are expanded by steam under boiler pressure the inner rings receive behind them steam or hot gases at the cylinder pressure. The effect is to relieve the pressure in the cylinder to a certain extent before the exhaust opens, and thus relieve the valve of the excessive upward pressure at the exhaust end, which in ordinary slide valves often lifts them from their seat. Any excess of pressure is relieved by the small valves opening into the steam chest from the ports. This valve has been applied to a locomotive formerly operated by the ordinary slide valve, showing a great saving in the use of steam and an increased mileage. It may readily be applied to all engines having the common slide valve. In the cut the valve is separated from its casing. This invention has been patented by Mr. Walter S. Phelps, of Wortendyke, N. J.

The Senses of Bees.

Sir John Lubbock lately read to the members of the Linnæan Society an account of his further observations on the habits of insects, made during the past year. The two queen ants which have lived with him since 1874, and which are now, therefore, no less than eight years old, are still alive, and laid eggs last summer as usual. His oldest workers are seven years old. Dr. Müller, in a recent review, had courteously criticised his experiments on the color sense of bees; but Sir John Lubbock pointed out that he had anticipated the objections suggested by Dr. Müller, and had guarded against the supposed source of error. The difference was, moreover, not one of principle, nor does Dr. Müller question the main conclusions arrived at or doubt the preference of bees for blue, which, indeed, is strongly indicated by his own observations on flowers. Sir John also recorded some further experiments with reference to the power of hearing. Some bees were trained to come to honey which was placed on a musical box on the lawn close to a window. The musical box was kept going for several hours a day for a fortnight. It was then brought into the house and placed out of sight, but at the open window, and only about seven yards from where it had been before. The bees, however, did not find the honey, though when it was once shown them they came to it readily enough. Other experiments with a microphone were without results. Every one knows that bees when swarming are popularly, and have been ever since the time of Aristotle, supposed to be influenced by clanging kettles, etc. Experienced apiarists are now disposed to doubt whether the noise has really any effect; but Sir John suggests that even if it has, with reference to which he expressed no opinion, it is possible that what the bees hear are not the loud, low sounds, but the higher overtones at the verge of or beyond our range of hearing. As regards the industry of wasps, he timed a bee and a wasp, for each of which he provided a store of honey, and he found that the wasp began earlier in the morning (at four A.M.), and worked on later in the day. He did not, however, quote this as proving greater industry on the part of the wasp, as it might be that they are less sensitive to cold. Moreover, though the bee's proboscis is admirably adapted to extract honey from tubular flowers, when the honey is exposed, as in this case, the wasp appears able to swallow it more rapidly. This wasp began work at 4 A.M., and went on without any rest or intermission till 7:45 P.M., during which time she paid Sir John one hundred and sixteen visits.

THE sum of $3,650,000 is now invested in the manufacture of iron in the Birmingham, Ala., district.

NOTABLE EXHIBITS AT THE NEW ENGLAND FAIR.

Our front page illustration represents a number of notable inventions exhibited at the recent fair of the New England Manufacturers' and Mechanics' Institute in Boston, Mass. Fig. 1 includes two machines of interest to tanners and curriers—Warren's unhairing and fleshing machine, manufactured by the United States Patents Company, Salem, Mass., and Lockwood's automatic leather scourer and setting machine, exhibited by the Lockwood Manufacturing Conpany, of East Boston, Mass. The first named machine stands in front. Its construction and operation are clearly shown in the engraving. It is said to operate equally well on skins, kips, or hides; and though but newly introduced, it has been adopted by a considerable number of the leading tanners and curriers of the country.

The Lockwood leather scourer and setting machine enters upon its merit rather than as a novelty. It has been a good while in use, and has established a solid reputation for doing the best quality of work. Its manufacturers claim for it also durability, economy of power, and ease of handling.

Fig. 2 represents the cascade in the exhibit of the Follansbee Pump Company. The cascade had a fall of twenty-two feet and a width of ten feet, the depth of the sheet of water being four and one-half inches. This handsome stream was supplied by a Follansbee propeller pump having a capacity of 5,000,000 gallons a day. With these pumps, water is lifted by means of two series of propeller wheels running in opposite directions. The propellers are carried by two spindles running through the pipe, which is made zigzag to receive the alternating propellers. By this means the column of water is steadily lifted with great rapidity and economy and discharged as a solid stream. It is claimed that the propeller pump is of great capacity for its size; that it will raise water from any depth required; that it is simple in construction and relatively cheap, and that it will lift tan bark, sand, coal, grain, and rubbish without choking or loss of efficiency. It has done excellent and economical service in paper mills, tanneries, sewage works, mines, and quarries, and as a wrecking pump. One master of a wrecking steamer mentions having pumped fifteen hundred bushels of potatoes out of a vessel in less than an hour and a half. This with an eight inch pump. The capacity of a pump of this size, making 750 revolutions, is 1,800 gallons a minute, with an expenditure of 6⅔ horse power for each 10 feet lifted. A 4-inch pump runs 1,500 revolutions, and discharges 350 gallons a minute, with an expenditure of 1¼ horse power for each 10 feet of lift. A 16-inch pump uses 22 horse power for each 10 feet of lift and discharges 7,000 gallons a minute, or upward of 10,000,000 gallons a day. Any pump above 6 inches in diameter can have an engine attached directly to it.

Fig. 3 represents the Jewett Wrecking Car, exhibited by the Continental Construction Company. The car is strongly built, and well adapted for doing heavy work. The mast, with its connected boom, is counterbalanced and mounted on a turn-table in such a way that it can be lowered for the passage of bridges or tunnels, and easily raised to an upright position for use. It is 35 feet in length, of great strength, and carries powerful hoisting gear. The car is fitted with patent grips to secure it firmly to the track, and on each side are four jack-screws, which are hinged to the car, and in transportation are simply lifted up and placed in "beckets." To secure a solid bed for the jack-screws, four pieces of timber are carried, which are provided with clamps to secure them to the track. These rest upon the ends of the ties when in use. It will be readily seen that these jack-screws give the derrick an absolutely firm foundation, and prevent any tipping of the car when heavy weights are lifted. Under the turn-table is a platform which is adjustable so as to rest upon the tracks, thus giving increased stability and taking the weight from the car. In fact, every possible precaution seems to have been taken to guard against any "give" in any part under any strain from any direction.

With the wrecking car is a tender or tool car, which provides ample stowage room for tools, and at the same time forms a receptacle for the head of the mast.

This wrecking car is well adapted also for use in constructive work, where a strong and handy portable derrick is needed.

Fig. 4 represents an exhibit of the Marine Bicycle Company, of Portsmouth, N. H. It is styled a marine bicycle, probably, for the reason that it has no wheels and cannot go to sea. It is a light double-hulled craft of the type commonly miscalled "catamaran," to be driven by a small propeller, set in motion by a treadle after the fashion of the driving gear of a velocipede. The hulls are like extremely slender racing shells, twenty feet long, seven inches wide, and eight inches deep, set three feet apart. The gearing is simple, and, with a proper propeller, the operator could probably attain considerable speed on smooth water.

What Gas is Formed when Carbon is Burned at a High Temperature?

Prof. Ledebur discusses the query whether the gas resulting from burning carbon at a high temperature is carbonic oxide (CO), or carbon dioxide (CO_2)?

When a carbonaceous fuel is burned, the combustion is said to be complete if the gaseous products of combustion contain no combustible constituents, *i. e.*, consist of carbonic acid, nitrogen, and vapors of water. Perfect combustion can only be attained when there is an excess of oxygen, and is aided by a high temperature in the space where combustion takes place; and the higher this temperature the smaller will in general be the excess required to accomplish the combustion.

These facts, which are on the whole quite true, have led to a very widely extended but erroneous conclusion, namely, that a high temperature always favors the production of carbonic acid, a low temperature that of carbonic oxide. The first part of this conclusion is correct only in those cases where an excess of oxygen is present The second part relating to the formation of carbonic oxide gas, is entirely false.

High temperatures favor the chemical union of carbon and oxygen. This principle really admits of the conclusion that when there is a sufficient quantity of both substances present, a high temperature must favor the formation of carbonic oxide.

These are by no means purely theoretical deductions, but the results of observations that can be made at any time. Dr. Stoeckmann found, for example, that a generator, when running cool, produced 16 per cent of carbonic oxide and 12 per cent of carbonic acid, but when running hot it made 22 per cent of the former and 7 per cent of the latter.

A similar circumstance has been observed in the manufacture of water gas, as will be seen in the various communications of Dr. Bunte regarding this process. The longer the operation of blowing in steam is continued, and the cooler the generator becomes, the larger the proportion of carbonic acid formed. Something very analogous occurs in the blast furnace. Here, too, it can be observed that the higher the temperature, the more quickly and completely the free oxygen will disappear, and not only so, but the oxygen unites with the carbon to form *carbonic oxide*. Hence, a hot blast favors the production of carbonic oxide in the blast furnace. If the opposite view were correct, owing to the strongly oxidizing power of carbonic acid at a high temperature, a blast of hot wind would not favor the production of cast iron so rich in silicon and manganese as it really does.

More convincing than any of these considerations and deductions are Ledebur's experiments, in which carbon was heated to different temperatures in a current of air, and the products of combustion analyzed. Accurate tests proved that carbonic acid was formed at a lower temperature, and carbonic oxide at a higher one.

In these experiments, sufficient precautions were taken to make them accurate enough to draw practical conclusions from. A measured volume of about one liter of atmospheric air was conducted from a gasometer through a combustion tube filled with pieces of wood charcoal, and heated to different temperatures. The combustion tube was heated by gas, that used for a cherry red heat being of glass, and that which was heated to a yellow was of porcelain. After the combustion tube was a potash bulb to absorb the carbonic acid, and this was followed by a tube of copper oxide for the direct estimation of the carbonic oxide by burning it to carbonic acid, which was absorbed in a second potash apparatus.

The proportion of carbonic acid and oxide varied at different temperatures in the following very decided manner:

	Temp.	CO	CO_2
1. Below the melting point of zinc	About 350° C.	78·6	21·4
2. At the melting point of zinc	" 440° C.	72·4	27·6
3. Dark red heat	" 520° C.	71·4	28 6
4. Beginning of a cherry red	" 700° C.	62·6	37 4
5. Yellow heat	" 1,100° C.	1·3	98 7

The Mississippi.

Some interesting and extraordinary data have just been compiled respecting the Mississippi. It appears that it boasts no fewer than 55 tributary streams, with a total length of navigation of 16,571 miles, or about two-thirds of the distance round the world. Even this, however, represents but a small amount of the navigation which will follow when the Federal Government has made the contemplated improvements in the Upper Mississippi, in the Minnesota, Wisconsin, and other rivers, in which it is now engaged. But while the Mississippi has 16,571 miles navigable to steamboats, it has 20,221 miles navigable to barges. This navigation is divided between 22 States and Territories in the following proportions: Louisiana, 2,500 miles; Arkansas, 2,100; Mississippi, 1,380; Montana, 1,310; Dakota, 1,280; Illinois, 1,270; Tennessee, 1,260; Kentucky, 1,260; Indiana, 840; Iowa, 830; Indian Territory, 720; Minnesota, 660; Wisconsin, 560; Ohio, 550; Texas, 440; Nebraska, 400; West Virginia, 390; Pennsylvania, 380; Kansas, 240; Alabama, 200; and New York, 70. Nearly all sections of these States and Territories can be reached with ease. Louisiana, Arkansas, Mississippi, Montana, Dakota, and the Indian Territory possess more miles of navigable stream than miles of railroad, all of which are open to everybody who wishes to engage in commerce.

New Steamer for Lake Nicaragua.

At a recent meeting of the Engineers' Club of Philadelphia, Mr. Chas. W. Pusey presented a paper upon the twin screw steamer Victoria. On November 7, this steamer sailed from Wilmington, Del., for Greytown, Nicaragua. This vessel is a light draught twin screw steamer for service on Lake Nicaragua, and of a class that is attracting some attention from those interested in the economical transportation of freight on bays and rivers where the draught of water is limited, and where the side wheel steamer is principally used.

The hull is of iron and is 136′ 6″ length over all, 26′ beam, and 7′ deep above cross floors. The model is the same as that of several side wheel steamers built for service on rivers and bays in South America and Mexico. She has one fore and aft bulkhead in center, and four athwartship, all made watertight. The compartment aft is fitted for water ballast to trim the vessel. The frame is of angle iron. The machinery consists of two compound engines with cylinders 12″ and 21″ diameter x 18″ stroke, fitted with jet condensers. The engines are independent, each driving a propeller wheel 6′ diameter. She has two steel boilers of the locomotive type, fitted for burning wood and constructed for a working pressure of 100 lb. per square inch. The finished draught of water, with five tons of coal in bunker, was 4′ 6″ aft, and 3′ 6″ forward. On trial trip, with a draught of 5′ 4″ aft and 2′ 10″ forward, she made a speed of 10 knots per hour, with 119 revolutions per minute, 94 lb., 26″ vacuum; total indicated horse power, 246. During the trial the ballast tank was filled with water.

When she sailed for Greytown she had a cargo of 105 tons of coal, also merchandise and stoves amounting to about twenty tons more, the draught of water being 6′ 3″ aft and 5′ forward. Under these conditions, going down the bay she made 9½ knots per hour with 80 lb. steam pressure and 108 revolutions per minute.

American Steamboat Builders in Russia.

Several Americans who went to Nijni Novgorod, from Pittsburg, Pa., to build boats to run on the river Volga, have had very good success. The plan was to take out engines and erect the boats on the spot from native timber. The first one launched did so well that others are to follow, and the business may acquire considerable magnitude. One of the party who has just returned says:

"The steamers which up to a short time ago were used exclusively were wholly made of iron, and so heavy that even in five feet of water they could traverse but a very small portion of the river. The Amazon, the engines of which I was sent over to put together, even in four feet of water, is able to cover more miles than are the iron boats in nine feet. The introduction of wooden boats is going to revolutionize the river trade."

