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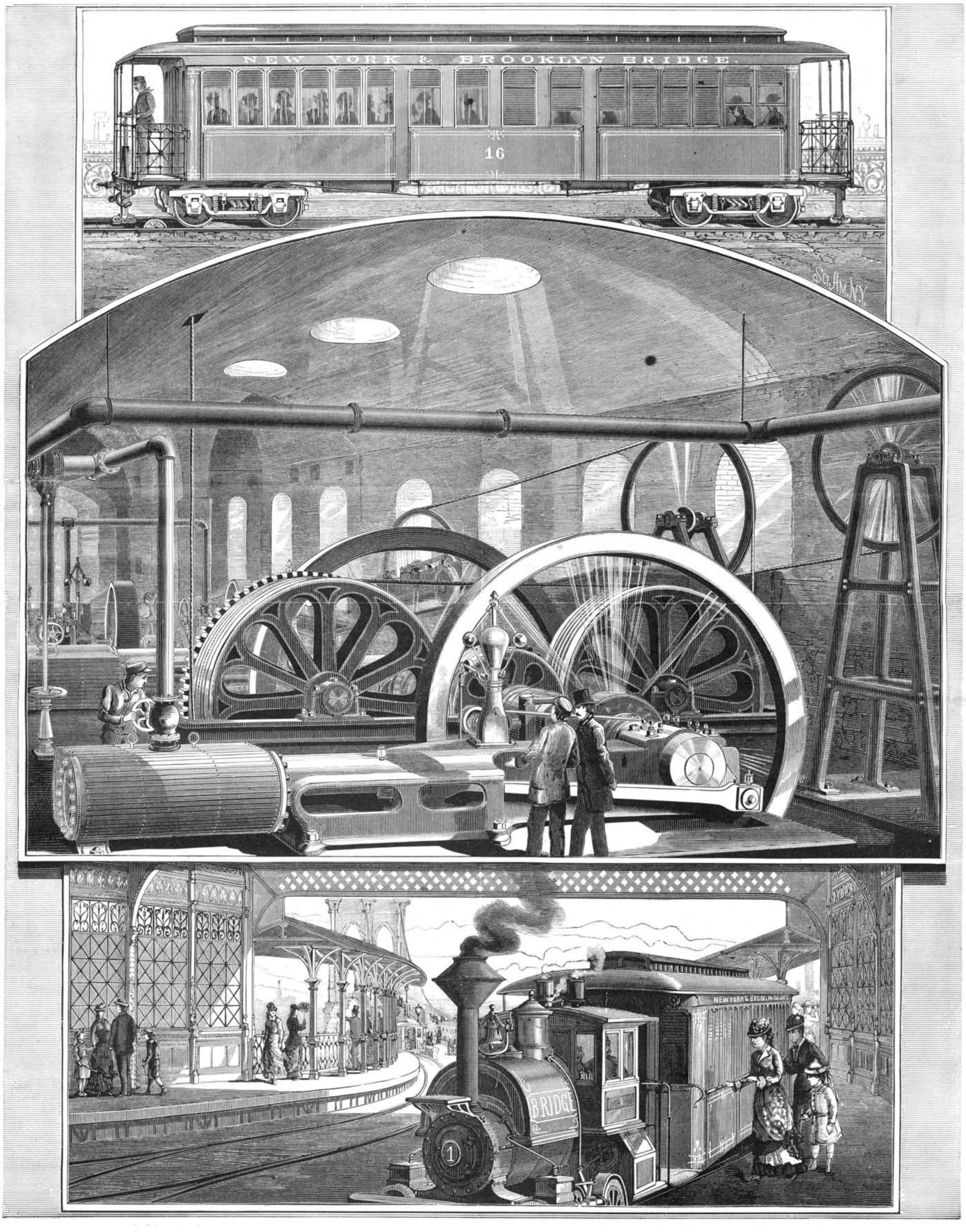

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NEW YORK, SATURDAY, JUNE 2, 1883.

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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 387,

For the Week ending June 2, 1883.

Price 10 cents. For sale by all newsdealers.

THE BRIDGE OPENED.

The great bridge that connects the two cities of New York and Brooklyn, and practically unites the island of Long Island to the main land, was formally opened to public travel by significant and appropriate ceremonies on Thursday, May 24. The President of the United States, the Governor of New York, the Mayors of the two cities in interest took part in the ceremonies. On the New York side was a procession of the famous Seventh Regiment of fourteen companies, preceded by a military band of ninety pieces, policemen mounted and on foot, acting as escort to the President, members of his cabinet, Governor Cleveland, and other notables, occupying twenty-five carriages. The President and guests walked across the bridge and were met by the Mayor of Brooklyn and other officials, and were escorted to the Sands Street bridge station by the Twenty-third Regiment. In the station addresses were made by Wm. C. Kingsley, Abram S. Hewitt, and Rev. Dr. Storrs.

The salutes from the five naval vessels in the harbor and from Governor's Island were an impressive feature in the "pomp and circumstance" of the occasion. But the culmination of the display was reserved for the evening. It is doubtful if ever, in this country at least, was there so magnificent an exhibition of pyrotechnics as that from the bridge. It was absolutely indescribable, and was as gratifying in its profuseness as superior in its beauty. A levee held by the President and the Governor later in the evening at the Brooklyn Academy closed the public ceremonies, after which the bridge was thrown open to the public, and thousands passed over from one city to the other, making a continuous procession during the entire night.

Our full-page engraving gives a view of the engine room and the engine which is to propel the steel-wire rope that draws the passenger cars across the bridge railway.

DEATH OF WILLIAM MASON.

Mr. William Mason, builder of locomotives and cotton machinery, died at his home in Taunton, Mass., on Monday, May 21, of pneumonia, at the age of seventy-six.

Mr. Mason's life was a signal illustration of the power of genius and perseverance in overcoming obstacles. The disadvantages of poverty in youth and a limited education were to him to be only incentives to more strenuous efforts. By his inventive talent he rose gradually from the position of day workman as a machinist to the superintendency of a large establishment. The perfection of his self-acting mule for cotton spinning first brought him into prominence among manufacturers. By this invention he has been better known for the last forty-five years than by all his other inventions and improvements, and they were many, and not confined to machinery for textile manufactures; his locomotives are probably unsurpassed in all the requisites of use by those of any other builder.

At the time of his death Mr. Mason was carrying forward extensive improvements and additions to his large establishment at Taunton, which would nearly double the area of the buildings and vastly increase the productive capacity of the establishment.

Mr. Mason was a fine specimen of manhood in physique. He was reticent in habit, but not morose; unbending from apparent thoughtfulness when in the presence of friends. He was much liked by his employes; some of whom, starting with him when he first went into business, still remain.

CONSIDERATION FOR OLD EMPLOYES.

Physical vigor and mental activity are necessary in all kinds of employment and all sorts of business. Lacking either, the man is, in some degree, incompetent. The cases are exceptional where profitable employment is fitted to the infirm, whether physically weak or mentally slow. And yet there are cases where employment and occupation should be given to such persons, not alone as a matter of policy—to prevent mental and bodily injury—but as a duty. An employe who has spent the vigor of his best years in the service of an employer deserves something more in his last years than cold neglect. Even the turning out of an old horse to die is a subject for attention by the officers of humane societies.

If an employe is of any value whatever, he ought to earn for his employer something above his stipend; in fact, the labor of employes, combined with the judicious use of capital, should accumulate for the employer a competency, if not actual wealth. The wealth thus gathered represents, in part, the excess of the value of the labor performed above the amount that has been paid to the laborers. Although the employe has no legal right to demand more than the agreed sum as wages, or salary, which he receives, the fact remains that the wages, or salary, may not represent the proceeds of his work in full.

This fact may not constitute even a moral claim by the employe for anything beyond his regular compensation, under any circumstances. It may be that the compensation was sufficient to have placed the employe, in his old age of feebleness, in a condition of comparative independence, but he may have neglected to provide for the inevitable rainy day. Employers have no special supererogatory duties toward employes of this class. Nor is it, perhaps, incumbent on them to pension off old employes, as governments sometimes do public servants. The circumstances will alter the cases. It is not to be expected that employing establishments or individuals are to become insurers against the decrepitude of old age and its attendant incompetency. But the dictates of humanity and the demands of business policy may so far go harmoniously together as to prevent the too common spectacle of an old, faithful employe deprived not only of a position of profit because of inability, but of occupation adapted to his failing powers. There are few sadder sights than this, and pity for the unfortunate man and detestation for his thoughtless or perhaps avaricious employer is felt by every spectator.

As men grow old in any particular service their business ways and work habits become fixed, and all the surroundings of their secular days' employments become more familiar to them than their home life. It is like casting them adrift without rudder, oars, or chart to turn out old employes under such circumstances. Who has not felt a pity for some superannuated employe thus set adrift, as he has noticed him returning occasionally to his old haunts, and looking about wistfully on scenes of which he once formed a necessary part, but in which he is now only an incumbrance and a disturbing element. Too old to start anew in another line, and possessing none of the hopefulness of youth and the ambition of mid-age, he becomes disheartened, melancholy, and perhaps imbecile, until death steps in to his relief.

There is a large manufactory in a New England State that for more than thirty years has been running with pecuniary success, employing young and old, male and female, in its various departments. When business has been dull, and the markets unstable, work has been reduced, and wages shortened, as was necessary to prevent financial disaster. But good employes were kept, if possible, even in the dullest times. There never was a strike, nor a threat of one, in this establishment. Among other humane practices and considerate measures for the comfort and well-being of their employes, this company keeps their hands even when old and unprofitable. There is one old man, now more than eighty, who has worked faithfully, for the best part of his vigorous manhood, for the company. He still works—not, however, full hours—and his employment is of so trifling a character that but for the circumstances it would be ludicrous. But the old man is proud of his employers and that he is still able to work, and is living a happy, contented life, believing that he is independent of charity and that he is still useful, if not necessary, to his employers. This is an example that might properly be followed by others.

A REMARKABLE WIND STORM.

A storm, or a series of storms, of high wind, rain, thunder, and lightning swept over portions of northern Texas, Nebraska, Missouri, Illinois, and Wisconsin, May 17 and 18, destroying property and lives, and making waste the country in its path. In some places this path was only 300 yards wide, in others it covered a width of one-fourth of a mile, and in other places extended to a width of two miles and more. No structure of man withstood the blast within its well defined limits; substantial buildings of brick and lighter buildings of wooden framework alike succumbed to the gale that accompanied the storm. In some localities the storm assumed a whirling motion, but in most places it appeared to be a straight-away gale. Unlike the popular idea of a tornado, which is that it comes suddenly after an apparent elemental slumber, this storm appeared to be the culmination of a severe rain and thunder storm. And yet there were indications of a peculiar electrical activity. Globes of fire were observed in the midst of dark clouds; a well defined hole was made in a roof as if cleanly cut; the top story of a brick dwelling was carried away, while the remaining portion of the house remained untouched.

The destruction of life and property that accompany these elemental disturbances renders desirable some accurate knowledge of their cause, with a view to their prediction, to enable those exposed to them to take such preventive and protective measures as are possible. To this end the United States Signal Service is making efforts to investigate these phenomena, and Sergeant John P. Finley, U. S. Signal Station, Detroit, Mich., who has charge of the investigation, asks for information from any person who, in this or previous years, has witnessed any remarkable wind storm.

WE read now and then of cases in which burglars are supposed to have rendered their victims unconscious by holding cloths wet with chloroform to keyholes before entering an apartment. Of course the absurdity of such a fiction is sufficiently apparent. Whether sleepers can be made to pass from natural to chloroform sleep, if the chloroform is held near to the face, is still a question. Sometimes the experiment has succeeded, but in five experiments recently made to determine the fact, every one of the sleepers experimented upon woke at the expiration of three minutes, before they had come under the influence of the drug.

WHEN nitrate of silver is used as a medicine for a length of time, the skin becomes of a peculiar bluish or slate color. Many may remember the familiar face of the blue man who formerly lived in this city, and whose face had assumed this singular hue. There is also a "blue man of Missouri," whose skin is discolored in the same manner and from the same cause. When about fifteen, he took five drops of a solution of nitrate of silver, containing twenty grains to the ounce, and continued this for five or six months. At the end of that time he observed that his face and hands were becoming dark. This color has become permanent, and hence his sobriquet. Nitrate of silver is sometimes used as a remedy in epilepsy.

The Material and Manufacture of Canes.

The manufacture of walking sticks and umbrella handles is an industry in which a great deal of capital is invested. The material is as various as can well nigh be conceived of. The Chicago *Times* recently had an article on the subject, from which we extract:

Many are of imported woods, some from the tropics, China, and the East Indies. The celebrated Whongee canes are from China, where they are well known and celebrated for the regularity of their joints, which are the points from which the leaves are given off, and the stems of a species of phyllosiachys, a gigantic grass, closely allied to the bamboo. The orange and lemon are highly prized and are imported chiefly from the West Indies, and perfect specimens command enormous prices. The orange stick is known by its beautiful green bark, with fine white longitudinal markings, and the lemon by the symmetry of its proportions and both prominence and regularity of its knots.

Myrtle sticks possess also a value, since their appearance is so peculiar that their owner would seldom fail to recognize them. They are imported from Algeria. The rajah stick is an importation. It is the stem of a palm, and a species of calamus. It is grown in Borneo, and takes its name from the fact that the rajah will not allow any to go out of the country unless a heavy duty is paid. These canes, known as palm canes, are distinguished by an angular and more or less flat appearance. Their color is brownish, spotted, and they are quite straight, with neither knob nor curl. They are the petioles of leaf stalks of the date palm. Perhaps the most celebrated of the foreign canes are the Malacca, being the stems of the Calamus sceptonum, a slender climbing palm, and not growing about Malacca, as the name would seem to indicate, but imported from Stak, on the opposite coast of Sumatra. Other foreign canes are of ebony, rosewood, partridge or hairwood, and cactus, which, when the pith is cut out, present a most novel appearance, hollow, and full of holes.

The manufacture of canes is by no means the simple process of cutting the sticks in the woods, peeling off the bark, whittling down the knots, sandpapering the rough surface, and adding a touch of varnish, a curiously carved handle or head, and tipping the end with a ferrule. In the sandflats of New Jersey whole families support themselves by gathering nanneberry sticks, which they gather in the swamps, straighten with an old vise, steam over an old kettle, and perhaps scrape down or whittle into size. These are packed in large bundles to New York city and sold to the cane factories. Many imported sticks, however, have to go through a process of straightening by mechanical means, which are a mystery to the uninitiated. They are buried in hot sand until they become pliable. In front of the heap of hot sand in which the sticks are plunged is a stout board from five to six feet long, fixed at an angle inclined to the workman, and having two or more notches cut in the edge. When the stick has become perfectly pliable, the workman places it on one of the notches, and, bending it in the opposite direction to which it is naturally bent, straightens it.

Thus sticks apparently crooked, bent, warped, and worthless are by this simple process straightened: but the most curious part of the work is observed in the formation of the crook or curl for the handles which are not naturally supplied with a hook or knob. The workman places one end of the cane firmly in a vise, and pours a continuous stream of fire from a gas pipe on the part which is to be bent. When sufficient heat has been applied, the cane is pulled slowly and gradually round until the hook is completely formed, and then secured with a string. An additional application of heat serves to bake and permanently fix the curl. The under part of the handle is frequently charred by the action of the gas, and this is rubbed down with sandpaper until the requisite degree of smoothness is attained.

Harmony of Color in Floriculture.

Artistic arrangement in flower gardens is a thing very easy to talk about, but it is not quite so easy to put it into practice. Anybody can point out the errors, the want of taste, the glaring defects in the laying out of a parterre, but it is quite another thing if they are asked how it is to be remedied. Everything seems so easy and so simple when you merely look on as a critic prepared to find fault without having any share in the labor. So many difficulties lie in the way of harmonious coloring and arrangement as applied to flower gardening—far more than would appear to a superficial observer. Although there are flowers of every hue and of all sizes, yet they may not bloom at exactly the same time, or some may fade sooner than others, or the form and size of one plant may not contrast favorably with the others.

Of late years we have made rapid progress in artistic floriculture. No longer do we submit to see our gardens scattered over recklessly, without regard to harmony or contrast, with flowers of every color or species. In our days we see more tasteful arrangements and dispositions in the flower gardens of some of the poorer suburban streets than were displayed in the extensive and costly parterres of thirty or forty years back. Flowers were formerly taken by striking contrast, without relation to harmony, and planted here and there, wherever a spot appeared suitable for their reception; but now, by grouping plants in masses, and attending, so far as possible, to their relative hues and forms, we can produce a finer and more striking effect with half a dozen species than the gardeners of past times did with half a hundred.

Nothing looks worse in a flower garden than to see plants, large and small, bright or somber, placed heterogeneously together in one bed. It is usual to see small beds filled with six or seven varieties of flowers of as many different colors. This imparts a very scattered effect to a parterre, for too much variety in detail leaves no spot for the eye to rest on. Small beds should never contain more than one species and one color, though this may be as bright as you please. Large beds, on the contrary, may be planted with a greater variety of flowers. Great care should always be taken to plant flowers of the brightest hues—scarlet pelargoniums, for example—in the center of the group; and these should be softened by degrees with flowers of a less brilliant tint toward the margin of the bed. White flowers are, perhaps, the best to plant along the margin immediately inside the box or turf edging.

In large parterres the beds should be separated from the bright gravel paths by a margin of green turf not less than two feet in breadth. In smaller gardens, however, this would occupy too much space, and box edging is generally substituted. But this verge should not be less than three inches in thickness, and perfectly flat on the top.

To form perfectly harmonious contrast in a parterre, it is best to plant one of the three primary colors—scarlet, blue, or yellow—next to another; or, if a perfect primary is not at hand, to take the complementary color formed by compounding the other two, green being complementary color to red, orange to blue, and purple to yellow. Many persons, indeed, say that two primaries form too violent a contrast, and recommend that the complementary should be employed in preference. For instance, red must be contrasted by blue or yellow, or else by green, but not by purple or orange, because red enters into the composition of both these colors. In default of any of these colors, white or some neutral tinted flowers may be employed. In the same way blue flowers should be contrasted by either red, yellow, or orange, but not by purple or green, because blue enters into the composition of both colors. Also, with yellow, you must contrast with blue, red, or purple, but not with green or orange. There are many neutral colors, as red brown, or olive brown, or pale lavender, or even light pink, which will form sufficient contrast to the others. White is very useful for placing between flowers of a brilliant hue which harmonize badly.

Very bright colors, however, should always be used sparingly and never placed in large masses, because the eye is wearied by too much positive coloring. It is a very great mistake to plant a clump of dark, funereal looking evergreens in the center of a bed of bright scarlet pelargoniums, bright yellow dahlias, or white candytuft as a strong contrast, and to make the whole look cheerful. But so far from having this effect, it imparts a harsh, disagreeable effect to the entire group. Masses of dark green should never be contrasted immediately with brighter colors. If they are softened by degrees with neutral tints, or even by pale yellow or white flowers, the group blends insensibly into the surrounding landscape in place of standing out in violent contrast from the rest.—*Land and Water.*

Defective Vision among Weavers.*

Should weavers be allowed to wear spectacles? This is a question which, we believe, has not occurred to many manufacturers, but we venture to put it in the general interest of the trade. Weavers are human beings like other workers, masters as well as servants, and subject to the same weakness of the senses. Indeed, it may be maintained that weavers are sufferers from defective vision to a much greater degree than others employed in the textile industries. Let any one who wishes to test this ask a number of weavers coming out of a mill on a Saturday afternoon. He will find that a great many young as well as old men and women will not be able to distinguish objects at a certain distance, and that a considerable number will only know their companions across the street from their general appearance or gait, and not from their features.

We know this to be the case, having tried it ourselves. If this is a fact, we ask, how is it, and what has produced this defective vision? With the men of the present age it may, to a certain extent, result from the desire to improve their education by reading in the evening, when the eyes are tired with the day's work, and suffer from the heat of the gas, now so general even in cottages; or it may be the dust of the shed flying about and irritating the fine texture of the eye and the ocular nerves; or it may be the result of direct injury to the eye by minute particles of dye from colored yarn in the case of colored work; or, again, it may result from the attempt of the eye to follow the quick motion of the sley and the shuttle, or be caused by a combination of all these factors. But we think the principal cause must be looked for in the speed of the looms, now so much greater than in former years.

It is the business of a weaver to keep his or her eye upon the work. The shuttle does not require his or her attention as the weftfork watches over that—still the eye, when on the cloth, cannot help following it. The sley moves at right angles, and when the eye is on the cloth it naturally also takes in this motion. These two motions struggle with each other in their effect upon the eye, and produce an unnatural strain, which must be weakening to the nerves. Let any one not accustomed to this try to follow the objects he passes in a railway train. An ordinary shuttle in a calico loom runs at the rate of about ten miles an hour, while the average speed of a railway train may be taken at about thirty miles. But on the other hand, the objects passed in a train are larger and at a greater distance from us than the shuttle is from a weaver. On trial it will be most fatiguing to the eye to follow, we will say, the telegraph posts regularly one by one, and we are convinced that not many people will be able to do this for more than five minutes at a time.

We may therefore fancy what a strain it must be upon the eye of the weaver to watch the flight of the shuttle the whole of the day, and day after day. It is the suddenness of the motions which tires the nerves, and this is of course increased by a greater velocity of the loom. A handloom weaver with 60 picks a minute has not nearly the strain put upon his eyes which a powerloom weaver has with 200 picks a minute, but while we see many old handloom weavers wearing spectacles we miss them in the shed among the powerloom weavers.

It is a well known fact among oculists, that weak eyes are far more frequent at present than half a century ago. This is so well recognized on the Continent that even military men have taken cognizance of it, for while in former years young men liable to military service managed to escape when they could prove their vision to be shortsighted, this is not allowed as an excuse under present regulations, and they are compelled to wear spectacles enabling them to compete with others at target practice at 1,000 yards distance. We may therefore take it for granted that on the whole there are more weak eyes among weavers than among the average of human beings. It is the nature of the work which produces weak and short sight, often ruining many young eyes in this way in a few years, so that we have to deal as much with younger people, before the looms, as with those whose hair has turned gray.

Spectacles and eyeglasses, when of the correct strength, are a help to the eye. They relieve the strain and are often the means of strengthening the nerves. Our improved mechanical facilities have made spectacles both better and cheaper than formerly, and like many other things they have passed from the position of luxuries to that of commonplace necessaries. How often do we now see children sent to school with spectacles, generally more to strengthen the eyes and to prevent undue strain. There is still the "heavy swell," with his gold eyeglass, or the fast young lady who thinks an eyeglass a necessary part of her outfit, but many more people will be found wearing glasses in the present day, simply because they require them and find them both a comfort and a relief.

The buyer when he examines the cloth he wants to purchase looks at it carefully through an eyeglass, in case he is shortsighted; the manufacturer produces his glasses from his waistcoat pocket when he looks at his deliveries, or when the new patterns are submitted to him; the clerks in the office imitate their master with or without necessity by sporting eyeglasses; but the poor weaver, who has to look at the cloth and the yarn it is made of far more closely, who has not to miss a pick in a complicated pattern or allow a float or other defects in the cloth, has to do all with the simple assistance of his natural vision, whether this is perfect or not. If a warp end breaks behind the healds, he or she must find it and tie it in the proper place. Here they cannot always bring their eyes close to it, and very often have to do it by feeling more than by seeing.

We believe there is an unwritten law among weavers prohibiting the wearing of spectacles, but we are not aware that masters would be averse to it. We see no reason why they should, and fancy the matter need only be brought properly before them to receive a hearty support from many humane employers.

* *The Textile Manufacturer* (London).

Cheap Gas for Cooking.

The small city of Nakskov, Laaland, has tried the experiment of cheap gas and encourages its use for cooking as well as illumination, and the consumption has reached 94 cubic meters (nearly 3,590 cubic feet) a year for each inhabitant. This result was accomplished by this arrangement.

1. The price for purposes of illumination is 4 cents per cubic meter ($1.16 per 1,000 cubic feet).

2. The price for heating purposes is 3 cents per meter (87 cents per 1,000 cubic feet).

3. The gas is put in the houses free.

4. The meters are sold to consumers at cost.

5. The house pipes, fixtures, and appurtenances are furnished as cheaply as possible, and five years are allowed for paying for them in quarterly installments, with four per cent interest.

6. The gas is paid for monthly.

7. When all the arrangements are completed, every consumer can burn gas free the first month.

8. One burner is allowed in the kitchen at the same price as for heating.

All classes of people are well represented among the consumers of heating gas, especially the small families of working men. The gas works are so managed that all the officials and each of the permanent employes receive, in addition to their regular salaries, a portion of the net profits of the works.

In spite of the extremely low price the gas works are doing a good business, besides lighting the streets gratuitously.—*D. A. Polyt. Zeitung.*

TIMBER covers about two-thirds of North Carolina; Mississippi has some twenty million acres of it; Louisiana, fifteen million; Texas, a great amount.

THE ATHENIAN TRIREME.

The restoration of the Athenian trireme is one of the most important and controverted questions of archæology. The documents which may serve to solve it are numerous, and worthy of credence. Texts, inscriptions, and figured monuments have been discovered and described; the data gathered by savants, as evidenced by the beautiful work published by Mr. Cartault, increase every day; and yet no general solution has been found, and we are not certain as to the most essential point—the mode of propulsion. Sailors, in spite of books and images, deny the superposition of the rowers, and Hellenists affirm it under conditions that are contrary to the laws of mechanics and to the experience of men who follow the sea. Both put forth hypotheses that their adversaries have no difficulty in combating, and the discussion remains sterile.

An attentive examination of a bass-relief representing the central part of an *Aphraktos* trireme, found by Mr. Lenormant, at the Acropolis of Athens in 1852 (Fig. 1), has suggested to me a new method. Without pretending to an exactness that the subject does not admit of, I will describe a trireme of the fifth century, such as the texts and figured monuments show it, according to my opinion. The trireme was a very long boat with flat bottom and sharp form, and sitting low in the water, as the use of a large number of oars required. In the direction of the length, we find three divisions, to wit: in the center, a rowing chamber, wherein was concentrated the motive power; and in front and behind, a prow and a poop, whose space was devoted to different uses. In the direction of the height, the volume of the hull was divided into two parts by a continuous and strong deck.

Beneath the latter was the hold, and, above it, a half-open space limited by the upper deck—a light structure forming only a maneuvering flooring and shelter. The central part of the hull was divided into three parts: the middle, in which were stored water and provisions, and the two sides, which the Greeks called *thalames*, because they served as a refuge to the sick and to those who were wounded in combat.

The provision magazine was separated from the thalames by strong partitions (*diaphragmata*), which are mentioned in the texts, and concerning the role of which controversy has run rife. The rowing chamber was fitted up with two kinds of benches—the *thranites*, owing their name to the form of their supports, and the lateral or *zygites*, from their Greek name, *zuga*. All these benches, according to the texts, were immovable.

The figures show the details of these arrangements, and permit the method of the four kinds of rowing in vogue among the Greeks to be understood. In simultaneous or parade rowing the thranites, zygites, and thalamites were juxtaposed and interposed. The oars had but a limited sweep, and the purchase of the blades against the water was reduced.

In thranite or combat rowing the thranite oars alone were manned, and each of them was actuated by three men. The whole crew was employed; the rowing chamber was full; moving from fore to aft was forbidden, as also communication with the center of the hold; and the thalames were open to receive the wounded rowers. The speed of the galley attained its maximum. Being given its probable dimensions and the number of the crew as stated by historians, such maximum may have reached 10 kilometers per hour.

In zygite rowing, or that employed in urgent missions, the zygite oars, which were shorter and lower than the thranite, were manned and actuated by two rowers. The crew was divided into two sets, which relieved each other from time to time. The galley was capable of making 120 kilometers in 24 hours. The thranite benches were removed, and moving about was easy.

In thalamite rowing, or the method used in fine weather, only the thalamite oars were used, these being so light that they could be handled with ease by the youngest sailors. The rowers, who stood upright in the thalames, followed a slow rhythm; the crew was separated into three or four divisions; the propulsion was continuous; and the unoccupied sailors found rest and shelter in the rowing chamber, which had become free.

It is easy now to appreciate the ingenuity of the arrangements adopted by the Athenians to obtain all the advantage possible from the motive power; to understand the immobility of the benches, a feature so regrettable as regards the strength of the vessel; and to comprehend the parade rowing, which, moreover, had a useful purpose, since it permitted of ascertaining at a glance that the *materiel* and *personnel* were complete, and that the rowers had learned to row in unison and with accuracy.

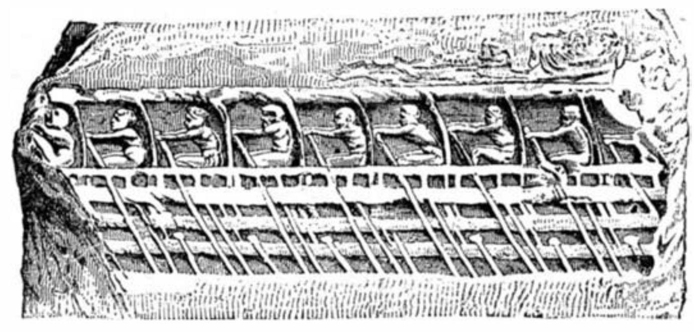


Fig. 1.—BASS-RELIEF REPRESENTING AN APHRAKTOS TRIREME.

The system of construction of the Greeks presented certain analogies with our own. The bottom of the ship consisted of strong timbers to which were attached the ribs forming the frame. Planks nailed to these ribs formed the shell and received the calking. The sides of the vessel presented a very peculiar aspect, which is at once revealed and explained to us by the bass-relief from the Acropolis. Strong horizontal pieces ran along the side at distances that permitted of the passage of the oars. These ribbands or wales were connected by diagonal pieces running from top to bottom and from prow to stern. These ribbands and diagonals, which were connected by mortises, were bolted to the ribs and formed a covering of invariable triangles. It is very probable that the internal partitions of which we have spoken were also constructed of several planes of crossed wood, and that the purpose of the whole was to give the trireme, at the expense of a delicate workmanship and accurate measurements, a rigidity without which there could be no stanchness. The ribbands performed also another role; they served as defenses in boarding, and as bearing points for the *hypozomes*—the flat cables with which the trireme was enveloped, and the office of which was to deaden shocks.

Independent of the channel-wales, there were strong cinctures below the water line that ended, according to ancient figures, at the rostrum; and, above the gunwale, there was a double ribband, called *parodos*, consisting of two plankings nailed, one of them inside, and the other outside of the frame. It was within this interval, within this passage (which must not be confounded with the *parodos* that ran throughout the length of the rowing chamber, between the bench supports) that the Greeks deposited their shields.

Above the *parodoi* there were knee timbers designed for supporting the upper deck—this latter being a light platform serving as a place for maneuvering and fighting, and having beneath it, in front, the cable bitts and the cook's room, and, behind, the officers' quarters. Around these principal facts, which are known to us through texts or figures, are grouped secondary features.

We see the mainmast—the large mast that carried those square sails that are still used by small ships in the Archipelago, and that are so useful for sailing large or down the wind toward a mooring—and the two extreme masts, one of which carried the jib, and the other that lug sail which was so remarkable for its cut and rig. We find in the *stolos* that high stem to which the Mediterranean ships fix their studding-sail yard, and we imagine to ourselves the *proreus* standing upon the *akrostolion*, and leaning forward to question those below.