It now seems possible, says the *American Ship*, that American steamers on the Volga, which is ordinarily navigable for 2,000 to 2,300 miles, may be in demand throughout the empire. Steamers from the United States, formerly running on the Yangtsze, effected great changes in China, and similar agencies in Russia may work similar results.

The Keely Motor again.

A Philadelphia paper says that the Keely motor will be heard from on December 10, that being the date mutually agreed upon for the presentation of all patentable points to the stockholders. We suppose, adds *Iron*, that the fluctuation in the price of stock will go on as it usually does just before any promised revelations on the part of the inventor, but we can only repeat to would-be buyers the well-known advice given by *Punch* to those about to marry. That Mr. Keely has developed a remarkable force is evident, but that he knows what to do with it is quite another matter We shall be pleased to hail Mr. Keely as a benefactor to the world of mechanics, but we prefer his proving his title before we pay respect.

Patent Barbed Wire Fences.

The following table shows the quantity of barbed wire that has been sold each year from 1874 to 1882, inclusive:

Amounting	in 1874 to	10,000 lb.	made and sold.
"	in 1875 to	600,000 lb.	" "
"	in 1876 to	2,840,000 lb.	" "
"	in 1877 to	12,863,000 lb.	" "
"	in 1878 to	26,655,000 lb.	" "
"	in 1879 to	50,337,000 lb.	" "
"	in 1880 to	80,500,000 lb.	" "
"	in 1881 to	120,000,000 lb.	" "
"	in 1882 to	160,000,000 lb.(est.)	" "

Anæsthetic Properties of Carbonic Acid.

Dr. Brown-Séquard has recently (*Nature*, p. 557) made the interesting discovery that in certain animals complete local anæsthesia of the larynx, accompanied by incomplete general anæsthesia, may be obtained by directing on to the upper part of that organ a rapid current of carbonic acid during a period of fifteen seconds to two or three minutes. The anæsthesia lasts from two to eight minutes after stopping the current. Dr. Séquard proposes to experiment on the human subject by introducing carbonic acid through the mouth or nostrils. This singular action of the acid may perhaps throw some light on the sedative action of aerated waters in vomiting and nausea.

The Sand Industry.

A large amount of capital is invested in the north side of Long Island in the sand trade, and the industry is fast assuming large proportions and is constantly growing. Four years ago there were but eight firms in the business, with a capital of not over $80,000. To-day it is estimated that over $2,000,000 are invested in the island. From recent estimates, it is safe to say that 4,500 tons of sand are taken from the north shore of the island daily Vessels are loading night and day, and the sand is delivered at all points for building purposes. The revenue from the industry is estimated at over $100,000 yearly to Port Washington alone.

Correspondence.

The Design Patent Law.

To the Editor of the Scientific American :

The editorial in the SCIENTIFIC AMERICAN of November 11, upon a recent decision of the Commissioner of Patents in relation to design patents, seems to have been written under a decided misapprehension of the existing practice in the Patent Office.

It is stated in that article that heretofore the grant of design patents has been limited to "designs for decorative work" only, and that the custom of the office has been to refuse patents for new and better shapes of machines and articles of manufacture. If by "better" is meant that the shape of the given thing renders it more capable of performing its function, then the practice has been correctly stated, and the decision referred to simply confirms this practice, and is based upon sound principles; if, however, the word be not so used, the incorrectness of the view taken is unequivocally shown by the office portfolios, which are filled with drawings of patented designs in all classes of invention. Design patents for the shape of chairs, tables, sofas, steam engines, and their frames, and even for the configuration of complicated machines, have been granted in large numbers. Patents have been refused mainly in those cases in which the shape sought to be protected has performed some mechanical function, and should therefore have been made the subject of an application for a mechanical patent. The T-shaped shingle machine referred to was refused protection for this reason, not because the design was not ornamental. Had the specification merely described and claimed the shape of the machine, without reference to the mechanical advantages arising from such shape, a patent would have been granted without question, as clearly appears from the record.

The decision of the Commissioner in the Norton case does not change the practice of the office in any particular. The case turned upon the question of the meaning of the word "useful," employed in the Design Act to define one of the qualities of patentable shapes or configurations of articles of manufacture. Is its meaning that of the ordinary language of life, or has it that technical sense which it has judicially been declared to have in the statute relating to mechanical inventions?

"'Useful' in the patent law," says the commissioner, "is in contradistinction to 'mischievous.' The invention should be of some benefit (Cox *vs.* Briggs, 2 Fish. 174). A design if not 'mischievous,' is useful if it attracts persons to it, or to articles made like it. It may not be of great artistic excellence, but if it be attractive it is useful."

In the light of the record, the important point determined by the decision in question is that the mechanical function performed by the shape or configuration is not to be considered in determining its patentability as a design. A shape alleged to produce a mechanical effect is to be protected by a mechanical patent. Patents are to be granted only for designs which are intended to appeal either to the eye or the æsthetic sense. It is not necessary that the article should be ornamental. The requirements of the statute are complied with if its appearance is such that purchasers are attracted to it. The law does not inquire into artistic excellence, but does require that the design should in some measure be attractive.

This decision of the commissioner is in strict accord with that of the Supreme Court of the United States in Gorham Manufacturing Company *vs.* White, 2 O. G. 592, in which it was said that the Design Act was "intended to give encouragement to the decorative arts," and that "it is the appearance itself . . . which constitutes . . . the contribution to the public which the law deems worthy of recompense."

Washington, D. C., November 15, 1882.

The Utilization of Natural Gas.

The steady decline in the yield of petroleum in the Pennsylvania oil regions is causing capitalists to turn their attention to the greater utilization of the natural gas which is a peculiar feature of the region. The drilling of oil wells is always attended by the appearance of inflammable gas in larger or smaller quantities, but its presence is not a necessary attendant of the finding of oil. Many years ago natural gas was discovered in Fredonia, Chautauqua County, N. Y., and it has been in constant use, both for fuel and light, at East Liverpool, Ohio, for twenty years, and no petroleum is found in either place. The presence of this gas in the oil regions has been one of the main causes of the development of the territory to so great an extent that the exhaustion of the petroleum deposit has been accomplished years before it otherwise would have been, for its adaptability and economy as fuel has permitted operations to be carried on where otherwise they must have been attended with loss to the producers. It takes from twenty three to twenty-five days to drill a well, and companies controlling the supply of gas furnish fuel for the boilers at an average cost of $1.25 per day per well. To buy coal or wood for this purpose would cost several times as much.

Bradford and nearly all of the oil region towns are lighted and heated by the natural gas. The "gas streaks," as those districts are called where the gas is found without oil, are very extensive in this field, and they were secured by companies years ago. These companies—the Keystone Gas Company and the Bradford Gas-light and Heating Company—furnish nearly all of the gas supply. They are chartered by the State. The latter company supplies this city with light and heat. Its principal "streaks" are the Rixford and the West Branch. The former is seven miles southeast of this city, and the latter lies two miles to the southwest. Six wells take the supply from these streaks, three on each. The Rixford gas is collected in immense iron reservoirs at the wells, whence it is forced to Bradford through iron pipes. For four miles of the distance the pipes are six inches in diameter, and for the other two miles eight inches. From the West Branch wells the gas reaches the city through 8-inch pipes by its natural force. The pressure of this gas at Bradford is six pounds and a half to the inch. Ingenious pumps of recent invention force the gas from the Rixford receivers, where it has a pressure of 40 pounds to the inch. Less than a year ago the Rixford gas reached this city by its natural force at the wells—a force sufficient to supply Bradford with 1,000,000 cubic feet. To drive the gas that distance now requires the use of a 400-horse-power engine, and the natural force of 170 pounds to the inch has declined to 25. The machinery for pumping the gas cost $50,000.

The natural gas is found in the largest quantity and greatest force in the third oil sand, and seldom deeper than fifteen feet in the sand. It is present, however, in all three of the sands in some wells. The wells are drilled just as oil wells are, and gas territory ranges from $150 to $500 an acre. It is destined to be worth much more when the finding of gas may be calculated on with certainty. In the Bradford field, gas has been found at no greater depth than 2,200 feet. It is used just as it issues from the depths of the wells, no refining being necessary. The gas of some districts is better and cleaner than that of others, the Bradford article being especially excellent in quality. There is no odor from it in burning, but before it is consumed it has the same as petroleum. In carrying it through the towns and into buildings the same system is employed as in conducting artificial gas, and for illuminating purposes is burned in the ordinary gas-fixtures. In many parts of the oil regions the pipes are laid on the surface of the ground, but in the larger towns and cities they are buried. For heating purposes a pipe is conducted from the main into the stove or range. The end of the pipe in the stove is perforated to give a spreading flame. A stop cock on the outside of the stove regulates the supply. The fire is kindled simply by turning on the gas and throwing a lighted match in the stove. In grates the effect of a coal fire is obtained by the placing of pieces of earthenware inside. These become redhot, and glow with the true anthracite cheerfulness.

For illuminating purposes a uniform charge of fifty cents a month is made to the consumer. Where twelve burners are in use, a discount of 20 per cent is made. To large consumers, such as hotels, stores, etc., a further discount from the twelve burner rate is given. An ordinary family parlor or cook stove pays $4 a month for fuel, while range and large heater cost $6 a month. In the early days of gas burning in the region an ordinary stove consumed about 300 cubic feet an hour. The subject has been given much scientific study, however, and a regulator devised by which the amount consumed is much reduced without affecting the heating power of the fuel. The gas is not measured. It is a matter of much surprise to the stranger visiting this region to see the gas in buildings and on the streets burning all day as well as during the night. No one takes the trouble to turn off their gas. It is believed that the gas would be consumed and wasted in other ways, even if it was turned off, and so it burns from one year's end to the other. For heat and lighting, the gas companies require pay in advance per month, but well drillers pay at the end of the month. At one time the Keystone Company had 500 drilling wells attached to their pipes, but not one quarter of that number are drilling now. The traveler through the oil regions will see great pillars of flame high in the mountains, in the depths of forests, and down in the deep valleys. These are made by the waste gas coming from pipes inserted in the wells. They burn constantly. Many of the smaller oil towns are as light by night at they are by day, owing to the presence of these pipes in their streets.

Natural gas at drilling wells causes many fatal accidents. Veins of it are sometimes suddenly penetrated by the drill, and it issues with great force to the surface. In such case it is liable to become ignited by the lamp in the derrick or the forge or by the fire-box of the boiler. It is more by good luck than anything else then if occupants of the derrick-house escape with their lives, for a frightful explosion occurs. Even if the lamp or boiler is removed far from the derrick, an explosion is apt to occur, especially if the atmosphere is murky and heavy. Then the gas settles to the ground, and if blown toward the light or fire an explosion is inevitable. Gas is found in large quantities in the Sheffield district of the Warren oil field. One of the heaviest wells ever struck is at Sheffield. It has been burning with a flame 50 feet high for years, and its roar may be heard for miles. Another heavy well is the Murrayville well, in Washington County. There is a great gas streak in that region, and a company has been formed and chartered by the State to supply Pittsburg and other places with light and fuel from it.—*Bradford, Pa., Correspondent of the N. Y. Times.*

COST OF THE EAST RIVER BRIDGE.—At the November meeting of the trustees of the East River Bridge, it was reported that the total cost of the bridge up to the present time is $14,045,683.86.

Education for Civil Engineers.

If a census could be taken of all the young men of the age of thirty who are in charge of parties on railroad location or construction, it would be found that those who graduated from technical schools were receiving the highest salaries and had the best prospects for promotion, and further, we feel confident that in number they would far outrank the others. This cannot be said of men of fifty, for thirty years ago, when they were young, technical schools were scarcely known. To argue that, because these older engineers have attained reputation and success without the advantages of scientific education, the young men of to-day can do so likewise is certainly fallacious, for the conditions in the two cases are far different.

An inspection of the lists of graduates given in some of the catalogues of technical institutes shows that young men who have been six years out of the school, in general, hold responsible and lucrative positions. On graduating, they began at the bottom of the ladder with low pay, but they have rapidly mounted the steps, passing and often leaving far behind those who began the ascent when five years younger. In fact, we know of no profession where the graduate advances so rapidly as in civil engineering. A young doctor finds it hard to obtain patients, even when he furnishes both services and medicine gratis. A young lawyer is glad to take cases where he receives nothing if he loses, and almost nothing if he wins. But the young civil engineer earns at once as rodman or draughtsman fifty dollars a month, and usually double or triple that amount after a very few years of practice.

The indications are, that technical education, as a qualification for technical pursuits, will grow every year more and more important, until finally it will become, as it is now in Germany, indispensable. Already some railroads hire for their field parties and draughting offices almost no others than technical graduates. They do this because they find it pays. A young man who is trained how to think is of more value to them at higher wages than one who does his work by rule of thumb at lower wages. He does more work in a day and does it better.

And when we look at the question from other points of view than the financial, everybody will agree that the young man of education has the advantage. The locating engineer, for example, does his work with a more cheerful mind, if he knows something about the rocks of the country through which he travels. He has an interest in the progress of science in general, as well as in that of his own specialty. When the panic comes that stops his work and his pay, he is not so bound to his trade that he cannot try his hand at something else. In such times, too, he feels at liberty to ask the alumni of his institution to assist in securing him employment. This may, perhaps, seem a trivial matter, but as a rule men's lives are largely controlled by circumstances, while those who are able to control circumstances are few; and many a college man will testify to encouragement received from his brother alumni in times of commercial depression, encouragement without which his life might have been very different. There is one other point suggested by the remarks made, two weeks ago, by Herbert Spencer, concerning overwork and gray hairs, that should receive the careful attention of parents who are puzzled to know whether to give their boys a technical education or put them at once into practical work. Much of course depends on the boys, but if they have any liking for study, we say by all means let them continue at it. In these days of hurrying business rush and overwork, let us keep the young men out of the world as long as possible. Let the days of their youth be spent in academic halls, where the worry of business is unknown. Let the selection of their special branches of engineering labor be deferred until they are qualified by age and experience to select. Overwork and gray hairs come soon enough to men, even when life is begun at twenty-two, and by commencing younger nothing whatever seems to be gained, but rather much seems to be lost.