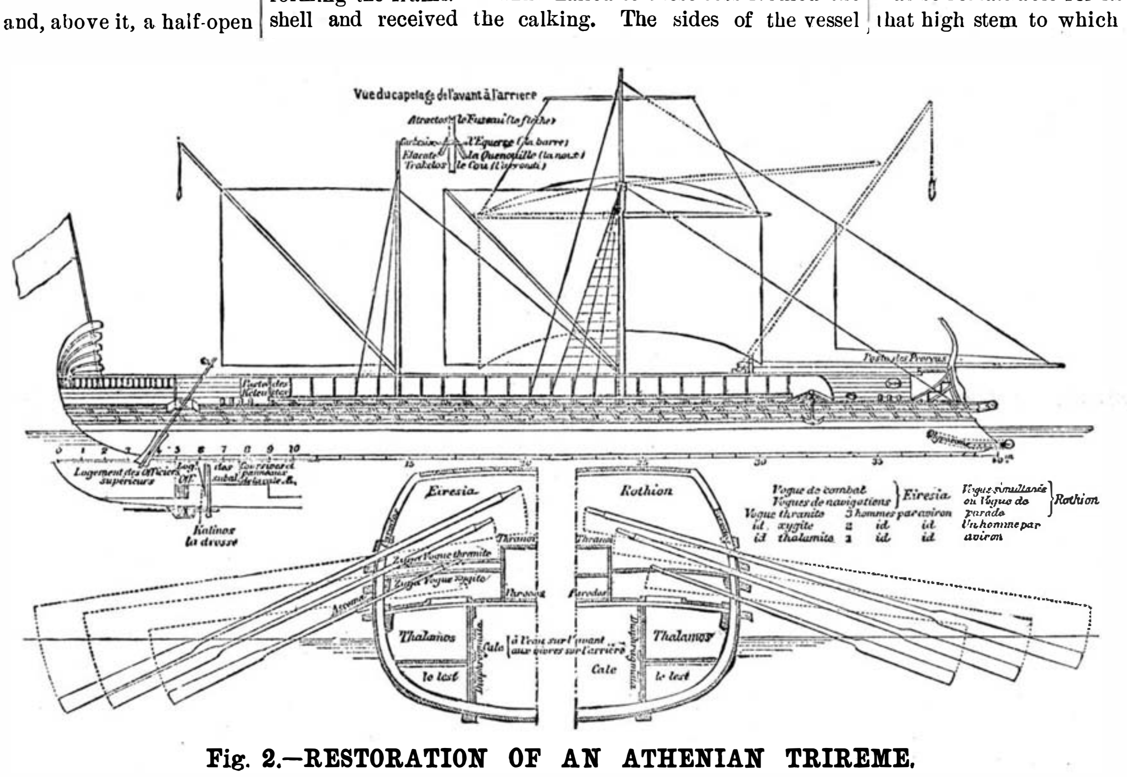


Fig. 2.—RESTORATION OF AN ATHENIAN TRIREME.

In front of the rowing chamber, and near the hawse holes (*ophthalmoi*), were the *epotides*—strong pieces of timber serving the double purpose of supporting the anchors, and protecting the oars when the enemy endeavored to break these by boarding lengthwise.

For this reason, these timbers were strongly braced by beams running backward and abutting against the ribbands, so as to form a sort of grating. Behind, there was a sort of fan whose curved blades were connected by the flagstaff. This was the *aphlaston*, which, although perhaps too much embellished, was certainly useful to the trierarch, who, from this open shield, watched the maneuvers of the enemy while running counter to him. Near by was the crosspiece which controlled the two rudders. These latter, which were conjugate, had the property (due to the arrangement of their bars) of revolving when pushed against; and their blades, which scarcely cut the water when the course was a straight one, dipped and sought of themselves more resistant strata when the pilot set them in action.

The trierarch's post was upon the upper deck, near the rudders, whence, through wide apertures, he was able to see the rear of the rowing chamber, and the *keleustes*, who transmitted his orders to the rowers. The mode of clearing the decks, and the maneuvers, were of the simplest nature.

The yards and square sails were deposited on shore, and the foremast was taken out and arranged for maneuvering the *delphins*. It is probable that these latter, not so heavy as the legend supposes, were metallic cylinders terminating in sharp cones, and guided in their fall by the cordage on which they had been hoisted. In falling, they acquired great penetrating power, and entered the deck just as the sharp-nosed porpoise enters the water after one of his leaps. The thranite oars were manned, the rowers being half naked. The thalamites had their shields at hand, ready, on fixing them in the parodos, to perform the maneuver that Jason taught the Argonauts. The defense of the rowing chamber was completed by leather curtains. The trireme bore down upon the enemy

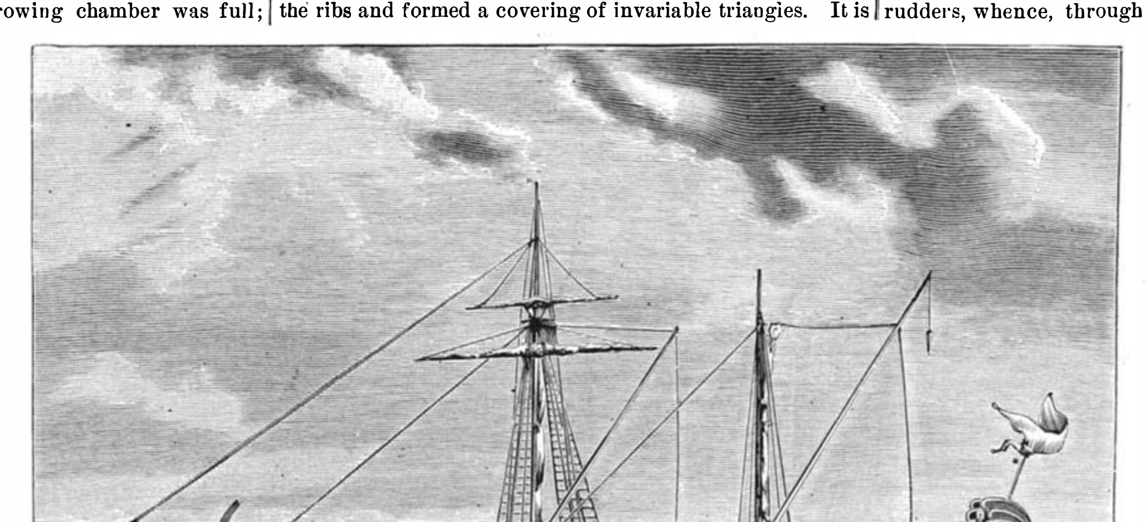


Fig. 3.—GENERAL VIEW OF AN ATHENIAN TRIREME.

and crossed him at a short distance; the soldiers and archers made use of their arms; and the oars on the side attacked were at once drawn in, their shanks slipping into their straps, and the handles, guided by the thranites, passing over the heads of the group on the opposite side, leaving nothing outside but the blades protected by the projecting *epotides*. If the distance permitted of it, the sailors let the delphins drop. The crossing effected, the oars were again actuated, and the trireme, thanks to her superiority in sailing and evolution, getting the better of her adversary, drove her rostrum into the latter's side.

We have designedly left till now a description of the rostrum and its accessories—the principal weapon of the trireme. This apparatus, which was placed very low, consisted of a bronze or iron fork whose branches were nailed to the longitudinal pieces of the prow, which latter was continued by a projecting rod and ended in a triple point. Thus outlined and attached, the rostrum did not penetrate so deeply as it would if it had had to attack less tapering surfaces higher up. There was less danger of its getting caught, and of thus exposing the vessel that carried it, and that had become immovable, to the attack of a second adversary; and the leaks that it opened were more difficult to stop. As an offset, if it had had to act alone, there would have been great danger of the trireme's being exposed to a dangerous strain through the action of transverse forces passing much beneath her center of gravity. This danger was warded off by the Greeks by means of the *proembolis*, which was a projecting piece forming a continuation of the channel wales, and armed with one or several metallic points. These latter came in contact with the surfaces above water almost at the same instant that the rostrum struck those below the water line. They struck into the planking or wales, prevented too deep a penetration, divided the frame timbers that tended to bend the beak, and annulled the action of that which tended to capsize the vessel. The utility of the *proembolis* was also very great during the course of a cruise; for by passing the hypozomes over its points, it became a safety buffer in cases of running afoul, and a protection for the cables. These precautions were not the only ones that the Athenians took against the dangers of navigation in squadrons. The points of the rostra themselves were sometimes trimmed with supplementary *hypozomes* offered by the expressed will of the people, that is to say, of the sailors. It must be observed that the intervention of such will was not an idle one, for the presence of submarine *hypozomes* rendered the work of the rowers very hard, and it was but just that those interested should be able to choose between fatigue and danger.

I have presented a general view whose parts are accurately arranged, whose details are borrowed from authentic documents that have been translated more or less freely, but always in the direction of practice and tradition. It is a solution which, by the fact alone that it is possible, seems to me ought to come near to the truth; and so I hope that this study will prove one step toward the restoration of a type that passed for a *chef d'œuvre* among a people of high culture, fond of an institution to which it owed glory, riches, and supremacy.—*Rear Admiral Serre, in La Nature.*

APPARATUS FOR REGULATING THE PRESSURE IN WATER CONDUITS.

The apparatus shown in the annexed Figs. 1 and 2 has been devised by a Mr. Eichenauer to deaden the shocks that occur in water conduits and to remove the air from the latter.

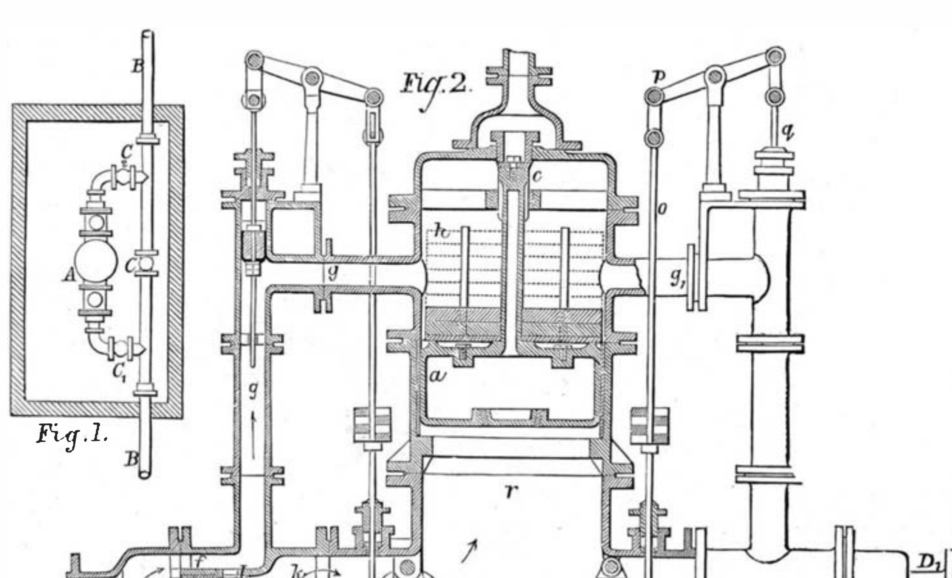
Referring to the plan, which is represented in Fig. 1, it will be observed that the apparatus, A, is placed at the side of the conduit, B, into the circuit of which it is introduced by opening the slides or valves, C_1 and C_2, and by closing C. This arrangement renders the apparatus accessible for repairs without its being necessary to shut off the water in the conduit.

If it is a question, for instance, of filling the empty conduit, B, with water, without the necessity of being obliged to open cocks or other apparatus in order to give exit to the air, the apparatus will operate as follows: The air, forced by the water into the apparatus at D in the direction of the arrows, shown in Fig. 2, through the channel, *g*, will be compressed in the cap, *h*, whence it may disengage itself through the valve, *c*, until the water, which has in the meantime entered the ⊥ pipe, *r*, lifts the floating piston, *a*, and thus closes the valve, *c*, which rests on the rod that guides it. Inversely, when a portion of the main water conduit is being emptied, the piston, *a*, falls with the water which is flowing out, and opens the valve, *c*, thus allowing a re-entrance of the air.

Any air that may accumulate in the conduit during its ordinary daily operations disengages itself in the same way automatically: As this air always flows to the highest points, it will collect in the cap, *h*, and finally, when its pressure has become greater than that of the water, depress the piston, *a*, and open the valve, *c*. There will thus be a constant equilibrium between these two pressures, and, besides, the air will prevent the water from rising too high in the pipe, *g*.

The injurious influence of the shocks that occur in main water conduits is prevented as follows: If, for example, the shock acts from the left, it will compress the spring, *k*, by means of the piston, *e*, and this spring being exactly regulated for a normal pressure, the piston, *e*, will in a certain measure close the aperture, *l*, in the tube, *d*, which serves as a guide to the said piston. At the same time the rod, *m*, by means of the bent lever or cam, *n*, will raise the rod, *o*, and depress the piston attached to *q*, thus closing the aperture, g_1. The shock is thus confined to the pipe, *g*, and to the cap, *h*, while the cross-shaped piece, *r*, and the part, D_1, of the pipe is closed. This difference in pressure causes the piston, *a*, to fall, so that the injurious effect of the shock is suppressed by the opening of the valve, *c*. When the shock has thus been balanced, the spring, *k*, carries the piston back to its normal position. The same thing occurs when the shock is produced from the other side.

The apparatus shown in the cut is designed for a conduit six inches internal diameter with a pressure of four atmospheres. It is wholly mounted upon the ⊥ or cross-shaped piece, *r*, which is provided with two manholes, *v*, in order to allow of easy access to the attachments of the piston rods. During the normal operation of this apparatus the water passes from D through *t*, into the annular opening, *f*, and enters the tube, *d*, through the slit, *l*, then enters the piece, *r*, and finally the part, D_1, of the conduit.



APPARATUS FOR REGULATING THE PRESSURE IN WATER CONDUITS.

WORTHINGTON'S EXERCISING APPARATUS.

THERE are a great many times, truthfully says one of our contemporaries, when a glue pot in the house is a "well spring of pleasure," and is an economical investment, especially when one of the kind here described: Buy at a tin shop one small tin cup, costing five cents, and a larger one, costing about ten, in which the smaller one can be set; five or six cents' worth of glue will mend a great many broken articles, or will fasten the things that have become unglued. Put the glue in the small cup with a little water; put boiling water in the larger one, and set the glue pot in it; in a few minutes the glue will melt and be ready for use.

NEW EXERCISING APPARATUS.

This improved exercising apparatus consists of a pair of horizontal parallel bars connected at one end by a third bar, and the three together supported by three legs suitably inclined and braced, one of them being under the center of the third or connecting bar and the others at the unconnected end of the parallel bars, said bars and legs being contrived to be easily taken apart and put together, and when taken apart are quite portable, light, and pack away in a small space. The apparatus is specially designed to afford the means in any room at one's home for the exercise known as "dipping," as practiced in the ordinary gymnasium.

This exercise, which, by the way, is a most beneficial one, consists in supporting the body upon the hands, which grasp the parallel bars, lowering the body by bending the arms until the chin is on a level with the hands, then raising the body by straightening the arms. This is repeated several times. The exercise develops the pectoral and triceps muscles very rapidly, and at the same time broadens and deepens the chest and throws back the shoulders, and has been highly recommended by authorities on physical culture; and for the want of suitable apparatus two chairs have been recommended, the chairs being placed back to back a short distance apart; but such device is so unsatisfactory that the exercise is generally neglected. This apparatus obviously overcomes all difficulties and affords entirely satisfactory means for practicing the exercise. An excellent exercise for the biceps and abdominal muscles may be obtained by grasping the bars from the under side and letting the body down toward the floor until the arms are straight, the legs, astride the back leg of the apparatus, forming a right angle with the body, and the knees kept straight, the raising the body by bending the arms until the shoulders are on a level with the bars, lowering again, and repeating several times. The exercise of dipping cannot be had from rowing-machines, health-lifts, or chest-weights. The nearest approach to it is found in the chest-weight; but they have to be permanently fixed in the room where they are used, while this apparatus, which is specially adapted for the exercise, may be set up for use when required and be readily taken down and put away when the exercise is over.

This useful invention has been patented by Mr. Geo. Worthington, of St. Denis, Baltimore Co., Md.

Flowers and Insects.