To conclude: A young man who wishes to attain success and happiness in the occupation of a civil engineer ought to begin by obtaining a sound technical education.—*Engineering News.*

Indigenous Potatoes in Arizona.

At a meeting of the California Academy of Sciences, November 6, Mr. John G. Lemmon reported the results of a summer's tour of botanical exploration among the mountain ranges along the Mexican frontier of Arizona. Among his discoveries were two or three varieties of indigenous potatoes, found growing abundantly in high mountain meadows surrounded by peaks attaining a height of 10,000 feet above sea level. The tubers were about the size of walnuts. Mr. Lemmon brought home a supply which will be carefully cultivated.

This interesting discovery goes far to settle the long vexed question of the origin of the potato.

No Tin in Colorado.

We learn from Mr. James F. Downey, editor of the *Mining Register*, Lake City, Colorado, that the paragraph that is going the rounds of the papers, and which was copied into our journal of October 28, is without proper foundation. No tin has yet turned up in Colorado, writes Mr. Downey, but nearly all other earthly treasures are to be found there in abundance.

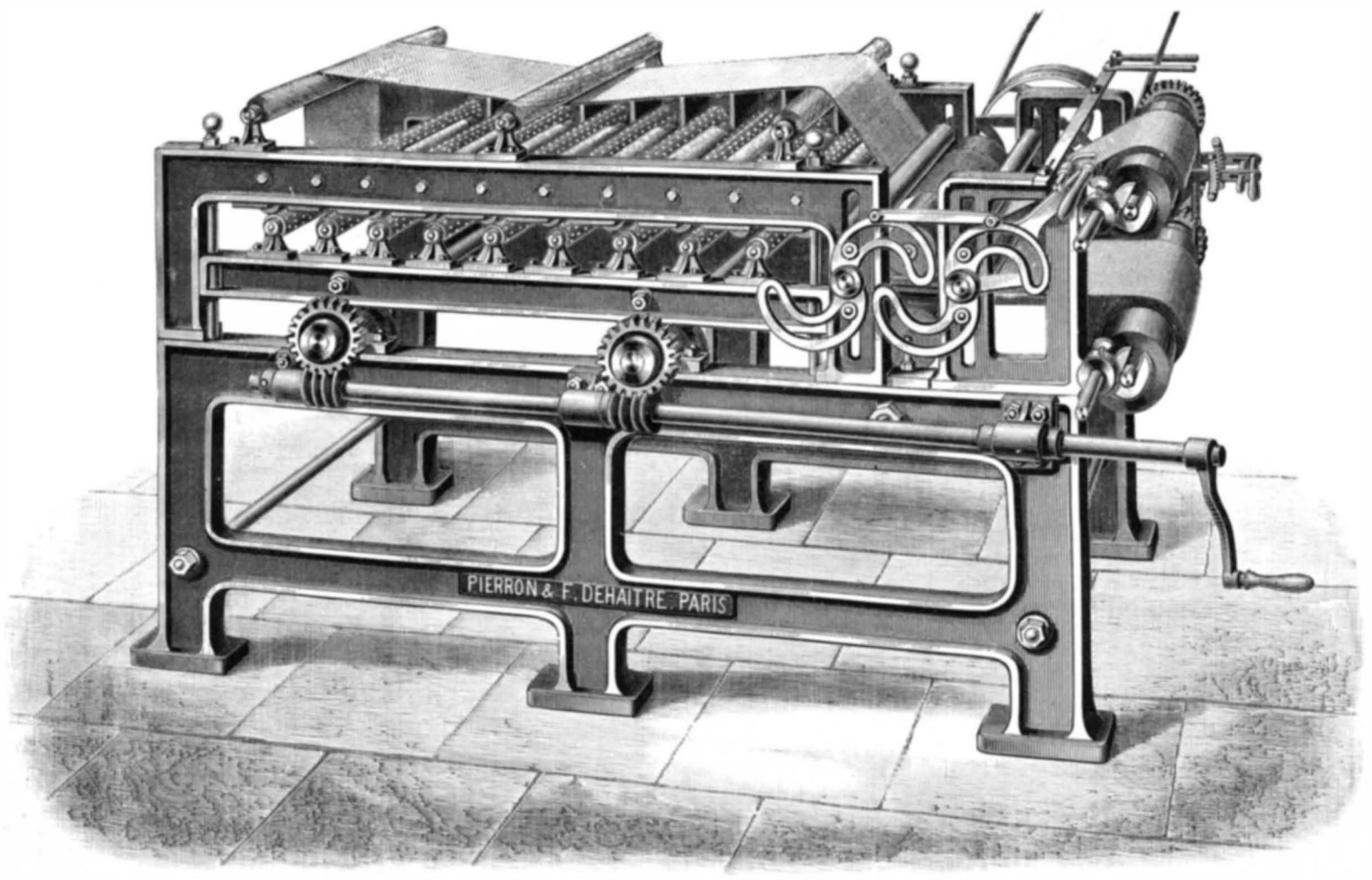
MACHINE FOR BREAKING FABRICS.

As well known, the object of breaking fabrics is to part the threads of the warp and woof which are held together by the finishing materials employed (starch, dextrine, gelatine, etc.), so as to make the goods soft and pliable.

The accompanying cut represents a new machine for the purpose invented by M. Garnier, and improved by Messrs. Pierron and Dehaitre.

All the parts of the apparatus are supported upon two parallel frames properly connected by crosspieces. In front there are two superposed rollers, one of which receives the fabric to be treated, while the other takes the latter up after it has been submitted to the action of breaking during its travel. The first roller is set in motion directly by the driving gear; and to the second there is attached a brake, by means of which the resistance of the fabric and proper amount of tension to give may be regulated at will. There is also an ingenious arrangement which allows of one or the other of the two rollers being actuated alternately, so as to make it easy to direct the piece successively from one cylinder to the other in order to submit it in each case to the parts of the machine.

The driving mechanism consists of a toothed wheel keyed upon the pulley shaft, and connected with a lever that carries a second wheel mounted loose on its axle, and gearing constantly with the first. On moving this lever, the teeth of the loose wheel are made to engage with the teeth of a third gearing fixed on the axle of the roller that it is desired to set in motion. When the lever is fixed in its medium position, the gearings of the two rollers are neither of them in contact with the middle wheel, and motion ceases.



MACHINE FOR BREAKING FABRICS

The fabric on unrolling passes over the breaking cylinders that constitute the principal feature of the machine. These are made of wood, and are provided with iron journals. Their external surface is studded, according to lines determined by practice, with oval-headed and perfectly polished nails like those used by upholsterers for trimming furniture. Ten of these rollers, placed between the upper parts of the frame, have fixed axles, around which they revolve. Another series of ten rollers, exactly like the others, are mounted on a horizontal frame which is capable of being raised or lowered by means of four interior eccentrics. This frame is held and guided vertically by rods inserted into the uprights of the machine frame. It rests on the eccentrics, and the motion of the latter is effected through the intermedium of two endless screws keyed upon a single longitudinal shaft. Upon actuating the winch figured to the right in the cut, the ten rollers of the movable frame enter between those that are mounted on the machine frame, so that both sets are ranged in the same plane.

As a consequence of this maneuver, the fabric which was passing freely between the breaking cylinders is forced to assume an undulatory form, and come in contact with the round and polished heads of the nails with which the cylinders are studded. As the oval projections do not present themselves at the same places, the fabric is both stretched over these and forced into the hollows between them during its travel between the twenty cylinders. It is at this moment that is effected the continuous and regular breaking over the whole surface exposed. The threads of the warp and woof are thus parted, and, at the same time, the fabric becomes pliable, while still preserving the finish that gives it the necessary body.

On leaving the breaking cylinders the fabric passes over stretching cones which have their apices in the axis of the machine and their bases turned toward the frame of the latter. These cones are designed for stretching the goods breadthwise, so as to prevent folds while being rolled up. Each of the large cylinders has a corresponding cone, on to which the fabric is directed by means of small movable cylinders that may be displaced by a hand-lever belonging to one of the S-shaped supports shown in the cut.

When the piece has been completely wound up on one cylinder, it is made to return upon the other by changing the position of the lever that carries the intermediate gearing of the driving mechanism, and by modifying the effect of the brake. The cylinders revolve in opposite directions, and the breaking continues as has been described.

For the treatment of light fabrics, two operations may suffice, but, by reason of the rapidity with which the work is executed, it is preferable to increase the tension progressively, and to cause the piece to pass over the breaking cylinders several times. In this way the desired degree of softness may be obtained without uselessly stretching the goods. This machine, employed for the treatment of Lyons fabrics, has given good results. The manufacturers propose to apply it likewise in the treatment of woolen fabrics as well as those of woolen and cotton; for, up to the present time, the apparatus that have been used for such a purpose (calendering machines, etc.) succeed in breaking fabrics only by making them thinner.—*Revue Industrielle.*

Conversation Carried Three Thousand Five Hundred Miles.

A wonderful feat, even for this age of wonderful things, was performed over the line of the Western Union Telegraph Company a few days ago, says the Kansas City *Journal*, at which time President W. B. Strong, of the Atchison, Topeka & Santa Fé Railway, talked by telegraph from Boston with C. C. Wheeler, general manager of the company at Guaymas, on the Gulf of California, a distance of about 3,500 miles. The circuit, it is claimed by telegraph experts, was one of the longest ever undertaken in America during daylight, and was from Boston to Chicago, thence to Kansas City and Pueblo, Col., from which point the wire ran south to ancient Santa Fé, N. M., the home of the fire worshiping Pueblos, and then to Benson, in the southern portion of Arizona. At Benson the wire led south across the line into old Mexico, through Sonora to Guaymas, on the Gulf of California, where some day a line of rail will also connect with Chihuahua. At Guaymas, General Manager Wheeler and party, who a few hours before had driven a silver spike into a mahogany tie, completing the line of the Santa Fe road from Kansas City to the Pacific Ocean, were in waiting, and about 12 o'clock by Pacific coast time the announcement was made that Boston was "O. K."

"Tick-tick-tick-tick," clicked the little instrument beneath the telegrapher's hand at Guaymas; "tick-tick-tick-tick," though very faintly, spoke the instrument as the sound passed through the Kansas City office, and the same instant it was heard in Boston. In less than five seconds came the reply from Boston, where President Strong was in waiting. The answer being heard at Guaymas, the two chief executive officers of the longest continuous line of railway in the world under one management talked with each other, receiving and sending congratulatory messages over the completion of the road, one with the Atlantic Ocean at his feet, and the other on a shore washed by the Pacific, 3,500 miles away. At stations between the two points, in States and Territories through which the wire passed, operators listened at the instruments for the first sound, and when at last the circuit was in good working order, all that was being said was heard at different points as the sound passed over the wires. The feat was one which operators from one end of the country to the other watched with interest, and, at the conclusion of the five hours' test, they might truly have said, one to another, "What hath God wrought?"

Rapid Formation of Ore Veins.

It appears from a recent observation by Dr. Fleitmann, of Iserlohn, known to our readers as the inventor of a process for welding nickel, that the formation of ore veins need not necessarily occupy such long periods of time as we are generally inclined to accord to it. Dr. Fleitmann gave his experience as follows: Some two years ago he had the bottom of a stable pit filled and rammed with common clay containing iron. The pit had served its purpose for storing dung for about two years, during which time, occasionally, to prevent overheating, water had been poured over it; lately it became necessary to remove the pit, when, to the great surprise of Dr. Fleitmann, he found the clay had entirely changed in character, and had become white; it was, moreover, divided in numerous directions by fissures from one twenty-fifth inch to one-sixth inch in width, which were filled by compact iron pyrites. The explanation Dr. Fleitmann gives is, that the iron oxide of the clay was changed, by the water containing sulphate of ammonia, into sulphate of iron, and the latter had, in accordance with molecular attraction, deposited itself in groups of fissures.

Lightning and Rods.

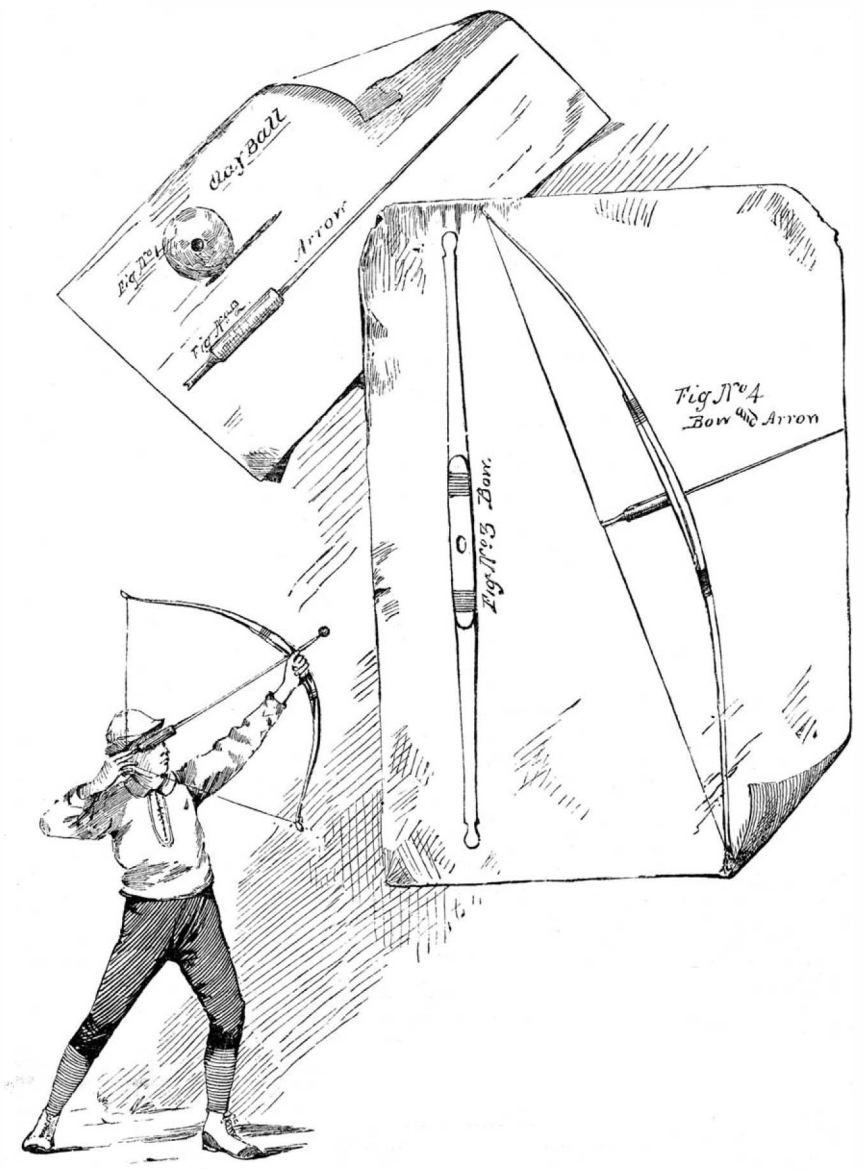
An interesting note on the efficacious protection of a house by a lightning protector, during a recent storm at Colmar, has been brought before the French Academy of Sciences by M. G. A. Hirn. The conductor was by no means a good one, and terminated in a piece of iron lying in a water cistern or trough standing in the corner of a court. In spite of a terrific thunderstorm which struck the rod, no part of the current left the rod, but all was discharged into the earth. The brass point was, however, fused. Experiments by M. Hirn fully confirm the views of M. Melsen that lightning rods should end in metal masses, such as pipes, and not in so poor a conductor as water. When there is a flaming discharge seen at the point of a lightning rod, it is a proof that the rod is not a good one, for M. Hirn has proved that these rods act busily during a thunderstorm in giving off a silent discharge. By means of an electro-magnet in a derived circuit from the rod, he has demonstrated this fact. When the storm passes the zenith, the bars become magnetized. The same effect is shown by connecting a galvanometer in the circuit of the rod; and we may mention here, says *Engineering*, that a plan was recently patented for charging secondary batteries in this way.

HOW TO MAKE A CRAB-APPLE BOW.

BY VICTOR SMEDLEY.

Perhaps the greatest practical difficulty boys find in archery is the constant liability to lose their arrows. Good arrows are costly to buy and difficult to make, and the bow is useless without them. The accompanying drawings illustrate a sort of ammunition and manner of using it that entirely obviate this difficulty. A strong and serviceable bow can be made of a barrel stave sawn lengthwise to about one and a half inches wide at the center, tapering to three-quarters of an inch at the ends, as shown in Fig. 3. The hole for the arrow should be in the center of the bow and about one-half inch in diameter. Before boring the hole it will be necessary to strengthen the bow by splicing a piece of stave, about one-third the length of the bow, to the center (Fig. 3). Cut the notches for the string about one inch from the ends. Fig. 4 shows the bow, arrow, and ball in complete order for shooting. The arrow should be cut from a piece of tough, straight grained wood, and should be about three-quarters of an inch thick at the shoulder (Fig. 2), which should end abruptly at the same distance from the notch as the string is from the bow when strung. The end of the arrow should be pointed to hold the ball (Fig. 1). Clay is as good material as any to use for the ammunition (Fig. 1). Take a piece the size of a large marble, roll in the palm of the hand till somewhat round, then punch a hole for the arrow to fit in, and set it away to dry.

Clay is not the only material that can be used for ammunition; anything capable of being stuck on the end of the arrow will answer the purpose. In the proper season the crab-apple trees furnish a bountiful supply of ammunition for the boys who live in the country. The little hard apples are just the proper size and weight.



HOW TO MAKE A CRAB APPLE BOW.

THE ECONOMIC VALUE OF SHARKS.

C. F. HOLDER.

One of the earliest industries recorded in the United States is that of shark fishing, the oil being the desideratum, and in some species the skin. Among the early colonists the bone shark was the one most sought after. Scientifically it is *Cetorhinus maximus*, known to fishermen and sailors as the sun-fish, basking shark, and sail fish. It is by no means voracious, living upon small animals, straining them through a series of rays or fringes, of an elastic, hard substance, that are arranged along the large gill openings that occupy nearly the whole space about the "shoulders." Mitchell mentions the fish "as a shark of huge size, taken in considerable numbers about Provincetown, Cape Cod, for the liver; remarkable for having something in its mouth resembling the horny substance called whalebone"

They grow to an enormous size. One captured off Long Island, several years ago, measured 28 feet in length and 16 feet in circumference. According to De Kay, they attain a length of 33 feet, while Storer says: "The elephant or bone shark attains a length of 36 feet." Sir Charles Lyell records one nearly 55 feet long, that came ashore at Rathesholm Head, at Stronsa, parts of which are now in the British Museum; but probably the largest specimen ever seen is the one portrayed in the accompanying cut. In a conversation this summer with Daniel W. Perkins, Esq., one of the selectmen and school commissioners of Wells and Oguenquit, Me., he informed me that a bone shark had been caught off Block Island that was about 70 feet in length, and when hauled alongside was longer than the vessel. To refresh my memory on the subject, I addressed Mr. Perkins and the following is a quotation from his letter in reply:

"Your remembrance of the shark story was mainly correct; the facts are these: The schooner Virgin, of Gloucester, Capt. Chas. Merchant, of which vessel one of my neighbors, now deceased, was one of the crew, caught a shark off Block Island, from which they took eight barrels of liver. They lashed its head to the windlass bitts, and his tail extended past the stern, so that he was longer than the vessel, which was of 68 tons burden. They also struck another shark the same day, which they reported *larger*, but he took their harpoon and line. . . . Several well authenticated stories of sharks of nearly equal size are reported. My great-grandfather emptied a pan of coals on the back of a shark which was lying alongside of his vessel on the Grand Banks, which he said was longer than the vessel."

From these and other accounts it would seem that there are sharks yet extant that would rival the extinct *carcharodon*. Capt. Atwood refers to three specimens seen by him, one of which drifted ashore in a state of decomposition, and a fisherman visited it for the purpose of obtaining slices for his hens, according to the custom, thinking it a *whale* from a distance. The liver from this specimen produced *five or six barrels of oil*, which brought $103 in Boston.

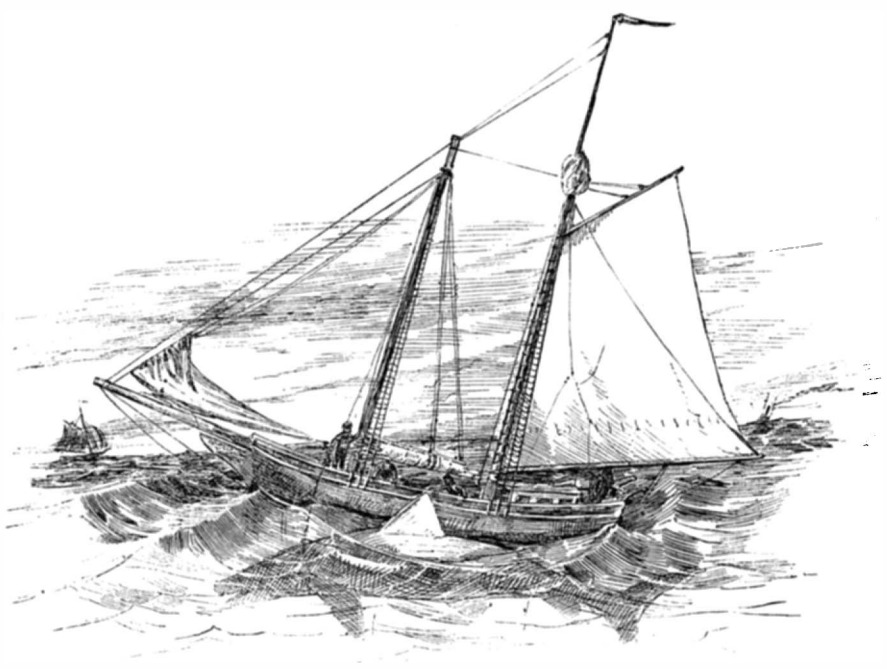
In 1848 numbers of these sharks were caught off Cape Elizabeth, Me., and a tradition exists among the men there, that, one hundred years ago, they were captured in a regular fishery as are whales to-day. In Greenland they are caught in great numbers, this most important fishery being at Naorkanek, where from three hundred to four hundred are taken every season, their livers yielding about 2,500 barrels of oil, that is preferred to seal oil, bringing even a higher price in the European markets. It is extremely pure, resists the cold, and is perfectly adapted for lubrication. Chemically, it can be compared to seal oil. Other important fisheries in Greenland are at Fiskenaes and Proven, and at these places and in Iceland, where the great shark is called the hoowcalder, the spec or blubber is a regular medium of exchange for coffee, pipes, tobacco, and other luxuries from the outside world. The shark next in value, in an economic point of view, is the nurse (*Somniosus microcephalus.*) It is rarely seen on our coast, one of the first being washed ashore on Lynn Beach, in 1843, where it was examined by Dr. Holder, curator of zoology at the Museum of Natural History, Central Park. It has a wide geographical range, and is extremely common on the west of Norway, and especially along certain banks of the Polar Sea, where the fisheries have been observed by M. Baars.

These banks lie at a distance of fifteen or twenty miles from the land, at a depth of 250 to 300 fathoms. Decked boats are used in their capture, although they seldom exceed fifteen tons burden, with a crew of five or six men. The mode of capture is by means of a line, about four-tenths of an inch in diameter, to which a lead of six to nine pounds is attached as a sinker. This line ends in a tinned or galvanized iron chain, of about three fathoms in length, so that it cannot be injured by the familiar habit of the fish, hereafter to be described. The hooks are made of strong iron or steel, nearly four-tenths of an inch in diameter. As soon as the boats reach the bank they are brought to anchor, and the cord let down; before this, however, a perforated box, filled with rancid or putrid seal blubber, is fastened about two fathoms above the hook. This substance escapes through the holes of the box, and is carried along by the water, thus attracting the fish to the hook, which is also baited with seal blubber. The fisherman holds the line in his hand, as in cod fishing, and as soon as it is observed that the animal has taken the hook, by a sudden jerk this is forced into the mouth. As soon as captured the shark rolls himself round and round in the chain, which is not injured by the rough, file-like skin, as would be the case with a line. The animal is then hauled up, sometimes by the use of a windlass. As soon as it appears above the surface it is killed and held fast until the belly is opened and the liver removed. The swimming bladder is then filled with air by means of a pipe, so that the carcass will not sink. It is then fastened to the stern of the vessel. Sometimes other sharks follow the carcass of the dead one, and are occasionally caught by means of gaffs. When the boats leave the banks a buoy is generally fastened to each carcass, so that it may remain at the surface without sinking, otherwise it would be eaten by its fellows, who would neglect the baited hooks.

The yield of this fishery is not only dependent upon the wind and weather, which are so inconstant in the Arctic seas, but also upon the variation in the size of the fish and their abundance. Some of the fish furnish a liver weighing only twenty-five to thirty pounds, while from others livers of two hundred and twenty to four hundred and fifty are obtained. Of late years the carcasses of these sharks have been brought ashore for the purpose of being manufactured into manure or guano; especially when they are taken inshore near the land, as is the case sometimes in the winter on the coast of Finmark, where they are sometimes taken with trawl lines. These trawls usually carry thirty hooks, six or seven fathoms apart, and are kept immediately above the bottom by means of glass floats.

The annual yield of this fishery amounts to eight to ten thousand barrels of livers, worth one hundred and fifty thousand gulden. The oil of this animal, obtained by steam heating, is extremely fine, and is used for purposes of illumination. The undissolved portions of the liver are then boiled, and furnish the brown tanner's oil.

The picked dog fish (*squalus americanus*), caught in such vast numbers on the Maine coast, are valued for their oil—each liver being valued at about a cent apiece—and sold to tanners; the skins are also used for many purposes. The writer was fortunate in observing some of the habits of these fish during the past summer at Ogunquit, and the damage they produce upon the fisheries of this State can hardly be computed. They seemed to appear all at once—in such vast numbers that the great bay at Wells was fairly alive with them. One Wednesday, four hundred pounds of cod, hake, etc., were caught in a few hours, and three days later the men gave up fishing, and went dog fishing for the livers. Not an edible fish could be had for love or money. The water seemed alive with them—ninety-nine per cent being females—all with young (August 20) nearly ready to be produced (*alive*); they breed, however, at any time. So savage were they that they bit at oars, the keel of the boat, or at the sail when hanging over. When the trawls came in it was often found that they had had eaten each other, and a man's life would be in the greatest danger by accidentally falling over, and several cases were current of loss of life under such circumstances. Some idea can be gathered of the vast numbers of these fish by the



GIGANTIC SHARK CAUGHT NEAR BLOCK ISLAND, R. I.

fact that from the small village of Ogunquit about twelve boats (dories) went out daily, and were filled to the water's edge in a few hours, so that at this one spot over five thousand were brought in daily for several weeks.