In these days, after the very elaborate and ingenious demonstrations of the relations of flowers and insects, it is scarcely any longer doubted that the intimate economy of both has been modified and adapted directly with reference to the needs and habits of each; that the flowers have developed color, scent, and intricate devices of form to attract and to entrap the insects, in order that by their propitious visits they may be cross fertilized, improved, and more widely distributed; that on the other hand the insects have become modified in shape and instincts to adapt themselves more commodiously to the various flowers, a process that has secured in nature a great variety of forms and habits among insects, and that these introactive influences are ceaselessly active.

Naturalists are inclined to think that the evolution of flowers, by which we now find three ways of fertilization created, viz., self-fertilization, wind fertilization (anemophily), insect fertilization (entomophily), has followed exactly this last mentioned order. That in earlier ages plants were all self-fertilized, that wind fertilized plants mark the next steps in advance, perhaps, and that insect fertilized plants developed their beauty of color and form last of all in the struggle for existence.

At this point, Mr. Ed. Heckel, a French botanist, enters a protest, contending that colors of flowers have not been evolved with any reference to the perceptions of insects. And he instances the brilliancy of the Alpine flowers, where he maintains there are no insects or too few to affect the results claimed by the evolutionists.

But recently M. Ch. Musset has spent four years of close observation in these altitudes, and affirms that insects are not absent or even rare at elevations of 7,000 feet above the level of the sea, and that the flower visitors, the Lepidoptera, Hymenoptera, and Diptera, were more numerous than the other orders. Further, the *comparative* rarity of insects at high elevations is exactly calculated to produce a sharper competition among the flowers, and lead to the production of more brilliant and conspicuous tints. M. Heckel still insists upon the insufficiency of the cause assigned, and of course he may be right, but the presumption is against him at present. His own explanation seems at any rate deficient, being that "the solar radiations are more intense than in the plains."

This might, it seems natural to think, affect the colors of the insects as well as those of the flowers, but they are as a rule somber and dark. At any rate, the brilliant skies of Persia, Arabia, and the Sahara have not produced a brilliant flora and fauna.

ENGINE AND BOILER ROOMS OF THE GREAT BRIDGE.

Situated under the roadway of the Brooklyn approach, a little beyond the end of the station building, is a large, irregularly shaped room, having an extreme length of about 61 feet, and a width of 39 feet. The ceiling is formed of brick arches supporting the roadways. Occupying the upper end of this room are the engines that move the endless rope to which the cars are attached. The engines rest on masonry beds, and are placed across the room, or in a line perpendicular to the axis of the bridge, one on either side of the drums carrying the rope. The drums are each 12 feet in diameter, with faces 26 inches and 27⅛ inches wide, and have five semicircular grooves cut in the center of the face. Between them is a friction drum having a diameter of 5 feet and a face 31½ inches wide. Passing through this drum is the crank shaft of hammered wrought iron, 12 inches in diameter. The duty of the friction drum is, principally, to take the stress caused by the rope which is wound about the two large drums. On the crank shaft is a pinion having 35 teeth engaging with a gear on one of the main drum shafts, having 84 teeth, the diameters being equal to those of the friction and driving drums, respectively; the face of each is 12 inches wide. Between one crank and the drum is a clutch, worked by a lever, thereby enabling the engines to run together or independently.

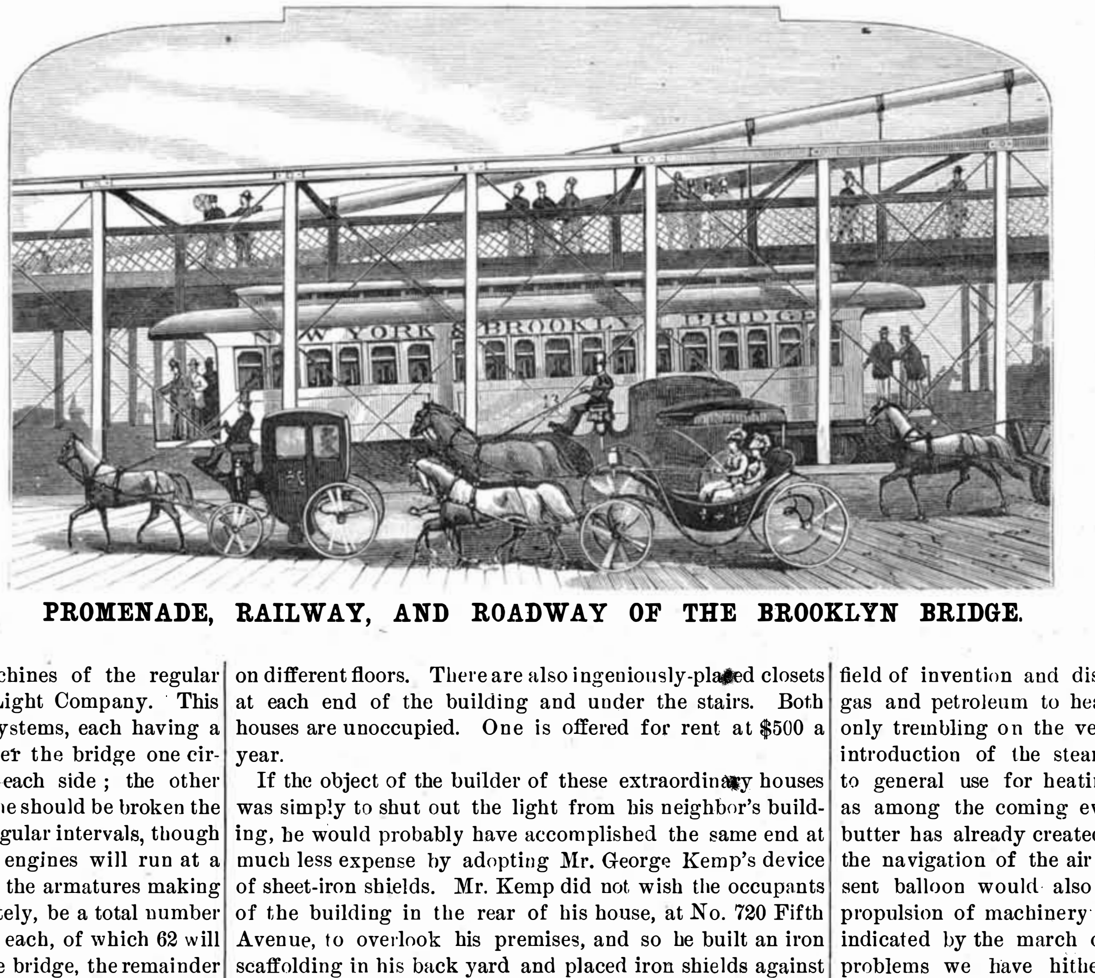
The openings in the clutch are so arranged as to bring the cranks quartering. The pillow blocks for the journals are of cast iron, with bottom brasses and Babbitted caps. The cylinders of the engines are 26 inches in diameter and 48 inches stroke, and the depth from center line to the base of the bed is 2 feet. The fly wheels have straight spokes, are built in sections, and weigh 18 tons. The engines are automatic. They were built by the Dickson Manufacturing Company, of Scranton, Pa.

Along one side of the room is a masonry incline, capped with granite blocks, to which are bolted steel rails. On these rails will run a heavily loaded car carrying a sheave, or a grooved pulley, around which the endless rope will pass, thus taking up the slack. The rope, after leaving the two drums, passes up and over a sheave on an iron frame at the higher end of the incline; it then passes around a sheave on the loaded car; then back to a sheave which guides it through a small hole in the roof; passing through this it goes over a summit sheave located on a frame between the tracks; thence to the New York side. On returning it passes over a summit sheave down to the other side of the drums, directly beneath. All the sheaves are 10 feet in diameter.

In the end of the room opposite that occupied by the machinery already described is the plant of the U. S. Illuminating Company for lighting the bridge. There are two engines of the Corliss pattern, each 16 inches by 38 inches, fly wheels 10 feet in diameter, and faces 16 inches. Each engine runs two dynamo machines of the regular style made by the U. S. Electric Light Company. This forms, practically, two independent systems, each having a circuit of 40 lights. As it passes over the bridge one circuit supplies alternating lights on each side; the other circuit supplies those intervening; if one should be broken the bridge would still be illuminated at regular intervals, though with only one-half the number. The engines will run at a speed of 80 revolutions per minute, the armatures making 1,000 revolutions. There will, ultimately, be a total number of 80 arc lights of 2,000 candle power each, of which 62 will be on lamp posts distributed along the bridge, the remainder being in the buildings. The lamps are furnished with two carbons, an automatic cut-out changing the current from one to the other at the proper time.

The boilers which supply steam to all these engines are in a building adjoining the approach. The building is five-sided, the long side being 65 feet, the two ends 28½ feet, and the other two sides forming an obtuse angle. Here is a nest of four boilers made by the Babcock & Wilcox Company, of this city. They consist of a series of lap-welded, wrought iron watertubes, inclining slightly, and connected at either end with a horizontal drum. Their construction and plan are so well and favorably known as to make a detailed description superfluous. The drums are 36 inches in diameter and 18 feet long. There are six sections of nine tubes, each tube being 4 inches in diameter and 18 feet long. The mud drum is 18 inches across. The boilers are each 104 horse power. The supply pipe leading to the engines is 12 inches in diameter. If the steam supply should be found to be insufficient, there is space at one end of the room for two additional boilers of the same size.

Our first page shows the engine room as seen from the upper end, the driving drums and engines being in the foreground, and the incline extending across the rear.



PROMENADE, RAILWAY, AND ROADWAY OF THE BROOKLYN BRIDGE.

THE Mexicans use a strong solution of iodine in potassium iodide for an antidote for rattlesnake poison.

A Narrow House.

The narrowest house in New York may be seen at the northwest corner of Lexington Avenue and Eighty-second Street. When Lexington Avenue was cut through some years ago, a strip of land five feet wide and one hundred feet deep was all that was left of a certain lot belonging to a person who did not own the next lot on the street. The strip, while of little value by itself, would be valuable to the person owning the adjoining lot on Eighty-second Street, because it would not only enable him to build a house five feet wider, but would give him windows all along the side of his house on Lexington Avenue. The two owners, however, could not agree as to terms, and a house was erected on the lot adjoining the narrow strip. The owner of the latter had nothing to do but to abandon his lot or build a house five feet wide upon it. The latter course was perhaps adopted because such a house would shut up all the side windows of the neighboring building, and considerably reduce its value.

The new building, which has been finished for some months, is therefore 5 feet wide, 100 feet deep, and 4 stories high. It is divided into two houses, each fifty feet long, and the entrance doors are, of course, on the Avenue, as there is no room for a door at either end of the building. The law allows a building at the corner of a street to have projecting bay-windows along the side, and taking advantage of this circumstance, the architect has managed to plan a house which, while peculiar in inside appearance, and probably very uncomfortable to live in, may find tenants. Without these bay-windows or square projections running from the foundations to the roof, it would not have been possible to build a house at all, for no room would have been wider than three feet. Each house has, therefore, two bay-windows, in one of which are the stairs, and in the other one room about eight feet wide by fifteen feet long, upon each floor. The long passage between the stair-well and the room is about three feet wide. Each house contains a kitchen 8' x 15', and four rooms, each of the same size, but on different floors. There are also ingeniously-placed closets at each end of the building and under the stairs. Both houses are unoccupied. One is offered for rent at $500 a year.

If the object of the builder of these extraordinary houses was simply to shut out the light from his neighbor's building, he would probably have accomplished the same end at much less expense by adopting Mr. George Kemp's device of sheet-iron shields. Mr. Kemp did not wish the occupants of the building in the rear of his house, at No. 720 Fifth Avenue, to overlook his premises, and so he built an iron scaffolding in his back yard and placed iron shields against the obnoxious openings, shutting out air and light as completely as a brick wall would have done. This arrangement has been for years the source of no little comment from the neighbors and passers-by.—*Evening Post.*

The Arlberg Tunnel.

The *Revue Generale des Chemins de Fer*, writes our Geneva correspondent, gives some interesting particulars concerning the Arlberg tunnel, the boring of which is being pushed with great energy and success. The present road over the Arlberg, which forms the frontier between Austria and Switzerland, is 5,400 ft. above the level of the sea; but the tunnel is much lower down, the opening on the Tyrol side being 4,030 ft., and that on the Swiss side 3,770 ft. above sea level. Its total length will be 10,270 meters (11,161 yards, or six miles and 601 yards), and it runs for the most part through a formation of mica schist. The method of excavation differs from that practiced in the making of the St. Gothard tunnel. Instead of piercing the upper part of the passage first, and working down, the Austrian engineers have preferred to begin at the base and work upward. The face of the rock is drilled by perforators actuated by compressed air, which is pumped into the tunnel by turbines stationed at its two extremities.

When a sufficient number of holes have been drilled, they are charged with dynamite and exploded. After the blast, the *debris* is removed by trucks, which follow closely on the track of the perforators, and a few minutes later the drilling is going on as rapidly as before. The drift thus made is 2·75 meters wide and 2·50 meters high. While one drift is being driven below, another, to which access is gained by vertical shafts, is being driven above. This work has necessarily to be done by hand, and the rubbish is shunted through openings, made for the purpose, into an inferior gallery. Until very lately the ventilation had given rise to no difficulty, and the heat has rarely exceeded 14 degrees Centigrade (58 degrees Fahrenheit). The contractors have undertaken to make an average advance of 6·60 meters a day. For every day they exceed the given time they will be mulcted in a penalty of £68; for every day gained they will receive a premium of £68. So far the contractors have kept well up to time. On not a few occasions the agreed rate of advance has been more than doubled. From January, 1881, when the work began, to September 30, 1882, the length pierced on the east side was 2,976 meters, on the west 2,643, together 5,619, equal to 8·80 meters daily, figures which are highly significant of the progress made of late years in the method of boring great tunnels.

In the month of February last the rate of advance per day was 4·68 meters on the east side, 4·74 on the west side, and but for the scarcity of water, owing to the freezing of the sources of supply, a still better average would have been made. On the west side there is now a stretch of 3,070 meters practicable for locomotion, while on the east side the completed stretch is only 1,430 meters. Up to the end of February the quantity of earth and rock removed amounted to 429·082 cubic meters, and the walling to that date executed measured 121·511 cubic meters. The tunnel is expected to be completed and the line ready for opening by the autumn of 1884.

The Age of Inventions.

The number of inventions that have been made during the past fifty years is perhaps unprecedented in the history of the world. Of course inventions of benefit to the human race have been made in all ages since man was created; but looking back for half a hundred years, how many more are crowded into the past fifty than into any other fifty since recorded history! The perfection of the locomotive, and the now world traversing steamship, the telegraph, the telephone, the audiphone, the sewing machine, the photograph, chromo lithographic printing, the cylinder printing press, the elevator for hotels and other many storied buildings, the cotton gin and the spinning jenny, the reaper and mower, the steam thrasher, the steam fire engine, the improved process for making steel, the application of chloroform and ether to destroy sensibility in painful surgery cases, and so on through a long catalogue.

Nor are we yet done in the field of invention and discovery. The application of coal gas and petroleum to heating and cooking operations is only trembling on the verge of successful experiment, the introduction of the steam from a great central reservoir to general use for heating and cooking is foreshadowed as among the coming events, the artificial production of butter has already created consternation among dairymen, the navigation of the air by some device akin to our present balloon would also seem to be prefigured, and the propulsion of machinery by electricity is even now clearly indicated by the march of experiment. There are some problems we have hitherto deemed impossible, but are the mysteries of even the most improbable of them more subtle to grasp than that of the ocean cable or that of the photograph or the telephone? We talk by cable with an ocean rolling between; we speak in our own voices to friends 100 miles or more from where we articulate before the microphone.

Under the blazing sun of July we produce ice by chemical means, rivaling the most solid and crystalline production of nature. Our surgeons graft the skin from one person's arm to the face of another, and it adheres and becomes an integral portion of his body. We make a mile of white printing paper, and send it on a spool that a perfecting printing press unwinds, and prints, and cuts, and delivers to you folded and counted, many thousands per hour. Of a verity this is the age of invention, nor has the world reached a stopping place yet.—*Cincinnati Times-Star.*

To remove the unpleasant taste which is frequently observable from new wooden vessels is a thing difficult of accomplishment. *The Brewing World* says that the simplest plan, and one that will succeed in most cases, is to scald them thoroughly several times in boiling water, then dissolve some pearlash or soda in lukewarm water, adding a little lime to it, and wash the inside of the vessels well in the solution. Afterward scald them several times thoroughly as before.