The writer examined the contents of the stomachs of many, but food was scarce; a few deep water star fishes, scarlet shrimps, etc., being found, but the greater quantity contained nothing but mucus, or, as I judged, the half digested remains of some jelly fish, and I was informed by Mr. Perkins that the dog fish eat out the center of the larger aurelias, etc., he having observed it, and examined great numbers of jellies that had been thus disemboweled. On the coast of Cornwall the *M. vulgaris* is found in equal numbers, as many as 20,000 having been caught in a single haul of a net. The liver of the mackerel shark (*Isunopsis dekayi*) is much valued, the oil obtained from it being in great demand by curriers. The shagreen obtained from the shark ray (*Squateica dumerili*) has long been used in polishing wood; even Aristotle refers to it. A specimen of the fish was captured some years ago, measuring 20 feet. In India and China the shark has a somewhat different value. The fins are the choice parts, and are used in the concoction of certain Asiatic and mysterious soups, more tempting to the curiosity than the palate. In one year over $100,000 worth of these fins have been shipped from Calcutta to China. In the islands of the Pacific the teeth of the large sharks are bound to swords, gauntlets, and spears, forming formidable weapons. In Florida, the jaws are sold as curiosities, and the back bone pierced by a steel rod, and well polished serves as a cane. One of the most practical uses of the shark is seen in its habits as a scavenger. Refusing nothing in the way of food, they form an important factor in the sanitary department of the submarine world.

October, 1882.

Blomidon.

To the mineralogist probably no place on the continent of America presents so much attraction as the trap regions of Nova Scotia, of which Blomidon is the representative. Our correspondent, Mr. S. D. Macdonald, F.G.S., of Halifax, N. S., who has spent some time in its vicinity, sends us a detailed description of the place, which may be of interest to our readers, especially as summer travel is increasing so rapidly in that direction.

This magnificent promontory is situated on the picturesque shores of the Bay of Fundy, whose tides are among the wonders of the world, attaining a height of seventy feet in their flood of three hours' duration.

Those who have watched their surges as they break and foam at the foot of the fir-crowned head of Blomidon, often bearing in their vortex some unfortunate coaster belated in his attempt to double the cape, or again, wave capped, hurrying on with accelerated force before the gale until encountering the opposing cliffs, there scattering their masses in driving clouds of foam and spray, have enjoyed a scene that will linger while memory lasts.

From Blomidon to Cape Split is a series of headlands, composed of amygdaloidal trap resting conformably upon sandstone of Triassic age, and overlaid by basalt. These rise almost vertically from the water to a height of four hundred and fifty feet, and present a picture of striking beauty, as well worthy the attention of the artist as that of the observer of geological phenomena.

This amygdaloidal bed is much fissured and full of cavities, in which are found those trap minerals of rare beauty that have made the place so celebrated that to-day but one place, Mysore, in India, alone rivals it in the variety and brilliancy of its minerals.

In winter the ice laden currents grind with terrible abrading force at the base of the cliffs, until, the superincumbent weight becoming too great, immense masses are detached from above and come crashing to the beach, opening up rich treasures to the mineralogist.

Among the most abundant of them are amethysts, chalcedony, agate, onyx, jasper, opal, cacholong, apophillite, natrolite, analcite, modernite, chabazite, stilbite, sinter, heulandite, and upward of fourteen others of the zeolite group.

Among the first visitors to this locality was De Monts, who, in company with Pontrincourt and Champdor, as early as 1604 "discovered great stores of jasper and amethysts," which were carried to France, and presented to the king, who ordered the finest of them placed in the crown of state. Many are still to be seen in the museums of Paris.

Of late years the attention of mineralogists, far and near, has been attracted to this place, until few cabinets in the New or Old World are without specimens from those grand old cliffs

Railway Speeds in Europe and America.

A German journal, *Die Verkehrszeitung*, has recently made a comparison of the fast trains of leading countries in Europe, to show the speed attained. This is a matter in which many take interest, but the various statements made from time to time have lacked authority, and could hardly be trusted as accurate records. The figures which the *Verkehrszeitung* gives, however, seem to have been compiled from time-tables, either official or the very accurate and recent ones published in the German and Foreign *Railroad Guide* compiled in the German Post-Office Department. We have reduced the distances given in this article from kilometers to miles, and added to its statement of minutes per mile (kilometer) a statement of the speed in miles per hour, which will be more readily intelligible to our readers. The speed in all cases is calculated by dividing the length of the route by the time between the two terminal stations, including stoppages between:

Runs of 310 *Miles* (500 *Kilometers*) *or More.*

Route.	Length of run, miles.	Miles per hour.	Minutes per mile.
London-Sheffield-Edinburgh express	416	41	1·464
Berlin-Cologne express	354½	37	1·625
Paris-Bordeaux fast train	346¾	36⅛	1·650
Paris-Lyons fast train	326	36⅛	1·650
Paris-Marseilles fast	536	34⅜	1·730
Bodenbach-Vienna express	335½	31·4	1·910
Paris-Toulouse fast	466½	29·4	2·040

Runs of 248 *to* 310 *Miles* (400 *to* 500 *Kilom.*).

Cologne-Bremen-Hamburg courier	277½	33⅛	1 80
Cracow-Vienna express	257	27¼	2·20

Runs of 186 *to* 248 *Miles* (300 *to* 400 *Kil m.*).

London-Salisbury-Plymouth express	230	37	1·62
London-Bristol-Portsmouth express	247	36 6	1·64
Paris-Longuyon express	207½	31·6	1 90
Hamburg-Cassel courier	215¾	30·8	1·95
Holzminden-Aachen	203½	30·0	2·01
Mainz-Basel	218½	29·7	2·02
Berlin (Kohlport)-Breslau	123½	29·4	2·04
*Munich-Nuremberg-Hof	241	26·7	2 25

Runs of 124 *to* 186 *Miles* (200 *to* 300 *Kilom.*).

Paris-Boulogne-Calais express	184½	37.0	1·62
Berlin-Hamburg	177½	35.3	1·70
Paris-Rouen-Havre fast	141½	33·1	1·81
Paris-LeMans fast	131	33·1	1·81
Bremen-Magdeburg express	163	31.7	1·89
Brussels-Cassel express	133½	30.6	1·96

Runs of 62 *to* 124 *Miles* (100 *to* 200 *Kilom.*).

London-Sittingbourne-Dover express	78	44·8	1·34
London-Tunbridge-Dover express	65¼	43·5	1·38
Berlin-Jüterbog-Dresden courier	116⅛	38·1	1·57
London-Norwich express	114	37·0	1·62
Dresden-Zoffen-Berlin courier	108	34·3	1·75
Cassel-Frankfort courier	123½	33·9	1·77
Breslau-Oderburg courier	132½	32·4	1·85
Berlin-Leipsic	101¼	32·4	1·85
Stargard-Stettin-Berlin	115	31·7	1·89
Darmstadt-Heidelberg	37¾	34·9	1·72
Mainz-Aschaffenburg	40¼	30·3	1·98

The speed made on parts of the longer runs is of course greater than the average for the whole. Some of the sections on which the greatest speed is made are as follows:

Section.	Length, miles.	Miles per hour.	Minutes per mile.
Stendal-Lehrte	83¼	45·1	1·33
Spandau-Stendal	57¼	43·5	1·38
Hanover-Debisfelte	54⅜	43·5	1·38
Berlin-Falkenberg	69½	41·1	1·46
Jüterbog-Berlin	39	41·1	1·46
Frankfort-Guben	30	41·1	1·46
Neustadt-on-Dosse-Spandau	—	40·3	1·49
Berlin-Luckenwalde	31	39·5	1·52
Stettin-Angermünde	42¾	37·5	1·60
Hanover-Cologne	203½	35 9	1·67
Berlin-Kustrin	51⅛	35·6	1·69

Long runs at fast speed are few, it will be seen, there being no room in Great Britain for what we would call a long run here, and fast trains being fewer on the Continent, and confined chiefly to comparatively short and especially important routes in France and Germany. The London-Edinburgh line, 416 miles long, is somewhat shorter than the New York-Buffalo and New York-Pittsburg lines in this country The London-Edinburgh speed of 41 miles per hour is very nearly matched by the New York Central's special Chicago express, running from New York to Buffalo, 440 miles, in 11 hours, or at the rate of 40 miles an hour. The Pennsylvania's New York & Chicago limited makes the 443 miles from Jersey City to Pittsburg in 11 hours and 50 minutes, or at the rate of 37·4 miles per hour—the latter faster time than is made by any Continental train that runs more than 300 miles. Indeed, the Fort Wayne's time for the Chicago & New York limited is 35 miles an hour for 468 miles, and the Chicago limited over the 525 miles of the Lake Shore from Buffalo to Chicago runs 34·4 miles an hour, and makes the trip in 15¼ hours. These are very nearly the same speed as that of the fast train over the 536 miles between Paris and Marseilles. The fast train on the Michigan Central makes the 284 miles from Detroit to Chicago in 8 hours and 5 minutes, which is 35·1 miles per hour, and the Great Western train connecting with it runs 229 miles, from Windsor to Clifton, in 6 hours and 25 minutes, which is 35·8 miles an hour.

On no European route of 200 miles or more named above is there a train making as much as 37 miles an hour, except between London and Edinburgh, Berlin and Cologne, and London and Plymouth. The list, however, strangely omits what is perhaps the most frequented of all—between London and Liverpool, on which there certainly are trains that make more than 40 miles an hour, and which is from 225 to 250 miles long by different routes—about the same distance as from New York to Boston, New York to Washington, or Buffalo to Detroit.

The best examples we have of trains to match these are on these very routes from New York to Washington and Boston. Trains now run from New York to Boston, by the Shore Line, 232 miles, in 5 hours and 53 minutes, or 39⅓ miles per hour, and this includes the ferry transfer at New London. On the Springfield line trains take six hours for the 234 miles—39 miles per hour. This is not equaled by any English speed given above for a line 200 miles long or more, except that between London and Edinburgh, but we are sure that it is surpassed by some of the trains between London and Liverpool.

*Numerous stoppages and an unfavorable alignment make this train slow.

During the session of Congress, the Pennsylvania last season ran a limited express, which passed over the 244 miles between Jersey City and Washington in 5 hours and 50 minutes, which is at the rate of 41⅝ miles per hour—not matched by any European line of equal length in the above list.

Of shorter routes, and parts of routes, there are many in Europe on which the speed is more than 40 miles an hour, and but few here. Our fastest train is one between Jersey City and Philadelphia, making the 89 miles by the Pennsylvania Railroad in 1 hour and 52 minutes, which is 47⅔ miles per hour, and by the Bound Brook route substantially the same time is made—faster than the speed of any European train reported by the *Verkehrszeitung*. On the Boston & Providence Railroad a train makes the 44 miles between Boston and Providence in 57 minutes—46⅓ miles an hour—also faster than any of the above European trains. The fastest train over the 142 miles of the New York Central between New York and Albany takes 3½ hours for the run, making a speed of 40·6 miles an hour.

Below we tabulate these fast American trains, which will render comparison easy with the European trains in the tables above:

Route.	Length, miles.	Miles per hour.	Minutes per mile
Jersey City-Philadelphia	89	47⅔	1·26
Boston-Providence	44	46⅓	1·29
Jersey City-Washington	244	41 5-6	1·43
New York-Albany	142	40 6	1·47
New York-Buffalo	440	40	1·50
New York-Boston (Shore Line)	232	39⅓	1·52
New York-Boston (*via* Springfield)	234	39	1·54
Jersey City-Pittsburg	443	37·4	1·60
Windsor-Clifton (Great Western)	229	35 8	1·68
Detroit-Chicago	284	35 1	1·71
Chicago-Pittsburg	468	35·0	1·71
Buffalo-Chicago (Lake Shore)	525	34·4	1·74
Chicago-Jersey City (Penna R. R.)	911	35·6	1·69
New York-Chicago (N. Y. C. & L. S.)	965	36·3	1·65

This certainly is not a very bad showing for a new country. Possibly one or two English trains equal the fastest American speed given above for 50 or 100 miles, but we think that none exceeds it, and so far as speed on long routes is concerned we make the best showing, though as there is more room here for long routes, that perhaps was to be expected. Only a few years ago we could not have made such a showing. On the Continent of Europe also there is greater speed, and fast trains on more lines, than was attempted five or six years ago. In England, however, there has been very little change for many years. The maximum, or a rate very near it, was attained there long ago, and there have long been very fast trains on many routes, which apparently has so satisfied the requirements of the people and the ambition of the railroad men that little effort is made to increase it.—*Railroad Gazette.*

An Ancient Salt Mine.

A mine has been found in a mountain near Salzburg, Austria, which, it is considered, gives indications of having been occupied and abandoned at least two thousand years ago. It contains a large and confused mass of timbers, which were used for support, and a number of miners' implements. The timbers were notched and sharpened, but were subject to an inundation, and left in confused heaps. The implements were mainly wooden shovels, ax-handles, etc. Among the relics, also, was a basket made of untanned raw hide, a piece of cloth woven of coarse wool, the fiber of which is very even and still in good preservation, and a torch, bound together with flax fiber. The probabilities are that the ancient salt-miners were overtaken by the flooding of the mine, as mummified bodies have been discovered also. The find seems to have belonged to the pre-Roman times, as the ax-handles were evidently used for bronze axes, specimens of which have been found upon the surface of the mountain. The relics are of a high order, the basket being superior even to some that were used in the early historic times.

The Car Coupler Problem.

It has been proposed to organize a joint stock company, says *The Railroad Gazette*, for the purpose of employing the best available ability to investigate the whole question thoroughly, and thus indicate what is demanded. When this is known, it is proposed to buy up all the patents which are essential to control all couplers and cars which would fulfill the ascertained requirements, and then, by the power and influence of the company, to secure the general introduction of the appliances which the company had determined to be the best. If a company of this kind were skillfully organized, and could secure the services of a competent person to do the work of what may be called mechanical evolution, it could probably exercise such an influence as would compel the general adoption of the appliances which its investigations had shown to be the best. The work to be done would be that of extended mechanical research, made through the instrumentality of a corporation, and then the bringing of the results of these investigations in such an angle of vision to railroad companies, the public, and State legislatures that the correctness of the conclusions would be recognized and the appliances recommended adopted. Of course, a corrupt use might be made of the influence of such a corporation, but without this it would seem possible for it to accomplish a great deal. It would be a kind of missionary society, first to ascertain what is the true inwardness of car couplers, then to convince benighted railroad officers of the soundness of its mechanical gospel.