Correspondence.

Visibility of Ruled Lines.

To the Editor of the Scientific American:

In an article in your issue of May 5, on "The Visibility of Ruled Lines," there are some statements which do not agree with my experience. I find that lines properly ruled on glass are similar to graven lines; they are smooth, clean cut, having a definite shape and depth. Such lines are always visible in the microscope, and central or oblique light will show the bottom of each cut as a dark or colored line, plainly visible, and requiring no graphite or other foreign substance to indicate it. The microscope is the test for a properly ruled line. The mechanical elements (pressure, etc.) entering into the process of ruling are not at all evidences that lines have been properly ruled. The slightest accident to the point of the cutter, or the surface of the glass not being perfectly clean, will spoil a line; that is, produce a scratch which cannot be satisfactorily illuminated in any light. Well ruled bands of lines, 70,000 or 80,000 to the inch, are visible in the microscope with central light; and with a Smith vertical illuminator (giving central light), I have seen 100,000 lines to the inch. As these individual lines have a width of about $\frac{1}{200000}$ of an inch only, it follows that the difficulty is not to see such a narrow line, but to eliminate the diffractions which tend to blur the image in the microscope, and so prevent the resolution or separation of the lines in a band of them. C. FASOLDT.

DECISIONS RELATING TO PATENTS, TRADE MARKS, ETC.

Supreme Court of the United States.

THE MANHATTAN MEDICINE COMPANY, APPELLANT, *vs.* WOOD *et al.*

Mr. Justice Field delivered the opinion of the Court.

A court of equity will extend no aid to sustain a claim to a trade mark on an article which is put forth with a misrepresentation to the public as to the manufacture of the article and as to its place of manufacture, both of which circumstances were originally circumstances to guide the purchaser of the medicine.

When a right to the use of a trade mark is transferred to others, the fact of transfer should be stated in connection with its use, otherwise a deception would be practiced upon the public.

Appeal from the Circuit Court of the United States for the District of Maine.

United States Circuit Court.—District of Rhode Island.

COUPE *et al. vs.* WEATHERHEAD *et al.*

Lowell, J.:

This bill is brought upon Letters Patent No. 213,323, granted the plaintiff Coupe, March 18, 1879. It describes a mode of stretching and reducing to a uniform thickness what is known in the trade as "rawhide leather;" that is, a hide which has been stripped of its hair and has been softened and brought to a state in which it is very soft and flabby and much wrinkled, but has not been tanned.

Held by the Court:

If, in the operation of a prior machine, a greater number of persons necessarily have to be employed than in a patented machine, this tends to prove that the machines are not alike.

The omission of certain elements of the old machine and insertion of certain additional features, if an improvement results, constitute a patentable invention.

Infringement of a claim is not escaped by the employment in a combination of a certain board, which only effects two-thirds of a desired result, it depending altogether on the thickness and stability of the board whether the whole operation is or is not copied.

It is not necessary for a machine to be automatic in order to be patentable.

Tin Cans and Foods.

Stamping machines first receive the tin, each machine cutting out one of the four pieces used in making the can. The first cuts the tin plate into plain, rectangular strips. These are for the cylinder of the can, which is made of a single piece. The second stamps out a round piece, forming the bottom of the can. The edge of this is turned over by the machine and a single stamp cuts it, turns the edge, and produces the bottom ready to be fitted on to the cylinder when that shall be made. The third produces the top. This is also round, of the same size as the bottom, with a hole in the middle on which the cap will be fitted later. This, with the turned edge and the groove around the hole for the cap, is also produced by a single stamp of its machine. The fourth machine turns out the cap. Each piece is then carefully examined for flaws or breaks. All defective ones are thrown aside.

The rectangular strips pass to the hands of a workman, who bends them, one by one, over a cylinder of the exact size of the can that is to be made. One end of the strip then laps over the other, perhaps a quarter of an inch. With a treadle he loosens a spring, which brings a clamp down on the upper edge and holds the tin ready for the solder. With a quick motion he throws a little powdered rosin and a small lump of solder upon the edge exposed, and then passes a soldering iron over it. By the time he has repeated these operations on another cylinder, precisely similar, with another strip of tin, the solder on the first one is cool enough to hold the edges together, and the hollow cylinder is taken off. It may be mentioned that the solder is all previously cut by machinery into lumps of the exact size necessary to solder the seam properly. This seam—the one up and down the body of the can—is soldered on the outside, in hand-made as well as machine-made cans.

The next workman has before him three piles. One is of the body of the can, so called, or the hollow cylinder, made as just described. In the other piles before him respectively are the bottoms and heads from the stamping machines. There is also a sponge, wet with one part of muriatic acid, in which zinc has been dissolved, and three parts of water, and there is a large dish full of powdered rosin. Taking a cylinder or body in one hand, he presses one end of it upon the sponge, wetting it with the diluted acid, and then thrusts it into the powdered rosin. Enough rosin adheres to make the necessary "flux" for the solder that is presently to be put there. Then taking a bottom in the other hand, he puts it on the end prepared.

The can is then ready for the machine that is to do the "outside soldering," which distinguishes it from the hand-made can. This machine is very simple and is run by a boy. By its means the can is made to revolve five or six times, with its lower edge in a bath of solder kept fluid at the proper temperature, the superfluous solder being scraped off at the same time. The top and bottom are soldered on in this way. The can is then filled. The filled cans are each placed on a small revolving table, a clamp holding them in position. Then, as they revolve, the boy touches the edge of each cap with a brush wet with dilute muriate of zinc.

As has been said, the top of the can is made with a hole, around which a groove is stamped. The cap is simply a round piece of tin with the edge turned down to fit into this groove, and with a small vent hole punched in it near the middle. All the parts being made by machinery, the edge of the cap fits into the groove with exactness, and it is supposed that, practically, none of the acid or of the solder reaches the inside of the can, but all remains in the groove on the outside. The solderer now applies a semicircular soldering iron kept at a great heat, and a stick of solder. The iron fits into one-half of the groove, and as the can revolves the whole edge of the cap is soldered on. The heat of this operation expands the contents of the can, which was as nearly full as practicable before being sealed, so that the last particle of air is supposed to be driven out through the vent hole. This vent hole is then closed with solder by the next workman, and the process of closing the can is complete. In dealing with meats and some kinds of vegetables it has been found necessary to revent them, or, in other words, to reopen the vent hole later on and solder it up again. Why this has to be done with some materials and not with others is not known; but experience has taught the canners that it must be done with some goods or else they will spoil.

The can is now sealed, but it is by no means ready for the market. If the goods were sent out at this stage, few of them would hold together, and all would spoil. The danger—the certainty—of putrefaction has yet to be guarded against. This is done by cooking the food inside. The packers call it "processing." Enormous kettles are arranged, into which crates or frames, holding sometimes a thousand cans, are lowered. A lid is then screwed on and steam is let in. The amount of heat to be used and the length of time the food must cook vary, of course, with different articles, and the skill of the superintendent is called in especially at this point. He must know, and does know, what degree of heat to apply, and how long to apply it. It is his secret. After the processing (and, as said, in some cases the reventing) the goods are ready to be labeled and sold.

The process above described relates to machine-made cans. The difference between these cans and the hand-made ones is this: The food does not come in contact with the cans above described, but the reverse is the case in the hand-made cans. The making of the cylinder of the can is the same in both cases; that is, the seam from bottom to top of a cylindrical can is always soldered on the outside. The top is then put on and a lump of solder is dropped in, together with some powdered rosin. With a hand soldering iron the workman then melts and places the solder. The can is then reversed, the bottom put on, and a lump of solder and the rosin are thrown in through the opening in the top, through which the packing is to be done. The soldering iron is then put through the same opening and the bottom is fastened by the same ordinary soldering process.

In the manufacture of tin cans, six substances or materials are used which come in contact with the foods which are packed in them—namely, tin, iron, rosin, lead, zinc, and muriatic acid. The tin plate, or, more properly, tinned plate, is made by dipping sheet iron plates into a bath of molten tin, the tin adhering in sufficient quantity to form a perfect coating on the iron. A surface of pure tin is thus presented by the cans made from this tin plate. The solder is tin and lead melted together, and the rosin and muriatic acid form a flux for the solder.

If all these materials are pure and rightly used, the danger of any evil effects from the foods coming in contact with them is very slight. Charges have been made that the canners (or some of them) use an inferior quality of plate, coated with an alloy of tin and lead called "terne." It is said, even by those in the trade, that some five or six years ago a quantity of this was used in the canning of food; but it is tolerably certain that none is used now. The danger of using it is admitted by all canners. "Terne" is used principally for roofing, and it is safe to say that none of it is used to make cans for holding "canned goods." It is used, however, to a considerable extent for making cans in which spices, tobacco, etc., are packed.

Some makers deny that any solder is to be found inside their cans, or that any "flux," excepting rosin, is used. In this case, and supposing the tin plate to be of good quality, that is, sufficiently coated with tin, the food could only be touched by tin or rosin. As a matter of fact, this statement is never mathematically true, since even in the most carefully and scientifically constructed can the vent hole is stopped with pure solder, that is, tin and lead. On the other hand, supposing a defect in the tinned plate, the food might touch iron. It certainly would touch tin. In case of an "inside soldered" can it would touch lead. And there is always an apparent possibility of a certain amount of the flux—rosin, muriatic acid, or zinc—coming in contact with food.

The dealers say that more of the hand-made cans are used than those manufactured by machinery, as the soldering done by hand on the inside makes a stronger can, and the loss is less on account of there not being so much danger of air entering. The smallest imaginable hole in a can will admit the air, and the packed goods will be ruined. The packers and members of the trade do not believe that there is any danger of poisoning in the cans, and say that the proportion of lead and acids is altogether too small. The *Manufacturers' Gazette*, from which we take the foregoing, remarks: "Certainly, if there were any trouble, we should hear more frequent complaints than we now do, and we must conclude that the tin cans in common use are, to all intents and purposes, harmless."

Modern Guns and Projectiles.

The U. S. Board of Engineers for Fortifications has recently submitted a valuable report upon the practice in Europe with the heavy Armstrong, Woolwich, and Krupp rifled guns. The conclusions of this report are as follows:

"Experimental firings for penetration during the past twenty years have determined:

"1st. That wrought iron and cast iron, unless chilled, are unsuitable for projectiles to be used against iron armor; that the best material for that purpose is hammered steel or Whitworth's compressed steel.

"2d. That cast iron and cast steel armor plates will break up under the impact of the heaviest projectiles now in service unless made so thick as to exclude their use in ship protection.

"3d. That wrought iron plates have been so perfected that they do not break up, but are penetrated by displacement or crowding aside of the material in the path of the shot, the rate of penetration bearing an approximately determined ratio to the striking energy of the projectile, measured per inch of shot's circumference, as expressed by the following formula:

$$\text{Penetration} = 2{\cdot}035\sqrt{\frac{V^2 P}{2g \times 2r\pi \times 2240 \times 0{\cdot}86}} \text{ in inches.}$$

V = velocity in feet per second; P = weight of shot in pounds; r = radius of shot in inches.

"That such plates can, therefore, be safely used in ship construction, their thickness being determined by the limit of flotation and the protection needed.

"4th. That though experiments with wrought iron plates faced with steel have not been sufficiently extended to determine the best combination of these two materials, we may nevertheless assume that they give a resistance about one-fourth greater than those of homogeneous iron.

"5th. That hammered steel in the late Spezia trials proved superior to any other material hitherto tested for armor plates. The 19 inch plate resisted penetration and was only partially broken up by four shots, three of which had a striking energy of between 33,000 and 34,000 foot tons each. Not one shot penetrated the plate. Those of chilled iron were broken up, and the steel projectile, though of excellent quality, was set up to about two-thirds of its length. This experiment seems to promise the solution of the problem to determine a material for armor plates which, though limited in thickness to the carrying capacity of the ship to be protected, will still have sufficient resistance to break up the projectiles of the largest guns now in the naval service, without being penetrated or broken by the projectile.

"It seems probable that a hammered steel plate, like that tried at Spezia, if equal in thickness to the belt armor of the Inflexible (22 inches), would stop the shot of the 100 ton gun (Armstrong) fired with its greatest practicable velocity.

"Finally, these later experiments confirm this Board in its opinion, enunciated some years since, that, while the 12 inch rifled gun may prove a sufficient armament for the barbette batteries of our sea coast defenses, as against the lighter ironclads of foreign navies, iron turrets, armed with guns of 100 tons weight at least, will be needed to meet the attack of armored ships of the latest construction."

The 100 ton chambered Armstrong gun, throwing a projectile of a ton weight, and fired with a charge of over 700 pounds of powder, may be taken as a sample of the monstrous requirements of modern war. Such guns must be both made and operated by machinery.

Corn and Wart Cure.

Gezou's remedy for corns and warts is prepared as follows:

℞. Acid. salicylic .... gr. xxx.
Ext. cannabis indic .... gr. x.
Collodion .... ℥ ss. M.

Why Some Mechanics don't get on.

We were much interested the other day in drawing from one of the oldest practical mechanics of Cleveland the secret of his success. Said he: "I have always made it a rule to do my work so well that it left a good impression on my employer." There is more in this than at first appears. Hard work is one thing; conscientious work is another. The hard worker may outwardly conform to all the requirements of the shop; he may always be in his place at the starting of the machinery; he may take short noonings, and he may be among the last to drop his tools at night, but after all he may utterly fail to get on in the world, and why? Let our experienced informant answer: "I know of a young man of just that kind. He works hard enough and wants to succeed, but somehow he can't. He came to me for counsel, and I found that he was slighting his work. That is, in his anxiety to turn off a large amount, he neglected the finish which always tells on good work. The consequence will be that, unless he makes a change, when times are dull he will be one of the first to be dropped by his employer." Superintendents and foremen notice these defects more closely than many are aware. The man who slides over his task, who lacks in thoroughness, who lets an unfinished piece of work leave his hands, is marked. In the unwritten law of the shop he is barred from promotion, while the conscientious workman is morally certain of advancement. Is the tendency of the day in the direction of a better finish to work? We think it is. As machinery is brought into competition the strife will be to secure superiority in cheapness, simplicity, and finish. Here it is that the thorough workman brings into play all the resources of his skill and honesty—his "mechanical moral sense," it has aptly been called. Here it is, too, that the slovenly, or careless, or hasty workman utterly fails. There are some forms of bad work that can be deftly covered up, but the compensations of life bring the inevitable result—failure to him who does not put his heart in the work, success to him who not only does his task, but does it well.—*Trade Review.*

How a Locomotive was raised from a River.

The *Elevated Railroad Journal* relates how the feat of raising a huge freight engine from the mud in Bush River, on the Philadelphia, Wilmington, and Baltimore Railroad, below Havre de Grace, was successfully accomplished a few days ago. The engine fell through the draw bridge some time ago. The difficulties of the feat may be imagined when it is understood that the engine was several feet below the water's surface, and completely buried in the mud. The wreckers have been at work a week, the first thing accomplished being the placing of heavy chains beneath the great mass of iron. Two divers, sent down for this purpose, were compelled to dig several feet under the soft mud at the bottom of the river. The chains were made taut to four heavy scows, which were filled with water at low tide. Everything being satisfactory, the water was pumped out of the scows, thus tightening the chains about the engine. When the tide began to rise, the engine was pulled a few feet from the mud. Then other scows were brought, and when the tide was again low, water was pumped in and the chains fastened to them. The tide went up again, and so did the engine, which came to the surface. After this had been repeated a number of times, the engine was swinging clear of the water, and was then placed on a large float, only slightly damaged, and wanting but few repairs to make it as good as before its tumble into the river. The railroad will now take charge of its fished up property, and tow it to the river bank near the railroad track. To that point, when the tide is high, a temporary track will be built connecting with the railroad, and when the tide has fallen sufficiently to place the wheels of the engine on a level with the temporary structure, the engine will then be run on the wharf and to the main track. It will be taken to Wilmington and repaired; it cost $1,000 to fish the engine out.