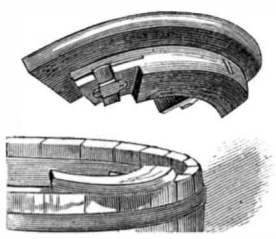
RECENT INVENTIONS.

Combined Whip and Cane.

The object of this invention is to provide an improved combined whip and cane, so constructed that the whip can easily be pushed into the cane, which forms a casing for the whip when not in use. The cane is made hollow throughout its length to adapt it to receive the whip stock, to the upper end of which the lash is to be attached. The handle end of the cane is closed by a suitable head, and through the opposite end, which is open, the whip stock is passed into this hollow cane. At each end of the cane there is a latch, provided with a hook end, and pivoted in such a manner that the hook will be nearest the ends of the cane, and will pass through into the inner recess or cavity of the cane. At the opposite ends of the latches there are small heads pressed outward by springs. The whip stock is provided with an annular groove at the larger end. When the whip stock is within the cane, it is held by the latch at the larger end of the cane; when the whip is to be withdrawn, the head of the latch at the head of the cane is pressed inward. When the base end of the whip arrives at the smaller end of the cane, the latch at this end of the cane snaps into the groove, and holds the whip stock in place. This whip can be carried conveniently, and is not apt to be stolen, as it need not be left in the vehicle. This invention has been patented by Mr. T. R. Lawhead, of Paola, Kan.

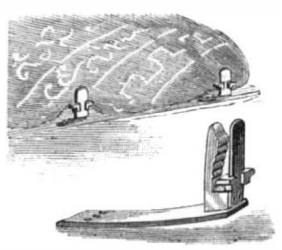
Combined Howel and Croze.

The engraving shows a howel and croze for coopers' use mounted on one stock, so that after the howel is formed the croze can be made without loss of time in changing tools, the arrangement being such that neither tool will act when the other is at work. The howel plane is located near the front end of the stock, and the croze plane near the rear end; and in order that the howel plane may be used first, and without the croze taking effect on the staves, the stock is crooked at or about a point midway between the planes, so that when one touches the circle for doing its work, the other will be clear of it, thereby enabling the work to be done by either one alone. The stock is a little longer than the ordinary howel plane stocks and croze plane stocks, and has a greater crook or curvature between where the two tools are located. The gauge of the stock is substantially the same as in other tools of this class. This invention has been patented by Mr. David J. Sessoms, of Blocker's, N. C.



Bed-Clothes Fastener.

This is a device for preventing the bed-clothes on a sleeping child or person from being worked off or displaced, so as to expose the body to cold. The fastener is more especially designed for protecting sleeping children who are kept covered with difficulty by simply tucking in the bed-clothes. Invalids suffering from fevers or otherwise disposed to be restless in their beds may use this fastener with great advantage. Ordinary jaw clamps are not sufficient of themselves to retain the bed clothes in position on the bed, nor is simply tucking in the bed-clothes under the sides or edges of the mattress or bed, and this mode of securing the clothes in place has a restricting and oppressive effect upon the sleeper. The bed-clothes fastener shown in the engraving, while it insures a firm hold of the bed-clothes and is capable of being easily applied to the bed or mattress, has a yielding or spring-like action that will relieve the hold of the bed-clothes from restricting and oppressive effect upon the occupant of the bed while turning or moving about. These clamps are designed to be applied to opposite sides of the bed for gripe on the bed-clothes, and are provided with flexible strap connections for attachment to the mattress or bed. This useful invention has been patented by Mr. Allyn Cox, of New York city.



Hay Stacker.

This is an apparatus for elevating and stacking hay. It consists of a post having a revolving head on top, and provided with a rising and falling and rotating jib, carrying a tripping hay fork. The jib is provided with tackle for operating the fork, and to the head are attached ropes and pulleys for controlling and adjusting the jib. By revolving the head and fastening the guy ropes at the ground, and by raising, lowering, or placing the loose jib at varying angles to the post, the hay may be stacked around the post at all suitable elevations. The tripping devices for detaching the load of hay lifted by the fork are similar to those already in use on various hay loading and unloading apparatus, the fork being tripped by pulling on a rope. In working the fork, the weight of it, when releasing the lifting rope from draught by the horse or animal to which it is attached, causes the proportion of the rope between the sheaves fixed to the jib to be bowed or drawn down, and the fork to be run back, when the fork is inserted in the hay, and draught applied to the lifting rope, which elevates the fork and runs it forward, when it is tripped to unload. When the apparatus is not required for use, it may be packed away in close compass. This hay stacker has been patented by Mr. James Wilson, of Marengo, Iowa.

Dress Form.

We give an engraving of a new dress form for exhibiting, fitting, and draping ladies' dresses. Its main purpose is to exhibit dresses, cloaks, and other garments to purchasers. One form will exhibit all kinds of garments, and will aid the purchaser in making suitable selection. The form takes up only a little space in the show window or in the shop, and supports the goods so that they may be seen at the best advantage. The device may be used to advantage by dressmakers in the fitting, draping, and general manipulation of dresses and cloaks. It can be quickly adjusted to any size or form. With a slight change in the shape, they may be used to exhibit men's, boys', and children's clothing. These forms are durable and inexpensive. Further information in regard to this useful invention may be obtained by addressing Therese R. Fischer, 69 E. Baltimore street, Baltimore, Md.

Comparison of English and American Railway Cars.

Mr. R. A. Proctor, who has traveled all over this country, and ought to know, if anybody does, what the merits of railway cars are, gives the following in *Knowledge:*

Every one who has traveled much both in Europe and in America, will agree with Mr. Sala's remark that "our present locked-in, boxed-up, stuffy, and narrow compartments are absurd, dangerous, and scandalous to us as a nation." Because when railway traveling was first introduced stage coaches were in fashion, the idea which a "slow" railway projector naturally formed was to make a train consist of a number of rather large stage coaches; and this arrangement, which was feeble-minded enough then, has remained in vogue for more than half a century.

Let me briefly enumerate a few of the advantages of the American system, and then I will touch on their more or less imaginary disadvantages:

First, you can get on board an American train or leave it when the train is moving pretty fast in perfect safety. I have run after a train and got in the rear car (with a helping hand from a brakeman) when it had attained a rate of certainly twelve miles an hour. I have never left one traveling at that rate, but by the rear car it could be done safely enough—at no worse expense than a sprawl.

Secondly, when on board you can choose any car or any part of any car to sit in; you can go to the smoking car, if you want to; or, if you like, you can visit the baggage van to see that your luggage is safe—all when the train is at full speed. I have walked the whole length of a train with both hands occupied by satchels, etc., stopping only when opening and shutting the car doors.

Thirdly, if pressed for time, you can, in nearly all parts of America, go on board without a ticket, and obtain one at the first visit of the conductor.

Fourthly, tickets are attended to while the train is traveling. There is no absurd stoppage at the last station but one and proclamation of "All tickets ready!" but, without delay of any sort, all tickets are collected *en route.*

Fifthly, the travelers by the train form a single community, with a force of conductors, brakemen, porters, and luggage men, so that if a disorderly or drunken person gets on board he must behave himself, at the risk of being turned off the train (in bad cases while the train is moving pretty fast, so that his exit is hasty and undignified, yet not unpleasing to those he had thought to annoy).

Sixthly, you generally travel in much more real privacy and comfort than in an English first-class carriage, not secured by a lawless fee to the guard. I used to find quite a rest in a railway journey between my lectures in America, with a little two-seat compartment to myself, all the passengers sitting in similar compartments facing one way; I could read or reflect undisturbed. Who can say quite as much of an English first-class carriage, if there are two or three passengers on the opposite seats? It is true that part of this arises from the "stony British stare," which foreigners and Americans find so strange and so unpleasant. But "fix it how you will," you can never feel quite so much at ease facing several persons as when all face the same way. On one very special occasion, in America, when I had to travel in an ordinary car for several hours under circumstances which would have made staring excusable enough (not to make a mystery where there need be none, I was one of a wedding party of two), I was struck by the careful courtesy with which a two-seat compartment seemed to be regarded as if it were a private sitting room. I never more thoroughly recognized the innate courtesy of all Americans toward ladies than I did on that occasion. Of course, when traveling in an American car, a man may be addressed by a fellow passenger more freely than in England. But it is easy to answer pleasantly; and if the conversation wearies, either to close it or seek another place.

Seventhly, all the carriages are well warmed, and warmed quite safely. I speak without any prejudice in favor of car stoves; for in a railway accident in Missouri I made a much more intimate acquaintance with one than I cared for, and shall carry the marks of the encounter to the grave. But one cannot expect stoves to behave well when the car they are intended to warm is pitched over an embankment thirty feet high. Under all the usual conditions of travel they are perfectly safe traveling companions, and many a time and oft I have missed them when shivering in an English first-class carriage despite wraps and the abomination known as a foot-warmer.

Eighthly, in all cars there is a retiring room; in nearly all there is a supply of drinking water; and in many there are conveniences for washing, brushing, etc.

If American trains only consumed their own smoke, they would be perfection; as it is, there is a very serious drawback to American railway traveling in hot weather. To reach your journey's end with collar, cuffs, and shirt-front, which had been clean a few hours earlier, reduced to smoke-stained, cinder-dust strewn clouts, is not a pleasant experience. The fault is one which might be easily corrected.

Great Gold Bars.

We saw this week, at the Bank of California, says the *Mining and Scientific Press,* the largest gold bar ever cast in the United States. It was shipped to the bank by the North Bloomfield (hydraulic) Mining Company, of Smartsville, Nevada County, Cal. The value of the bar is $114,000, and weight 511½ pounds troy. Its length is 15 inches, width 6 inches, and depth 7 inches. It contains 630 cubic inches of gold, and is worth about $19 per ounce.

The mould for this bar was cast at the Nevada foundry of George G. Allan, Nevada City. The entire dimensions of the mould are as follows: On top, 17 inches long and 7 inches wide; on bottom, 16 inches long and 6 inches wide. It contains 715·20 cubic inches. The thickness of the sides is ¾ inch and bottom 1 inch. The mould weighs 138 pounds, and was cast expressly for making this bar. The castings were from iron produced at Clipper Gap, in this State.

The North Bloomfield mine, from which the gold came, is one of the most prominent hydraulic mines in California. The run is not an exceptional one, though the bar is. The line of the tunnel is cleaned up about twice a year, and this time they thought they would see what they could do in the way of casting a big bar. The bar is said to have been the result of a twenty days' run.

It was in 1873, if we remember aright, that the Spring Valley Mining Company sent down to this city a bar weighing 141 pounds, worth $41,000. At the time they thought this the largest bar ever made, but at their request we made inquiries and found that Seligman & Co., bankers, of this city, had received one from Helena, Montana, worth an even $50,000; the London and San Francisco Bank had one worth $35,000, and the Mint and Bank of California had each had one worth $40,000. The San Francisco Assaying and Refining Company had also had one worth $41,000.

The Spring Valley people then went to work, and after thirty-five days' run, with 1,000 inches of water, with a partial clean up of 800 feet of head flume and 14 undercurrents, produced a bar worth $71,273.15, weighing 299 pounds.

Since then, however, the Spring Valley Mine, Cherokee Flat, Butte County, shipped to this city a gold bar valued at about $90,000, and that was considered an exceptionally large one. The North Bloomfield Company, considering it owned the biggest hydraulic mine in the State, thought it would make the biggest bar, with the result noted.

There is no special advantage in making bars so large, except in happening to have the gold to do it with. Smaller bars are more convenient to handle, and some people even prefer the metal in small circular shape, such as we are accustomed to see on bankers' trays. The big bar we refer to is on the way to the Mint, out on Fifth street, where it will soon be transferred into coin. The North Bloomfield and the Milton hydraulic mines, both under the same management, have produced this season about $1,000,000 in gold, and the ground they are in is increasing in richness right along. This doesn't look much as though hydraulic mining was a dead industry.

ACCORDING to the Mississippi Handbook, there are 175,251 white and 251,438 colored children attending the free schools in the State, at a cost of $830,701.

ENGINEERING INVENTIONS.

Mr. Daniel O'Connor, of Little Rock, Ark., has patented a device for changing the position of the target used for signaling purposes. The invention consists in a novel arrangement of a base or stand, a vertical crank shaft carrying the target, a sleeve, a latch, and a lever, whereby several advantages are obtained.

Mr. Orlando H. Jadwin, of Brooklyn, N.Y., has patented improvements in the system of cable traction for street railways, which consist, first, in the improved construction of grip mounted on the car which serves to clutch the traveling cable; and, secondly, in the improved construction of channel way for the traveling cable and means for arranging the guide pulleys therein.

Mr. Aaron C. Vaughan, of Shane's Crossing, O., has patented an improvement in T-shaped railroad rails, whereby great saving of steel in the manufacture of the rail is attained without decreasing the strength of the rail, and better joints formed between the rails and fish plates, thus relieving the tension on the bolts which secure the fish plates to the rails; and the invention consists in first cutting away, by a change of the angles, a part of the lower faces of the T-head of an ordinary T-rail, and adding a less amount of metal to the upper faces of the base of the T-rail, and forming curved indentations in the opposite inclined under faces of the rail head and in the opposite upper inclined faces of the base, or in the under face of the head alone. This construction will require less metal than the ordinary rail, and will form, also, much better joints with the fish plates to prevent them from slipping than the ordinary construction.

Mr. Joseph W. Putnam, of New Orleans, La., has patented an improvement in piles, such as are used as a substructure for bridges, etc. It is applicable for building high bridges over deep streams of running water. In such places the proper elevation of the bridge above the water, the depth of the water, and the necessary penetration of the pile into the mud or clay to get a solid support is such that it is not practicable to get piles from single trees of sufficient length and sufficient diameter to give them requisite strength to resist the current. This invention consists in a pile composed of two tree sections, having their larger or butt ends sawed off square and abutting against each other, in combination with two semi tubular metal clamp sections of a slightly smaller diameter than the pile ends. The semi-tubular sections have flanged edges, which, when bolted together, draw the splice sections together, compressing the ends of the piles and covering the joint.

MECHANICAL INVENTIONS.

Mr. Albert Slagle, of London, O., has patented an improved cork extractor having a base or foot provided with a horseshoe-shaped frame or standard, a corkscrew provided with bevel gear wheels for rotating it, and supported by a frame which slides between the branches of the horseshoe frame, and a lever for raising and lowering the frame.

An improved screw conveyer has been patented by Mr. William Walter Hewitt, of Swanscombe, County of Kent, England. This improvement relates to conveyers for carrying cement, grain, shingles, ballast, or other granular substances; and it consists in a U-shaped trough having the hangers with their upper ends resting thereon, and converging at their lower ends to support the conveyer shaft boxes or bearings centrally in the trough.

An improved car coupling has been patented by Mr. Daniel W. Deal, of Toddville, Ia. In this improved car coupling, each drawbar has a bevel head with shoulders behind it for being engaged by bevel-ended hook catches, of which two are attached to each drawbar, so that when the drawheads of two cars come together, four hook catches automatically engage with the shoulders of the heads, said catches being arranged on pivots and suitably provided with springs for enabling them to so engage, and each drawbar is provided with means for disengaging the four catches.

Mr. Charles Drauly, of Carrizo Springs, Tex., has patented an improved wheel composed of sections which can conveniently be taken apart for transportation and united for use. The hub is formed of a tube provided with an annular shoulder, and having its outer end threaded, on which threaded end a nut is screwed, between the wider inner end of which nut and the shoulder of the tube the inner ends of the spokes are clamped, cushion bands and rings and metal bands and rings being interposed between the ends and sides of the spokes and the tube, its shoulder, and the inner end of the nut.

An improvement in sewing machines has been patented by Mr. Thomas J. Le Count, of New York city. The invention consists in a sewing machine in which the power is transmitted from the treadle shaft to the needle bar, shuttle lever, and feed directly by means of shafts and gearing, thereby avoiding the use of belts and pulleys, which rods and gearing are partly contained in an arm hinged on the top plate, which arm can be tilted to facilitate fastening the needle and other sewing attachments. In order to permit tilting this arm, the vertical drive rod is provided with a universal joint, and the part below the joint is squared, and slides in a sleeve with a squared aperture.

An apparatus for coiling wire for making spiral wire springs, or for making coils to be used in manufacturing mattresses or for any other purpose, whereby the coils may be made more easily and rapidly than heretofore, has been patented by Mr. Joseph A. Coultaus, of Brooklyn, N Y. In carrying out this invention two blocks of cast iron are employed, each formed with corresponding semi-cylindrical grooves, and adapted to be bolted together upon a table, so that the grooves will form a cylindrical passage, one of the blocks being formed with an orifice in its front, intersecting the cylindrical passage at about right angles thereto, and at or near its upper side, in combination with suitable rollers placed near the orifice for forcing the wire into the orifice and cylindrical passage.

AGRICULTURAL INVENTIONS.

An improvement in hedge trimmers has been patented by Mr. William F. Throckmorton, of Adair, Ill. This improvement relates to hedge trimmers of the class shown in Letters Patent granted to the same inventor June 27, 1882, No. 260,255, in which machine a cutter bar is attached to a handle and fitted for operation by a crank. The present invention consists in the means for attaching and holding the cutter bar with the object to allow of its adjustment for trimming either the top or the sides of the hedge, and also in an improvement in the stirrup or clevis uniting the handle and the adjustable bar carrying the support for the machine.

A combined sulky plow, harrow, seeder, and roller has been patented by Mr. Daniel C. Beaty, of Olympia, Washington Ter. The invention consists of a machine having attachments contrived to perform all the operations at once without allowing the horses to step on the plowed ground.

An improved self-dropping check rower and marking attachment for corn planters has been patented by Mr. David McCausland, of Marshalltown, Ia. In this machine the seed slide is vibrated by means of tappets and cams.

Mr. James D. Patterson, of Competition, Mo., has patented improvements in that class of wheel plows in which the plows are alternately drawn forward by the truck. By these improvements the plow is rendered efficient, and its construction is simplified.

An improved check row planter has been patented by Mr. George W. North, of Burlington, Kan. The invention belongs to the class of planters in which the grain to be planted and the dropping mechanism, which includes an oscillating cup, are located in chambers formed within the wheels.

An improved corn planter, check rower, and drill has been patented by Mr. Simeon Smith, of Graymont, Ill. This invention relates to the construction and arrangement of the mechanism of a combined corn planter or drill, and check rower, the object of which is to simplify the construction and operation of such machines and improve their efficiency.

Mr. Lucien B. Beaumont, of Alexandria, O., has patented a plow or cultivator attachment composed of a single rod or bar coiled to form a fender, and having a portion thereof extended forward for an attaching arm, and the end turned back upon itself to adapt it to be clamped to the beam; the object being to allow fine soil to pass freely around plants, while preventing clods and stones from being thrown against the plants.

Mr. James D. Watters, of Belair, Md., has patented an improved fastening and releasing device for cattle stalls. This invention relates to that class of devices which are adapted to permit the fastening and unfastening individually of any one animal, and also the releasing simultaneously of the entire number, when desired; and it consists mainly in the combination of a sliding locking-bar with a sliding releasing-bar, and the crossbar of a chain.

Mr. John R. Owen of Pulaski, Tenn., has patented a combined cotton planter and fertilizer distributer constructed with an opening plow connected with the seed box by a grooved and slotted bar, which serves as a bottom to the seed box. The seed box is supported upon wheels, and is provided with three cylinders having radial arms and with pulleys connected by an endless belt, whereby the cylinders will be operated and the fertilizer and cotton seed removed from the box by the advance of the machine. The machine is provided with a coverer, which also serves as a fastener to keep the seed box and slotted bar in connection.

MISCELLANEOUS INVENTIONS.

Mr. George W. Comee, of Waseca, Minn., has patented an improved burial case corner. The improvement consists in the method of securing the sheet metal in the ends or edges of the side and end pieces of the case.

Messrs. Timothy Kehoe and Joseph A. Bourke, of New York city, have patented a pool bottle constructed with two pins placed at such a distance apart as to receive a ball between them, and operated by a lever and a spring.

An improved fruit washer has been patented by Mr. Charles E. Marshall, of Lockport, N. Y. This invention consists of a vessel having a perforated false bottom, a filler, and a spout, and of a device adapted to regulate the opening of the cover of the vessel.

An improved sulky has been patented by Mr. Jesse C. Boyd, of Rushville, Ind. The invention consists in a seat provided with arms connected to the shafts by clips, and having C-springs interposed between the seat and axle.

An improved ditching and tile laying machine has been patented by Mr. Andrew S. Hughes, of Eldora, Ia. The implement has a cylindrical and pointed opener, diverging blades, and a colter for making the ditch, an inclined chute for receiving the tiles, and scrapers for covering.

A novel music holder for pianos and organs has been patented by Mr. Charles P. Bynon, of Yonkers, N. Y. This appliance is to be used in connection with the common piano and melodeon music rack, and will hold music sheets of any size, also music books. It is compact and convenient.

An improvement in the suspender ends for attaching the suspender bands or straps to pants, has been patented by Augusta Netzner, of New York city. The suspender end is formed of crossed bands held together at the crossings by rings which pass over one part or strand of the band and under the other part or strand.

An improved opera chair has been patented by Mr. Bernhard H. Koechling, of New York city. The object of this invention is to provide opera chairs constructed in such a manner that the seats, when not in use, will turn up laterally against the side frames and the backs will swing forward against the seats, leaving a clear space.

An improved bee smoking apparatus has been patented by Mr. Tracy F. Bingham, of Abronia, Mich. This invention relates to improvements on the apparatus for which Letters Patent were granted to the same inventor January 29, 1878, No. 199,611, and reissued under date of July 9, 1878, No. 8,326.

Mr. James P. Winter, of Greenup, Ky., has patented a heat regulating and reflecting attachment for open fire places, calculated to control the draught, lessen the escape of the heat up the chimney, and increase the reflection of the heat into the room, so as to effect a large economy of fuel in open fire heaters.

Mr. Theodore Berteling, of New York city, has patented an improvement in flutes, which consists in novel arrangements of the key valves, whereby the F's can be produced by means of fork fingering, and can consequently be played much more easily and more distinctly and rapidly than in a flute of the usual construction. The volumes of the F tones and nearly all the other tones are greatly augmented.

An improved folding umbrella has been patented by Mr. Patritius F. McGuire, of New York city. This invention consists of a stick or staff having runners, braces, jointed ribs having sleeves and bands, a nut screwed upon said staff or upon a sleeve fitted on the latter, a cover adapted to be detachably connected to the ribs, and a cap nut fitting upon the umbrella and the nut.

An improved watch case has been patented by Messrs. Gustav Speckhart and Bernhard Vogel, of Nuremberg, Germany. The invention consists in a watch case formed of a crystal or front and back held together by an open ring provided at the ends with half-pendants which are held together by a screw, so that the ring when closed surrounds the edges of the front and back, which are thus held in place.

An improvement in tricycles has been patented by Mr. John A. Edmonds, of Camden, Del. This invention relates to tricycles and other vehicles designed to be propelled by hand or feet; and it consists in a loose arrangement of the driving wheels on their axle, in combination with pawl and ratchet wheel connections to provide for either separate or joint rotation of the wheels on opposite sides of the vehicle.

An improved mode of manufacturing bracelets has been patented by Mr. Alonzo Lambert, of Corona, N. Y. The invention consists in pressing the stock into a grooved die, then bending the turned up edges inward at right angles over rectangular wires placed in the angles of the stock while still in the die, then bending the inwardly projecting edges downward at right angles along the inner sides of the wires, and then bringing the bracelet into shape upon an oval mandrel with a bending tool.

An improved automatic pencil holder has been patented by Mr. Joseph H. Wright, of New York city. This is an improvement on the pencil holder for which Letters Patent No. 245,257 were issued to the same inventor August 2, 1881. It consists in a reel provided with an annular groove for receiving a cord or tape in its circular side, the outer edges of this groove being flush with the circular side of the reel, whereby a great length of cord can be wound on a reel of small diameter.

Mr. Lewis McLellan, of Gorham, Me., has patented an improved vessel for cooking, boiling, or preparing corn or other articles which it is designed to preserve in hermetically sealed cans. It consists in the peculiar construction of the boiler or vessel, and in the combination, with a steamtrap, of the boiler, wherein is placed the corn or other article to be cooked by steam at a temperature higher than 212° Fahr., or by boiling under pressure as may be deemed best for the article to be prepared.

A device for attachment to one of the bars of a grate in an open fire place for the purpose of facilitating the heating of a vessel of water, and for other purposes, has been patented by Mr. John J. Mitchell, of Hopkinsville, Ky. The invention consists in a forked bar, for engagement with the upper bar of a grate, provided with a pivoted latch for holding it in position on the bar, and having a pivot for engagement with a socket on a swinging skeleton plate for holding a vessel to be heated.

A novel combined stereoscope and graphoscope has been patented by Mr. William H. Lewis, of Brooklyn, N. Y. This invention consists in a novel combination, whereby increased facility is afforded for dismembering and closely packing the instrument, for converting it from a standing instrument into one which can be conveniently held in the hand, for supporting and steadying the lazy-tongs frame of the instrument, and for insuring a uniform motion of opposite ends of the frame; likewise for utilizing the bar which carries the graphoscopic lens as an adjustable holder of the stereoscopic lenses.

Mr. Samuel Wilson, of Dallas, Iowa, has patented an improved fishing wheel having nets embraced in four or more sectors, each net having an opening made from the periphery or near it, and from which there is an escape passage from the center of the wheel, leading to a chute connecting with a cage net, all so arranged that the wheel being located in a fishway to be rotated by the water flowing against it or by another wheel attached to the shaft outside of the fishway, the mouths of the passages into the nets of the wheel will open at the rear of the wheel to the fish ascending the stream, to be entered by them as they attempt to pass under the wheel. As that side of the wheel rises the fish will be caught, carried up, and shunted out into the chute, by which they will be delivered into the trap cage.

A novel field stove and kit has been patented by Mr. Walter Clifford, of Fort Buford, Dakota Ter. This invention relates to that class of stoves used in traveling from place to place by soldiers and campers. The object of this invention is to furnish a stove which shall be light, durable, and capable of being packed in the smallest possible space. This is accomplished by constructing the stove body in the form of a parallelopipedon, having removable bottom and top plates; and in attaching to the rear end of said stove a removable extension somewhat less in length and of about half of the depth of said body, said extension having an opening in front coinciding with a like opening in the upper rear end of the stove, a second opening in the back coinciding with a like opening in the stove pipe, and a removable top; and in a stove pipe constructed in two or more sections, said sections decreasing in diameter from the bottom upward, and calculated to fit over each other.

[OFFICIAL.]

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FOR WHICH

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

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Soaps, candles, oils, and lard, Procter & Gamble... 9,829
Tobacco and cigarettes, chewing and smoking, J. Hancock..... 9,818
Wine, champagne, G. H. Mumm & Co..... 9,837

English Patents Issued to Americans.

From November 7, 1882, to November 10, 1882, inclusive.