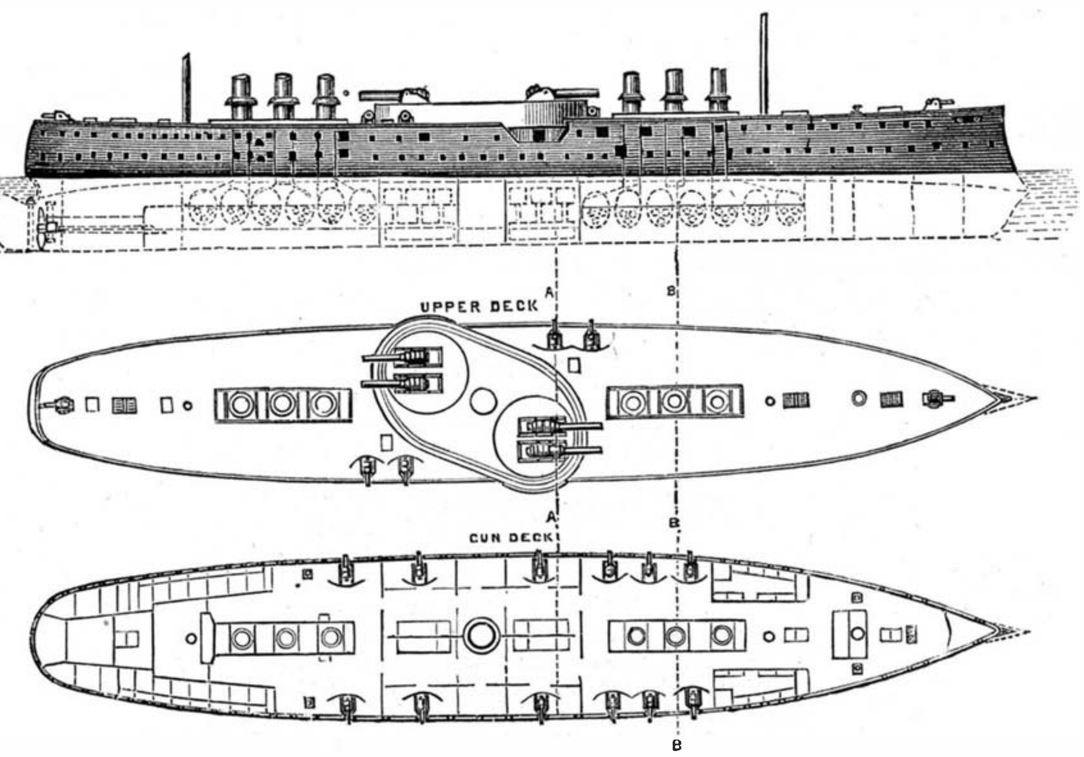
A MAN breathes about eighteen times a minute, and uses 3,000 cubic feet of air per hour.

Indestructible Bank Notes.

It is a curious fact that so firm in texture is the paper of a genuine Bank of England note that burning alone can hardly destroy it. The authorities have in a little glazed frame the remnants of the note which was in the great fire of Chicago. Though completely charred and black, the paper holds together, and the note is sufficiently legible to establish its genuineness and to be cashed.

THE GREAT WAR SHIP LEPANTO.

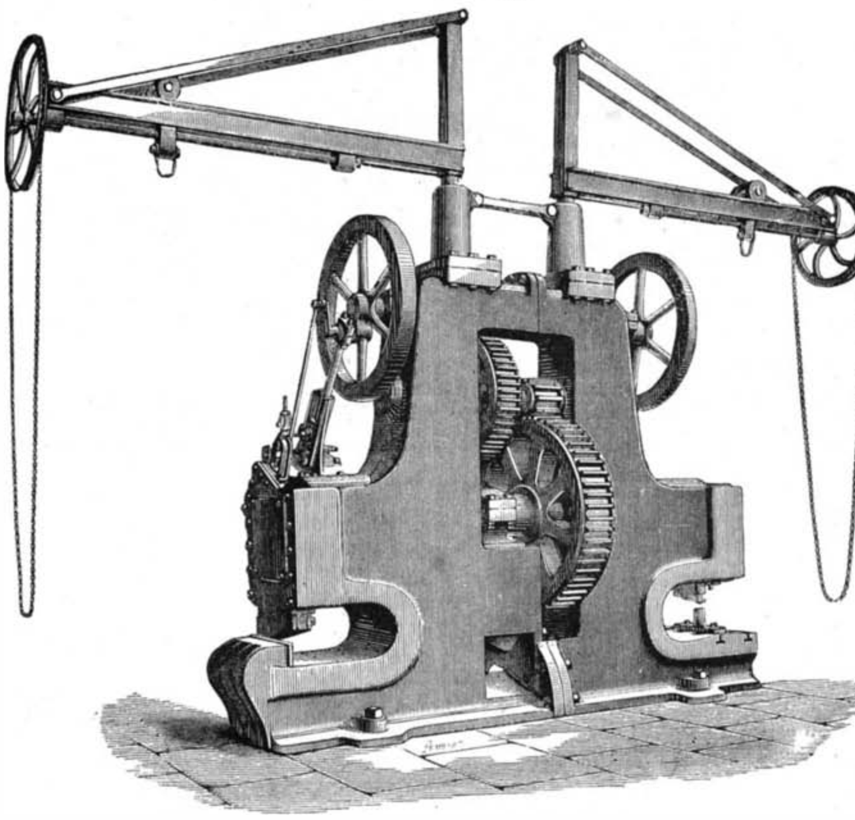
In the SCIENTIFIC AMERICAN for April 21 we gave a view of this remarkable ship of war, supposed to be the most powerfully armored of any vessel afloat. We now give diagrams showing the general arrangement of her guns and other defenses. The ship is 400 feet long, 73 feet beam; weight of hull, armor, etc., 10,000 tons; power of engines, 18,000 horses; speed, 16 knots; armament, four 100 ton Armstrong guns and twelve 6-inch guns; steel armor 19 inches thick.



THE ITALIAN IRONCLAD LEPANTO.

PUNCHING AND SHEARING MACHINE.

We illustrate a heavy punching and shearing machine manufactured by Messrs. Francis Berry & Sons, of Sowerby Bridge. It is driven by a steam engine mounted upon the main casting, and is capable of punching 1½ inch holes through 1½ inch plates at one end, and of shearing 1½ inch plates at the other end, the gaps being 30 inches deep. The middle shear will cut 6 inches by 6 inches by 1 inch angle iron, or 12 inch by 11 inch flat bars. Provision is made for lifting and turning the work by a jib crane at each end of the machine. These cranes are each capable of carrying 30 cwt., and are provided with screw traversing gear, worked by endless chains. The total weight of the machine, which is a powerful and useful tool, is 26 tons.—*Engineering.*



IMPROVED PUNCHING AND SHEARING MACHINE.

IT is estimated that 2,000 persons a year, mostly prisoners, take their own lives in Russia.

Post-mortem Examination of a Snake.

Mr. H. B. Stanley, of Placerville, Cal., communicates to the *Pacific Medical and Surgical Journal* an interesting account of an examination he made in dissecting a hibernating snake. On the 14th day of last February, says the writer, one of my neighbors, while digging among some rocks near this place, suddenly came upon the winter quarters of a small "bull snake." The serpent was in a torpid state from the cold weather, and was easily killed. During the afternoon of the 15th I happened to be at the place where it was killed, and procured it for examination. It measured 3½ feet in length and weighed 7 ounces. On opening the body, the stomach was found to be entirely empty; the bowels were almost empty, containing only a small amount of creamy looking substance in the lower bowel, streaked and tinted with something greenish resembling bile. Being a female, the parts answering to ovaries were large and congested, and each consisted of 26 distinct parts or divisions. The liver was very small and pale. The gall bladder was large and full of bile, containing nearly half a fluid drachm. The lungs were fully inflated and extended on each side of the spinal column nearly the whole of the middle third of the body. The heart and arteries were nearly full of bright red blood. The spleen was 7 inches long, and weighed one-fourth of an ounce, which it will be seen was one twenty-eighth of the weight of the entire animal. It was of a dark red color, and seemed to be rich in blood.

Is it probable that this enormous spleen serves as a reservoir of nourishment upon which the animal lives after its stock of adipose tissue is gone? The cavity of the body contained but very little fat, perhaps not more than 10 grains. Snakes at this altitude usually go into winter quarters about the 20th of October, and emerge from their winter homes about the last of April, or 15 days earlier if the weather be warm. This gives them a period of about six months in which they take no food. If not for the purpose of nourishing the body during this long fasting period, the writer adds, what can be the use of such an enormous spleen?

The Danger of Explosives.

Whether dynamite, nitroglycerine, gun cotton, and kindred explosives can be properly packed for transportation so that the danger will be comparatively slight is a matter upon which the community is for the most part quite ignorant. The London *Observer*, treating very briefly of this subject, says:

An explosive is a body of unstable chemical composition, which, when its chemical equilibrium is disturbed, violently expands in bulk. This expansion is called explosion, and the conditions of explosion vary. Gun cotton may be held in the fingers, and burnt; but if a detonator be attached to it, and it be clapped between the palms of the hands, it will blow a man to pieces. Gunpowder may be thrown about with impunity unless there be friction sufficient to produce an actual spark Chloride of nitrogen—an oily liquid something like chloroform—will explode with terrific violence if the bottle containing it be tapped with a feather. Gunpowder mixed with its weight of sawdust may be safely thrown on the fire. A bottle of gunpowder lodged at the back of the grate is dangerous. Explosives may be roughly divided into combinations which are purely chemical and those which are chemical and quasi-mechanical. Nitroglycerine is purely chemical. All purely chemical compounds decompose spontaneously and group themselves into subcombinations of a treacherous nature. Ordinary nitroglycerine can be carried about safely. But if kept for any length of time, it passes through internal changes which render it unsafe. Amorphous or red phosphorus may be held in the flame of a candle. If left alone for some weeks, it reverts to its original condition of waxy phosphorus, and will burst into a violent flame upon mere contact with atmospheric air.

PROF. JOHN W. CLARK, of the Massachusetts Agricultural College, will set out 1,000 apple, 200 pear, and 3,000 peach trees in his North Hadley orchard this year. He has 2,000 peach trees which he expects to bear this season, and 1,000 bushels is his lowest estimate of the crop.

GULLING THE PELICAN.

JOHN R. CORYELL.

The willingness of men to reap the fruits of the labor of others should dispose him to regard with interest if not with admiration the same trait and its practical application in any of the members of the lower orders of animals. It is true that he is not inclined to look with the same complacency on his beastly type as on himself, and for this reason we find the jackal universally scorned of men. Nevertheless, there are two qualities the exhibition of either one or both of which will at once command his applause. These are wit and impudence.

The gull has both of these qualities, and exercises them for its own benefit at the expense of its fellows. Behold then a good reason for admiring it! It is not at all nice in its choice of victims, but practices its rogueries with regard only to its own safety and profit. If the victim be small, then force alone is resorted to to obtain the coveted object, which is always something to eat; if strong, then wit is brought into play; and if stupid, then impudence accomplishes the same result. Nor is the gull unaware seemingly of the ludicrousness of the part it so often plays of making others do the work it ought and can do itself, as may be seen in its dealings with the pelican.

The brown pelican (*Pelicanus fuscus*), though its numbers have been greatly lessened, is still plentifully found along the shores of the Gulf of Mexico, and in Florida especially may be encountered without difficulty. It is indefatigable in two pursuits—first fishing and then eating.

It is a ponderous, clumsy bird, with a body as large as a swan's, but with enormous wings which enable it to fly with ease and power and almost with grace. The head, which is almost all bill, is not pretty, but, what is better, it is eminently useful, for it combines fish spear and lunch basket in one. The upper part of the bill terminates in a hook which is fatal to a fish, and the lower part is hung with an elastic pouch into which the captured prey are deposited until desired for eating.

As it has large webbed feet and swims well, it catches a great many fish, just as the ducks do; but it also has a very picturesque way of capturing its finny prey. It sails majestically over the water at a considerable height above it, glancing sharply about for victims in the transparent element below, until, catching a glimpse of one favorably disposed for capture, it launches itself straight downward, and with bill projecting and wings folded cleaves the air like a bolt, transfixing the fish and by the impetus of its fall disappearing under the water, to return to the surface, however, with all the buoyancy of a cork, and with the quarry comfortably tucked away for future reference.

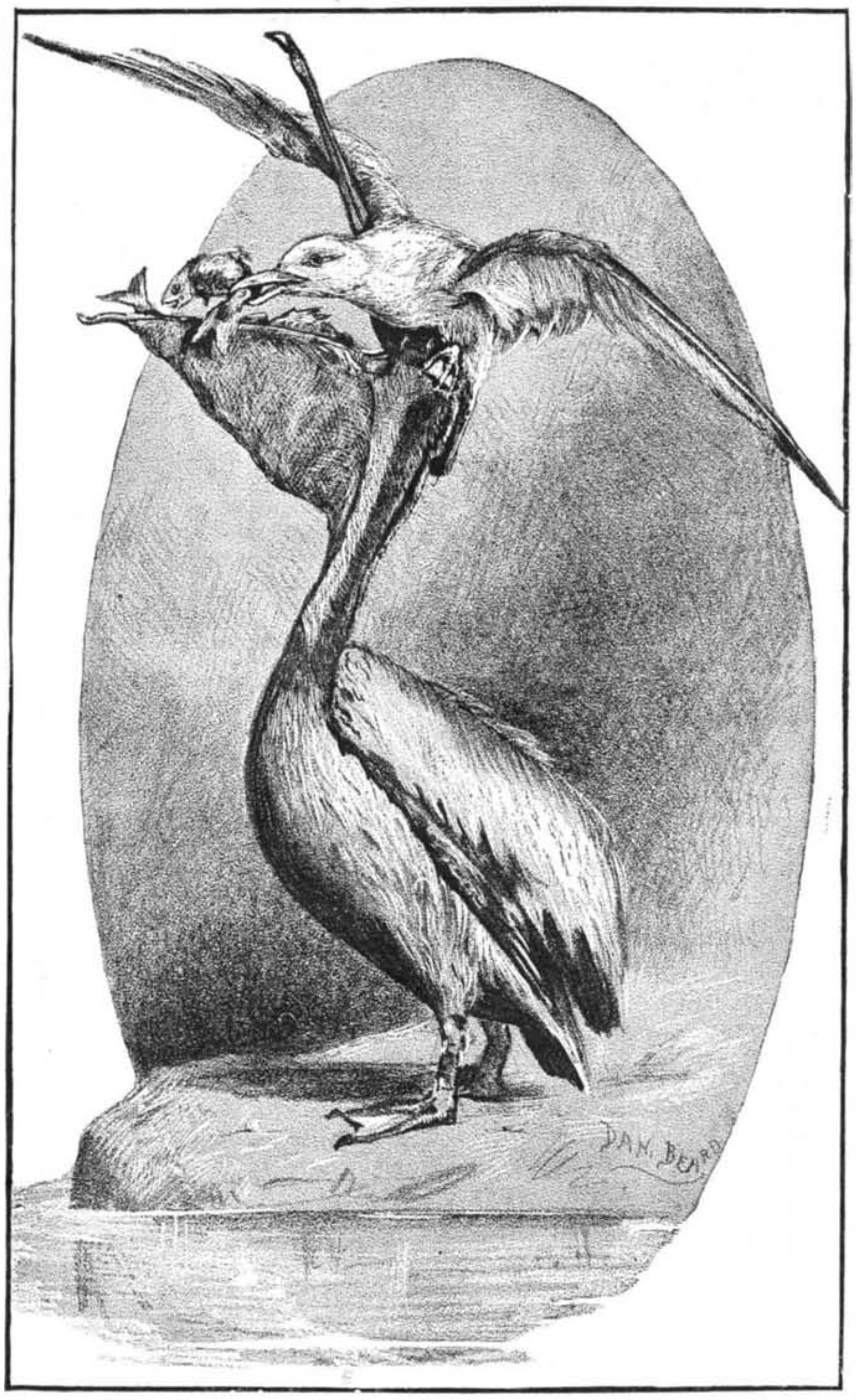
Having labored earnestly in this way until its pouch is full, the pelican seeks a long low ledge of rocks, and there in company with his fellows takes up his position in solemn earnestness to enjoy the fruits of his toil. A skillful toss of the head shoots a fish from the reservoir into the throat, and a gulp sends it on its way into the stomach. A little time for the pleasurable sensation of digestion, and again the head is tossed. And so the game is played with regularity by the whole grotesque line. The long heads are sometimes turned about and rested on the shoulders pointing backward, or more frequently are held pointing vertically downward.

Although a large and clumsy creature the pelican is not necessarily stupid; but by dint of frequent tossing of the well laden pouch it becomes at once gorged and dull, and then is the golden opportunity of the gull.

He impudently alights upon the very head of his victim, and waits patiently until the pelican receives warning from within that another fish is wanted. Up goes the bill, open gapes the awful mouth, out shoots a doomed fish—not into the ready throat, however, but into the waiting bill of the gull, which has adroitly twisted its head so that it can see all that is exposed of the pelican's internal economy, and has snatched the morsel and flown with a wild scream of laughter to eat it at its leisure, if indeed a gull ever had such a state of being.

The pelican is almost too stupid to know that it has been robbed, but the gull gives every evidence of enjoying the trick very little less than the booty, for its farewell shriek sounds derisive enough for the evil one himself.

It might be supposed that the pelicans would learn wisdom in the course of time, but they do not seem to have done so yet, for day after day along the coral reefs of the Florida coast may be seen long lines of gormandizing pelicans entertaining gulls in this way.



GULLING THE PELICAN.

Storms and Gales.

The exceptional character of the season, which has prevailed, not only in our own country, but over nearly the entire Continent of Europe, has directed public attention very forcibly to the forecasts of the meteorologists which are published in the daily papers, and to the evidence on which their assumptions are founded. Nor very many years have passed away since weather prophets were regarded very much as clairvoyants and spirit media are at the present time; a lucky hit in a weather almanac has more than once sold off numerous editions, and made the fortune of the proprietor; but with the advance of science, and the greater diffusion of scientific knowledge among the reading public, these empirical announcements have fallen into decay, and few, if any, readers could now be found to believe in the prophecies of Mr. Murphy, or Zadkiel, or even Old Moore himself.

The storms which are so frequently predicted, and, in the majority of instances, with extraordinary accuracy, are foretold by the state of the barometer at various places on the earth's surface. The reports are received by telegram at the chief office, and being studied hour after hour, serve to indicate the depression at different places, as shown by the fall of the mercury, and the rate at which the atmospheric disturbances are traveling, thus enabling a very accurate estimate to be formed of the direction of the coming storm. Although in this and other temperate climes we live in the region of variable winds, and cannot calculate on trade winds and monsoons, that blow either constantly or for weeks together in one direction, nevertheless the storms that ravage our coasts and wreck our strongest shipping obey certain laws; and, once their presence is known, even on the opposite coast of the Atlantic, their course, and even their duration, can be predicted with a great amount of certainty.

There are few persons of any observant power who may not have noticed that a violent gale seldom blows for any length of time in one direction. The wind changes from south to north, and veers about in an apparently erratic manner. In the account of gales encountered at sea it is frequently stated that, after blowing with the utmost fury, the gale will suddenly be succeeded by an almost perfect calm; but, before the mariners have had time to congratulate themselves on their supposed escape from the imminent peril with which they were surrounded, the gale returns with all its original violence, but in precisely the opposite direction. To the affrighted passengers it appears as if the demon of the storm, regretful of having allowed the vessel to escape, had come back to complete the work of destruction.

It is now some years since that the theory of storms was investigated by scientific men, when it was discovered that they were but gigantic eddies and whirlwinds, such as are in miniature rendered visible at street corners on a windy day, when the clouds of dust, with leaves and straws, are whirled about by the eddy caused by the meeting of two opposing currents of air. If we imagine whirlwinds several miles or sometimes several hundred miles in extent, moving with a velocity that is unknown in this country, we shall have an idea of a cyclonic storm; and as the eddy that has carried the cloud of dust which renders it visible to the eye travels along the highway, so does this huge whirlwind, that takes its rise usually near the West Indian Islands, pass across the Atlantic until it reaches Europe, still retaining sufficient force to inflict the damage with which we are so familiar.

One singular circumstance respecting these storms has been definitely ascertained—that the circling of the current is always in the same direction, which is the reverse to that of the hands of a watch. As the wind thus moves in a circle, it is evident that the direction in which it strikes any building or vessel in its course depends on the part of the circle in which they are; and if the ship is so situated as to be passed over by the center of the cyclone, the gale will increase in intensity until the center is reached, when there will be a sudden calm, which is only a prelude to the recommencement of the tempest from the opposite direction. Since the publication of these facts, vessels seldom allow the center, which is the worst of the cyclone, to pass over them. Now that science has shown the way, they steer out of the storm, instead of following the course previously adopted of running before the gale, and allowing the terrible wind to blow them north, west, south, and east for days together. It is a knowledge of the existence of these circular storms of greater or less intensity, of their rate of passage across the Atlantic, and of their exact direction, which enables our meteorologists to predict with wonderful though not unerring accuracy the coming of gales and tempests, and to enable the mariner to take measures accordingly. By the aid of the returns published daily in the morning papers, and sent by telegram to all seaport towns, thousands of lives have been added to the list of those saved by science.—*London Queen.*

Work in the British Royal Mint.

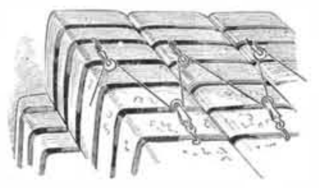
For the first time after more than two years the process of gold coinage at the Royal Mint was recently resumed. It was even remarked that the strong man who pours the molten stream from crucible to mould, and who holds that post because of his especial skill in directing the metal into narrow apertures without spilling or waste, showed on this momentous occasion some little signs of nervousness and agitation. For gold coinage on Tuesday, says the *Pall Mall Gazette*, was successfully resumed in reconstructed premises with new and improved machinery, and it will probably be long indeed before there is such another interruption of the coinage as has been now happily brought to a conclusion.

The reconstructed mint can now turn out sovereigns at the rate of a million a week without stopping the coinage of silver and copper, whereas previously it could only deal with one metal at a time, and that to a much smaller extent. The beautiful instruments employed for weighing the coin are now manufactured within the precincts of the mint, and are, as is well known, a miracle of minute and ingenious automatic machinery. Out of every hundred sovereigns that pass over the balance, the fastidious little instrument rejects, as either too heavy or too light—but most frequently he latter—a number varying from five to twenty.

THE bee has long been a type of the industrious worker, but there are few people who know how much labor the sweet hoard of the hive represents. Each head of clover contains about sixty distinct flower tubes, each of which contains a portion of sugar not exceeding the five-hundredth part of a grain. Some patient apiarian enthusiast, who has watched their movements, concludes that the proboscis of the bee must, therefore, be inserted into 500 clover tubes before one grain of sugar can be obtained. There are 7,000 grains in a pound, and as honey contains three-fourths of its weight of dry sugar, each pound of honey represents 2,500,000 clover tubes sucked by bees.

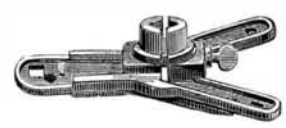
Cotton Bale Binder.

This is a simple contrivance for binding cotton and other bales together when loaded on flat cars to prevent the load from being shaken apart and separated by the shocks and jolts of the car, and also to prevent the bales from being pulled off by cotton thieves. The contrivance consists of two or more hooks having pulleys or eyes strung on a rope, the rope being fastened to one of the eyes or pulleys forming one end of the binder, the hooks being caught in the bands of the bales, and the rope passing over the center of the load in a zigzag course to opposite hooks on the opposite bales of the tier, as shown in the cut, so that the stress of the cord when pulled taut will draw the bales of the respective tiers against each other, thus binding the top tier of the load firmly in a compact mass, which will not be separated by the shocks of the cars, and cannot readily be pulled apart. This invention has been patented by Mr. Lewis Burr, of San Antonio, Texas.



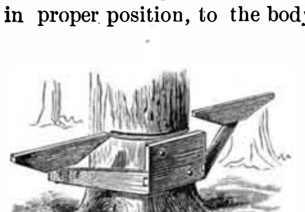
Improved Wrench.

This is a wrench for taking off and putting on the nuts of carriage axles. This wrench is provided with three or more arms or handles arranged to radiate from a common center, and having ribs or projections on their backs for operation in connection with a fixed and adjustable jaw on the meeting face portions of the arms, whereby the wrench is balanced, so that a nut may be run on and off an axle with greater freedom and ease, and the necessity of reaching around the hub when putting on or taking off the nut is avoided, and the wrench, holding the nut, may be laid on the floor or ground without exposing the nut to sand or grit, and the handles being raised from the ground, the wrench may be readily grasped and lifted when required. This useful invention has been patented by Messrs. I. W. & T. F. Giles, of Abington, Mass.



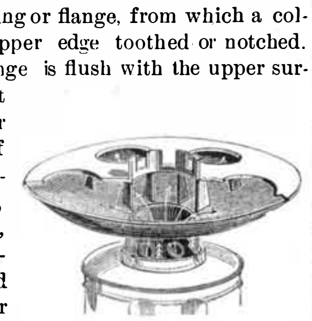
Horizontal Guide for Saws.

This is a device to be attached to standing trees or stumps for guiding a crosscut saw in cutting the tree down or cutting the stump off close to the ground. The invention consists of a main center board adapted to be spiked to the body of the tree or stump to be cut, of two arms hinged to the ends of the center board, and of two guide pieces pivoted upon the hinged arms. In use the device is first spiked, in proper position, to the body of the tree or stump to be cut, and the arms are to be swung backward away from the body of the tree or stump, so as to hold the guides in position for supporting and guiding the saw in starting. The saw having been well started, the arms will be swung gradually forward toward the body of the tree or stump as the sawing continues, so that the guides will continue to support and guide the saw until the tree or stump is sawed entirely off. In this manner it will be seen that no difficulty will be experienced in starting the saw or in causing it to make a straight cut, and will thus be a great relief to the persons sawing, since they will not need to give the saw any special attention. The guide is adjustable to the size of the stump or tree to which it is to be applied. This invention has been patented by Mr. James J. Sadler, of McBrides, Mich.



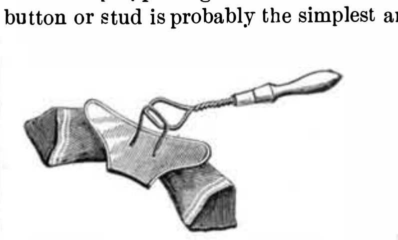
Cooking Attachment for Oil Stoves.

A new attachment for oil stoves, whereby an increased quantity of food can be cooked on an oil stove, has been patented by Mr. E. Porter, of Leon, Iowa. A flat cup shaped heat transmitter is provided at its middle with a downwardly projecting collar, which is adapted to pass into the top opening of an oil stove. Around the rim of the collar a series of supports project upward from the inner surface of the heat transmitter, and are connected at their upper ends by a horizontal ring or flange, from which a collar projects which has its upper edge toothed or notched. The upper surface of the flange is flush with the upper surface of the rim of the heat transmitter. An annular top, which can be made of sheet iron, Russian iron, ordinary tin, or of cast iron, rests on the rim of the vessel, the flange and a series of supports arranged in a circle and projecting from the inner surface of the heat transmitter. The top is provided with a series of openings, which can be closed by covers so that the openings which are not closed by cooking vessels can be closed by the covers, whereby the surplus heat of the oil stove will be retained within the vessel or heat transmitter. The vessels on the top will thus be heated and their contents cooked. A heat transmitter can also be placed on the collar, the heat passing through the notches in the upper edge of the collar. A great part of the surplus heat of the oil stove is thus saved, and a considerable quantity of oil is economized.



Necktie Fastener.

Neckties and bows have been variously constructed to provide for readily securing them in place; but the ordinary elastic loop appendage used to attach the bows to the collar button or stud is probably the simplest and neatest fastening for the purpose. There is, however, much difficulty frequently experienced in hanging or putting on the bow with the fingers by its attached elastic loop over said stud or collar button. To obviate this difficulty Mr. Wanton D. Slocum, of New Bedford, Mass., has invented the novel necktie fastener shown in the engraving, whereby the elastic loop is readily picked up, placed in position over the collar button or stud, and the bow adjusted with facility to its place.



Transplanting Implement.

The engraving shows a new implement for transplanting flowers, young plants, etc., in such a manner that they are not injured by being transplanted, and do not have their roots loosened from the earth in which they are embedded. The transplanting implement is formed of two spoons or scoops provided with arms which are pivoted to each other. The scoops can be separated and forced into the ground and gradually closed, and the cone of earth containing the roots of the plant will be held between the scoops and can be withdrawn from the ground. Plants, flowers, and shrubs can thus be transplanted very easily and rapidly without any danger. This useful invention has been patented by Mr. John M. Lindsey, of Crystal Springs, Ga.

Bees.

Many persons will just now purchase swarms and commence beekeeping; it is, therefore, essential that they should know something of the natural history of bees. We can calculate by the weight of the swarm the number of bees, as the "authorities" allow 5,000 bees to the pound. The hive will then consist of queen, workers, and drones. The queen lays all the eggs, from which the inhabitants of the hive are produced. She deposits from two to three thousand daily for weeks in succession. The workers perform the essential duties, such as comb building, brood raising, and honey gathering. The drones are the males, and their approach at the swarming season for the fertilization of young queens is a wise provision of nature. They gather no honey, and are driven from the hive during the month of August, when their services are no longer required. Honeycomb consists of six-sided cells made from wax, which is not gathered, but elaborated from honey by the bees. Five worker cells measure one inch across, and in these honey and pollen are stored and worker bees produced. The drone cells measure four to the inch, and in these the drones are raised. The cells in which queens are raised hang like acorns upon the side or end of the combs, and sometimes as many as twelve or fourteen may be found in a hive at swarming time. When a hive is deprived of its queen, previous to the introduction of a foreign sovereign, and fearing that her majesty may not be favorably received, the beekeeper must be careful to cut out all queen cells save an open one, on which he may cage the new queen, as, when liberated after forty-eight hours' confinement, the bees imagine she has just emerged from the vacant cell, and acknowledge her authority at once. The queen no doubt lays all the eggs; but they must be kept warm by the bees until they produce tiny white grubs, which hatch out at the end of three days, and are then fed by the nurses with a mixture of honey, pollen, and water; when fully grown, at the end of six days, they are sealed over with a brownish cup of wax and pollen mixed together. In twelve days they emerge from their incarceration perfect bees, thus occupying the cell for twenty-one days; first three days in the egg state, six as an unsealed grub, and twelve in a state of quietude ensconced within the cell. Drones pass through like changes, but require twenty-five days to complete the transformation from an egg to a perfect drone. The drone brood may at any time be known by the size of the cells and their convex cappings. Bees can raise queens from eggs destined to become worker bees, provided that drones are abroad to mate with the young queens. Should this occur when no drones are about, all their efforts would be in vain, as the eggs deposited by such a queen would produce none but drones; even the eggs laid in worker cells would produce miniature drones, and the hive go to ruin. Although the queen is much larger and more fully developed than the worker, she arrives at full maturity in five days' less time, and she hatches out in about eight days after being sealed in. The dose of royal jelly which she receives is said to hasten on the transformation scene. The queen lives five years, but the workers' life in summer does not exceed two months, but the bees hatched out in autumn live till the following spring. Drones are to be found in May, but are driven out of the hive before the end of August, and their nervous nature prevents them returning to the hive, hence they die at once. As we advance in the practice of bee keeping, we must avail ourselves of the inventions of modern science, such as bar frame hives and comb foundation, as much valuable time is saved by their employment.—*J. Traynor, in the Farmer's (Irish) Gazette.*

How to Make a Water Varnish.