Bottling machine, J. Mills, Terre Haute, Ind.
Cocks for casks, etc., J. Schaefer, New York city.
Coupling for hose, E. Nunan, San Francisco, Cal.
Electric signal apparatus (2) Standard Time Company, New Haven, Conn.
Envelopes, manufacture of, A. C. Fletcher, New York city.
Grain cleaning machine, L. Gathman, Chicago, Ill.
Insulating compound for electric wires, R. G. Waring *et al.*, Pittsburg, Pa.
Paper boxes, manufacture of, H. H. Rogers, Brooklyn, N. Y.
Printing press, W. G. Walker, Madison, Wis.
Reeling silk, etc., J. M. Grant, Hartford, Conn.
Tellurian, J. Spicer. Taylor's Island, Md.
Tool holder, J. F. Allen. Brooklyn, N. Y.
Wire for fastening bottle stoppers, manufacture of, O. R. Chaplin, Boston, Mass.

NEW BOOKS AND PUBLICATIONS.

LEXIQUE DE LA LANGUE IROQUOISE. Par J. A. Cuoq. Montreal: J. Chaplean & Fils. $2.

For thirty years the venerable author has been in active service as missionary among the Iroquois and Algonquins of Oka, on the Lake of the Two Mountains, near Montreal. His knowledge of these tongues is full and intimate. The present work embraces; I. Iroquois roots; II. Derivatives and compounds: III. Supplementary notes; IV. Appendices, and many curious and interesting foot notes. It is to be hoped that the author's life may be spared for the completion of a corresponding dictionary of the Algonquin tongue, which he has in hand.

REPERTORIUM DER JOURNAL-LITERATUR DER EISENBAHN TECHNIK (REPERTORY OF THE TECHNICAL LITERATURE OF RAILWAYS). By Franz Woas. Years 1880 and 1881. Berlin: Julius Springer, 1882. 260 pages.

Consists of a general index or reference book to the English, American, French, and German technical periodical literature relating to railways. It is divided into five chapters, named respectively: "The Railway Systems;" "The Building of Railways;" "The Rolling Stock;" "The Repair of Railways;" and "The Running of Railways." Each chapter is divided into sections, and each section into certain subdivisions; so that, for instance, if a person is desirous of finding the current literature on tunnels, he will find all the references thereto in Chapter II., Section B, which contains a complete list of all the articles relating to tunnels in the several technical periodical publications for the years 1880 and 1881, as the repertory comprises only these two years. In the same manner, articles relating to any other subject matter in the railway line can be found in this repertory. This work is of great service to engineers, builders, publishers, and others, as it saves much time in searching reading matter in regard to certain subjects, and facilitates obtaining a thorough knowledge of all that has been published in relation to the said subject.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

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

(1) S. M. B. writes: A common year consists of 365 days 5 hours 48 minutes and 49 seconds. Now, as every fourth year contains 366 days, which is leap year, it is supposed, of course, that the extra day takes up the surplus time over 365 days, which it does, and 44 minutes and 44 seconds over. Now, in a certain number of years this shortage of time would make a day. How is that loss of time accounted for? A. One day is dropped every 400 years. All even centuries are divisible by 4, and would naturally be "leap years;" but to correct the deficiency mentioned the centuries divisible by 400 are not leap years, *i. e.*, 1800 and 1900 are leap years, but the year 2000 will not be a leap year.

(2) W. M. B. asks: 1. Is not the violent ejectment of sparks from a locomotive caused by the excessive force of the exhaust across the face of the flue sheet? A. Yes. 2. Would not the draught be the same if there were no stack; the stack only serving to carry the steam and smoke above the line of sight? A. No, for very little pressure of air would be produced on the fuel in the furnace.

(3) W. L. H. asks: How many horse power is an engine 18x24, 110 revolutions per minute, pressure in cylinder 60 pounds? I say 164 horse power; am I right? A. It is 163 horse power after deducting 20 per cent for losses by friction, etc; 60 pounds pressure in the boiler does not give 60 pounds pressure in the cylinder; this pressure you must ascertain by the indicator.

(4) H. D. C. asks: 1. What is the exact formula for calculating the strength of steam boilers, the tensile strength being known? A. P=pounds pressure per square inch; D=diameter of boiler in inches; T=thickness of plates in inches; c=tensile strength of plates in pounds per square inch; then the formula is $T=\frac{D\,P}{2c}$ or $P\,D=2Tc$; but if the tensile strength of the iron is taken in the body of the plate or sheet, it must be borne in mind that the single riveted seams are only 0·50 and the double riveted seams 0·70 of the strength of the solid plate. 2 Also are steel boilers preferable to iron boilers, and why? I find it hard to learn anything about boilers in that important direction, as I have not the facilities for getting the information, nor do I know where to seek for it. A. Yes, because they are stronger in proportion to thickness of plates, and the plates more homogeneous in their character. Obtain "Wilson on Steam Boilers," or "Nichols's Practical Boiler Maker," for information, or consult the rules of government inspectors.

Business and Personal.

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

Permanent Exposition.—Inventors' Institute, Cooper Union, N.Y. City. Every facility for exhibition of machinery, merchandise, and inventions. Send for particulars.

Drop Presses, Bending Machines, the Justice Hammer, tools for plow and agricultural implement makers. Williams, White & Co., Moline, Ill.

THE UNION IRON AND STEEL COMPANY, CHICAGO, Nov. 18, 1882.

DEAR SIRS: This Company now have in use your Asbestos and Hair Felt (Double Air Chamber) Covering on Steam Pipes, aggregating over twelve thousand (12,000) square feet of surface. I think the combination a good one, and am so well satisfied with the results, that I am having all of our new pipe connections covered in the same manner as fast as they are completed.

Yours very truly, R. R. JONES, Gen'l Supt.

BEADLESTON & WOERZ, EMPIRE BREWERY, 291 W. 10TH ST., NEW YORK, Nov. 21, 1882.

MR. ——

DEAR SIR: The H. W. Johns Manufacturing Company is doing our covering of pipes and boilers, and we continue to give them orders. They give perfect satisfaction. Yours, etc., BEADLESTON & WOERZ.

The South.—Important notices. See pages 380 & 381.

Coil-gongs for Clocks. Makers of, address Box 21, Somerset Club, Boston.

Curtis Pressure Regulator. See illus. adv. on p. 364.

Blake's Belt Studs. The strongest and best fastening for leather and rubber belts. Greene, Tweed & Co., N. Y.

American Fruit Drier. Free Pamphlet. See ad., p 366

Am. Twist Drill Co., Meredith, N. H., make Pat. Chuck Jaws, Emery Wheels, Grinders, automatic Knife Grinders.

Fire Brick, Tile, and Clay Retorts, all shapes. Bornerg & O'Brien, M'f'rs, 23d St., above Race, Phila., Pa.

Drop Forgings of Iron or Steel. See adv., page 365.

For best Portable Forges and Blacksmiths' Hand Blowers, address Buffalo Forge Co., Buffalo, N. Y.

Brass & Copper in sheets, wire & blanks. See ad. p. 364.

Cope & Maxwell M'f'g Co.'s Pump adv., page 366.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Millstone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau street, New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 366.

Garmore's Artificial Ear Drums for relief of partial or entire deafness. Invented by one who has been deaf thirty years. Simple and scientific in construction; not observable in use. Send for circular. John Garmore, S. W. cor. 5th and Race Sts., Cincinnati, O.

Pure Turkey Emery, Glue Composition, Rouge, and Pumice for polishers. Greene, Tweed Co., New York.

Mathematical Instruments of all kinds, Drawing Papers, Tracing Cloth, etc. Send for illustrated catalogue. Keuffel & Esser, 127 Fulton St., New York.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 364.

Red Jacket Adjustable Force Pump. See adv., p. 366.

Pays well on small investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday-schools, and home amusement. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

Upright Self-feeding Hand Drilling Machine. Excellent construction. Pratt & Whitney Co., Hartford, Conn.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 366.

Trevor's Patent Key Seat Cutter. Trevor & Co., Lockport, N. Y. See page 366.

Bonhack's Match Splint Setting Machine. Best and quickest in the market. Recipes and advice gratis. Address C. F. Bonhack, patentee, 527 W. 43d St., New York.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, New Haven, Conn.

To stop leaks in Boiler Tubes use Quinn's Patent Ferrules. Address S. M. Co., So. Newmarket, N. H.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

The Berryman Feed Water Heater and Purifier and Feed Pump. I. B. Davis' Patent. See illus. adv., p. 350.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 349.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 350.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 350.

4 to 40 H P. Steam Engines. See adv. p. 350.

To make Violins, write James Roblee, Syracuse, N. Y.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Drop Forgings. Billings & Spencer Co. See adv., p. 333

Assays and Analyses of ores and all commercial products. Advice given and investigations made in all branches of chemical industry. Send for circular. N. Y. Assay Laboratory, 40 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description.

Soapstone Packing, Empire Packing, Hemp Packing, Rubber Packing of all kinds. Greene, Tweed & Co., N. Y.

Wanted.—A second-hand centrifugal machine for liquids Address, with description and price, P. O. Box 3396, Boston, Mass.

Lubricator. See advt., Detroit Lubricator Co., p 318,

See New American File Co.'s Advertisement, p. 318.

Steam Pumps. See adv. Smith, Vaile & Co., p. 316.

Engines, 10 to 50 horse power, complete, with governor. $250 to $550. Satisfaction guaranteed. Nearly seven hundred in use. For circular address Heald & Morris (Drawer 127), Baldwinsville, N. Y.

Sheet and cast brass goods, experimental tools, and fine machinery. Estimates given when models are furnished. H. C. Goodrich, 66 to 72 Ogden Place, Chicago.

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Combination Roll and Rubber Co., 68 Warren street, N. Y. Wringer Rolls and Moulded Goods Specialties.

First Class Engine Lathes, 20 inch swing, 8 foot bed, now ready. F. C. & A. E. Rowland, New Haven, Conn.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Jas. F. Hotchkiss, 84 John St., N. Y.: Send me your *free* book entitled "How to Keep Boilers Clean," containing useful information for steam users & engineers. (Forward above by postal or letter; mention this paper.)

Steel Stamps and Pattern Letters. The best made. J. F. W. Dorman, 21 German St., Baltimore. Catalogue free.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

Presses, Dies, Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, Brooklyn, N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works. Drinker St., Philadelphia, Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

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Lehigh Emery Wheels emit no offensive odor; do not gum or glaze; are free cutting, safe, and very durable. Write for catalogue and prices to Lehigh Valley Emery Wheel Co., Lehighton, Pa.

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(About eight words to a line.)

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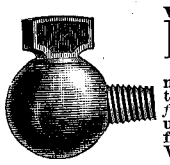

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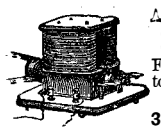

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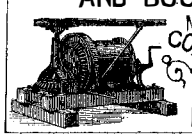

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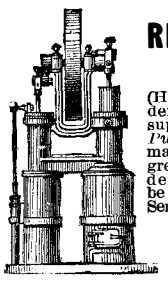

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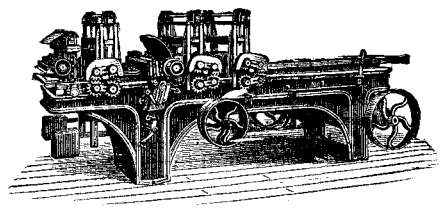

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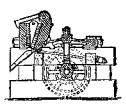

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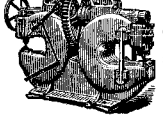

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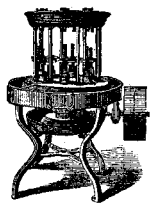

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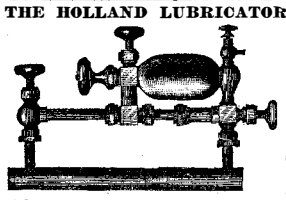

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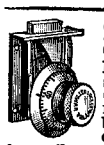

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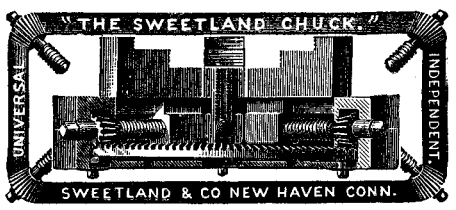

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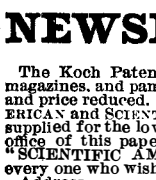

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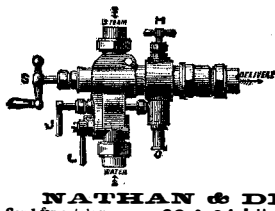

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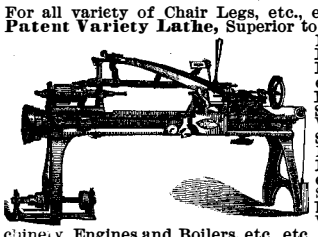

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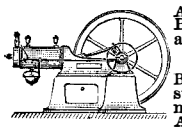

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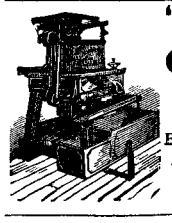

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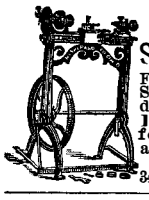

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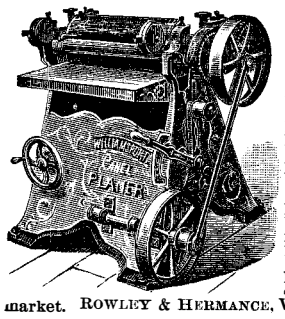

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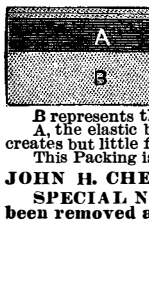

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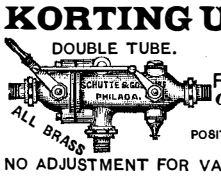

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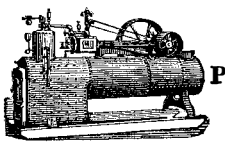

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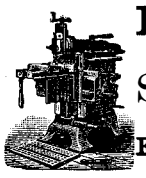

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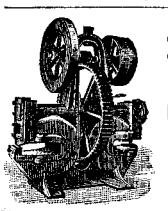

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