Take of shellac (in thin flakes) a quarter of a pound and water one pint, place them in a tin saucepan or other suitable vessel on the fire or over a gas stove, and raise to boiling point. When this is reached, add a few drops of a hot saturated solution of borax, stirring vigorously with a glass rod or clean stick until this shellac is all dissolved, which will be in a few seconds. Do not use to much borax, but add slowly and stop short of complete solution rather than the other way. After this the solution is filtered through charcoal, and the water varnish is ready for use.

Some may ask, What is it fit for, now it is made? That is what I intend to describe. First of all, for wet collodion negatives it is invaluable, as its use entirely does away with split films, and when only one or two prints are required the negative need not be varnished with spirit varnish. All that is required, after the negative is washed, is to flood it with the water varnish, stand up to dry, and when dry the negative is ready for the printer so far as the surface is concerned. A film so protected stands a great deal of rough usage and is not very easy to scratch, while for retouching the surface is superb. For wet collodion negatives the advantages are certain immunity from split films and saving of time, trouble, and expense of spirit varnish, fire, etc., and risk of cracking the plate from the action of heat.

For gelatine negatives water varnish is applied directly after they are washed, and when dry the retouching is performed and spirit varnish applied in the usual way, when there will be little danger of the films being silver stained, no matter how long they are in use.

A gelatine negative, covered with water varnish and dried, was placed upon a shelf, and a cotton wool plug out of a silver funnel was laid upon the film. At the end of three days no sign of a silver stain was visible, and this without any spirit varnish over it. I do not doubt, from my own observations, that this water varnish will be found far superior to a film of plain collodion, besides being easier and simpler of application.

One important point in favor of a water varnish is the fact that it can be applied to the film when wet, and therefore with all its pores open; while that part of the varnish that does not sink into the film, but remains upon the surface, will give a gripe or hold for the subsequent film of spirit varnish, affording a promise of security more in accord with the known permanence of a well varnished collodion negative.

With these remarks I am content to leave the formula in the hands of photographers, with a firm conviction that those who adopt it will find great benefit in its use.—*W. T. Wilkinson, in Br. Jour. of Photo.*

General Scott, of England.

Major-General Henry Y. D. Scott, C.B., F.R.S., late Royal Engineers, died at his house, Silverdale, Sydenham, on Monday, April 16, aged 61. He had been actively employed up to a short time before his death, and had just finished superintending the construction of the great International Fisheries Exhibition. General Scott acted formerly as Instructor in Surveying and Practical Astronomy at Chatham, and also as Examiner of Military Topography for the Military Education Department at the War Office. When he retired from the army in 1871, he became Director of Buildings at South Kensington, acting as architect to the Royal Albert Hall and Science Schools. He was also Secretary to the Royal Commissioners of the 1851 Exhibition. He devoted much attention to the utilization of sewage, and took out a great number of patents in connection with this subject. Perhaps the most important of the processes he invented was one for the manufacture of cement from the sludge obtained by precipitating sewage.

Interesting Experiment.

Dr. Eder and Mr. Plener are continuing their interesting experiments in Vienna in the way of separating pure bromide of silver from gelatine emulsion by the simple expedient of centrifugal force. Dr. Eder reports that the bromide of silver thus separated presents several very interesting features. There are distinctly two kinds of silver bromide, he says; that precipitated by alcohol, and that precipitated by water. The former appears to be most sensitive to indigo rays, and the latter to the blue rays.—*Photo. News.*

It is said that the matinee nuisance is getting unbearable in London. But the worst part of it is not known. A theater filled all the afternoon cannot possibly become properly ventilated by the evening; therefore the air breathed by the evening audience is of the most foul description. Moral: Don't go to an evening performance after a matinee, if you can possibly help it.

ENGINEERING INVENTIONS.

A speed changing mechanism of improved device has been patented by Mr. B. B. Powell, of Petoskey, Mich. This invention has for its object the changing of the number of revolutions of a shaft within a given time, this shaft being driven by another shaft, having a fixed number of revolutions within the same time. This machine is more particularly intended as a thread cutting and feed gear for lathes, but may also be employed for other purposes.

An improvement in sawing machines, which is designed to facilitate the controlling of the machine and economize power in driving it, has been patented by Mr. William E. Hill, of Kalamazoo, Mich. The machine is designed especially for sawing logs into bolts and blocks, and may be operated by any style of reciprocating engine, but the inventor has devised a new plan of engine, on which he is about to secure a patent, and which is specially adapted to the newly patented sawing machine.

A novel device for breaking up snow drifts to clear the track for the passage of a train has been patented by Mr. G. A. Gunther, of New Utrecht, N. Y. This is accomplished by successively exploding torpedoes on the front of the snow plow. The torpedoes are deposited on a receiver on the top of the locomotive boiler, from whence they are permitted to pass down a tube by gravity to an anvil located at the front of the plow, where they are exploded by the falling of a weight. The weight and the gate of the receiver are both operated by a chain which passes to the caboose.

Messrs. David Clark and T. G. Blatch, of Hazleton, Pa., have patented an improved mechanism by means of which the steam can be controlled by the engineer while the engine is in motion, and without shortening the stroke of the side valve, and thus without obstructing the free entrance and exit of the steam. A slide block is so connected with the cut-off valve by a vibrating link that it will be operated by the latter, and with the slide block are connected rock arms and connecting rods for adjusting the slide to regulate the movements of the cut-off valve.

Mr. Daniel Kunkel, Sr., of Oregon, Mo., obtained a patent in November, 1880, for a car coupling, and he has now patented additional improvements. The latter consists in a drawhead provided with an inclined way, up which the coupling hook slides to catch on a cross bar at the upper end of the same, and with a stirrup for raising the hook to uncouple the cars. A shaft extending to the top of the car is provided at its lower end with an arm upon which a stirrup is attached, so that by simply elevating the shaft the stirrup will be raised. A horizontal shaft with a similar arm for the same object extends to the side of the car for uncoupling from that point.

MECHANICAL INVENTIONS.

Mr. A. C. Calderwood, of Johnstown, N. Y., has patented some improvements relating to the hand board, thumb stick, and table employed for steam heating the thumbs and fingers of gloves while in process of manufacture, greatly facilitating the finishing process.

Mr. Henry Staib, of New York city, has patented a paper hanging machine and rack which is an improvement upon a patent granted to the same inventor in October, 1881. This improvement is designed to render the handling of the paper and the rolling of the paper between the successive printings entirely automatic.

An improved combination lock and latch for right and left hand doors has been patented by Mr. G. H. Van Winkle, of Hornellsville, N. Y. The latching mechanism is inclosed in tubular casings for insertion into the free edges of the doors, while the lock proper is a permutation lock, and is capable of almost infinite variation.

Mr. Pleasant R. Houpe, of Oak Forest, N. C., has recently patented an improved method of adjusting the head block or reed bar on to the carriage of a shingle sawing machine. The invention is designed to greatly simplify the mechanical construction of the machines, and at the same time increase the effective working.

A very simple but efficient washing machine has been patented by Mr. G. D. Ferris, of Mexico, Mo. The clothes are placed in a hollow cylinder which is revolved inside of the boiler in which it is suspended. The cylinder is provided with a series of holes and with perforated tubes at the four quarters thereof, by means of which the clothes will be agitated and thoroughly cleaned.

Mr. E. C. Merryman, of New Freedom, Pa., is the patentee of a bit brace, which is an improvement upon the bit brace patented by Mr. Merryman in October, 1878. The jaws of the bit have semi-pyramidal grooves in their faces, one of which is provided with a raised part near the center which is designed to bind the shank in close contact with the opposite groove.

A shoe soling machine of ingenious construction has recently been patented. The object of the invention is to provide a machine for fastening the sole to the shoe by means of nails. The machine moulds the sole, lays it, holds the nails, drives all the nails at once, guides the nail drivers straight, and beats out the shoe to a uniform edge and smooth bottom, all in one operation. Mr. John Westwood, of Lynn, Mass., is the patentee.

An improved roller dredge has been patented by Mr. Andrew J. Burr, of Olympia, Wash. Ter. This dredge is designed to be used under water in leveling and removing ridges and bars from river and harbor beds, by being towed to the ridge or bar to be removed and then dragged over it, by which means the earth or whatever constitutes the ridge or bar is loosened, so that the current of water will carry it away.

An improved combination of chair and bed has been patented by Mr. S. A. D. Clark, of St. Joseph, Mo. This chair is so constructed that if necessary the back of the chair may be depressed and the foot rest elevated, whereby a very comfortable bed will be provided. Dentists' and barbers' chairs may be constructed in the same manner if desired. When used as a chair, the back may be declined and held at any desired angle.

An improved machine for compressing dry and plastic materials, has been patented by Mr. Charles Killgore, of Utica, N. Y., and assigned to Ida W. Killgore, of the same place. The machine is provided with dies and moulds, and the material to be compressed is fed into the moulds, when it is compressed and discharged into a receiver provided for the purpose. The material may be moulded into any form or shape desired.

Mr. Alexander D. Clarke, of New York city, is the patentee of an ore concentrator which consists of a screen upon which the sand containing the ore is conducted, a series of settling boxes into which the water passes after having passed through the screen, and a flume arranged below the screen for carrying off the water after it has passed through the settling boxes, by which device the particles of sand will be washed off and the ore concentrated.

A machine for washing bagasse and extracting the saccharine matter therefrom has been patented by Mr. A. S. Wheeler, of New Orleans, La. The process consists in passing the bagasse between compressing rolls, these being arranged within a hot watervat for saturating the bagasse and dissolving the saccharine matter exuding from the bagasse while passed through the rolls. An ebullition tank is likewise provided, as well as telescopic tubes for injecting liquid and steam upon the bagasse.

An improved machine for painting wire fences has been patented by Messrs. W. E. Brown and H. J. Durgin, of Irving, Kan. Two rotary brushes are mounted upon a frame in such position as to be constantly supplied with paint from a tubular reservoir located above them. The wire of the fence is inserted between these two brushes and the latter are then moved along the wire, while at the same time they are being revolved in their bearings by a crank provided for the purpose.

Some improvements in the method of operating velocipedes have been patented by Mr. Thomas A. Davies, of New York city. In the slotted rear ends of the treadles are pivoted gear wheels to engage with the endless chains, and which are held from turning, when the treadles are moving downward, by latches hinged to the treadles, and arranged to allow the gear wheels to turn freely when the treadles are moving upward. The treadles are raised automatically, after being forced down, by springs pressing against their lower sides.

An improved automatic guard for protecting the hatchway of elevators has been patented by Messrs. Joseph Byers, of Newtonville, and George Taylor, of Everett, Mass. This guard is pivoted to a post, and it is raised or lowered automatically by the movement of the platform when lowered. The free end of the rod rests in a receiving jaw or loop, one part of which is free and is actuated by a spring while the other part is fixed. Both parts are provided with elastic cushions which receive and prevent the guard from rebounding.

Mr. S. K. Todd, of Eugene, Ind., is the patentee of an improved machine for hulling and cleaning wheat and other grains, and removing the skin and brush from the same. A perforated cylinder is located inside of an outer closed cylinder, the former being provided with a shaft carrying arms with knives at their ends. These knives traverse every portion of the grain, cutting off the fuzz and cleaning the berry of its impurities. The refuse particles are drawn out of the cylinder by a current of air caused by a fan blower located without the inner cylinder, but within the outer one.

An improved sectional inking roller, to be used in printing presses where several different colors are printed at one impression, is the subject of a patent granted to Mr. W. F. Jones, of Baltimore, Md. Between the ink fountain and the main cylinder the rollers, which are composed of a series of disk-like sections, are placed on a shaft, a separate roller for each color, which colors are transferred to the main cylinder. The novelty of this invention relates to the construction of the shaft and to the manner of applying power to the rollers.

An improved method of dry pressing bricks has been patented by Messrs. H. B. Morrison and G. Willett, of Motley, Minn. The press consists of upper and lower press followers worked by eccentrics upon the same shaft so arranged that one of the eccentrics opens the mould properly for receiving the clay from an automatic feeder, then causes the followers to converge on the clay while it is soft, then to act more powerfully by differential speeds while both followers are moving in the same direction to complete the pressing, and then separate for delivering the pressed bricks from the mould by an automatic feeder and discharger.

An improved safety apparatus to be applied to elevator platforms has been patented by Mr. Volney W. Mason, of Providence, R. I. The improvement consists in vibrating safety catches provided with rolls on their further ends which travel in zigzag ways, by which the thrusts of the rolls from the elevation of the ways will fail to swing the catches far enough to engage the racks at the ordinary speed, but should the elevator become uncontrollable or the speed be materially increased, the thrusts of the rolls will be greater and the catches will engage with the rack and lock the platform fast.

A wind gauge for thrashing and cleaning machines has been recently invented, Mr. J. E. Curry, of Lawrence, Kas., being the patentee. A ball governor is attached to the fan blower of the thrashing machine, the object being to provide an automatic regulating apparatus, so that whenever the speed of the machine is increased too much by reason of irregularity in the feeding or other causes, the force of the blast will be regulated so as to prevent the grain from being wasted by being blown over the back of the elevator, and when the speed of the machine decreases, more wind will be admitted and the grain thus uniformly cleaned.

AGRICULTURAL INVENTIONS.

Mr. William Rath, of Sutton, Nebr., has patented a combined thrashing machine and separator, the object of which is to facilitate the separation of the grain from the straw and from chaff and foul seeds as they come from the thrashing cylinder, which the inventor claims it will do in a very efficient and rapid manner.

Mr. Charles Lee, of Dadeville, Mo., has patented an improved seed planter. This invention provides a planter which the inventor claims is lighter of draught and more durable than those in use, and may be easily adjusted for seeds of different sizes. It plants rows of any desired width, and it may be easily arranged for planting with equal facility on wet or dry ground.

Mr. John H. Hicks, of Gadsden, Ala., has patented an improved cotton planter and cultivator having for its object, first, the feeding of the seed centrally from the hopper in a thin continuous stream from the furrow; secondly, to enable the teeth of the coverer or harrow to conform to the slope of the seed bed, and thus more effectually clean it; and further, to adapt the machine to be used either as a planter or cultivator.

An improved contrivance for drying sand for use on locomotives has been patented by Mr. J. G. McPherson, of Mattoon, Ill. This drier is formed with a central fire chamber having suitable pipes or flues leading from the top, and a surrounding wall forming a sand receiving chamber around the fire chamber, the drier being adapted to receive the sand at the top and to discharge it at the bottom of the drier when it is required.

An improved method of attaching plows to wagon gearing is the subject of a patent granted to Mr. W. H. Kremser, of Omaha, Nebr. Two upright bars are secured to the axle of the wagon gearing, and blocks are arranged to slide upon these bars having the bail hinged to them, which is connected with the plow beam by clamping plates. These sliding blocks are connected with bent levers, by means of which the plows may be adjusted and controlled at will.

An improvement in cotton seed planters has been patented by Mr. L. M. Alexander, of Cavins, S. C. A U-shaped foot for opening the furrow into which the seed is to be dropped is located in front of the wheel of the planter. A spout is connected with an opening in the bottom of the hopper for carrying the seeds to the furrow, so that they may not be blown away by the wind, while a pair of scrapers are located behind the spout to cover the seed as it lies in the furrow. The inside of the hopper is provided with a rake head which is oscillated by the action of the wheel to agitate the seed and prevent clogging.

Mr. A. L. Griffith, of Beallsville, O., has obtained a patent for improvements in a machine for scraping roads and for ditching and leveling ground. The form of the scraper is wedgeshape, and the draught attachment is made in such a way with the scraper that both sides of the scraper may be made to incline alike to the line of draught, or else it may be caused to run along the furrow to throw up the earth to one side only. The point of the share is curved, so as to level the uneven places left in the bottom of the ditch by the plow, and at the same time to shear off strips of the bank and pass deeper into the earth.

A very ingenious machine for harvesting corn and sugar cane has been patented by Messrs. O. H. Judd and C. T. Rawalt, of Fairfield, Nebr. The stalks are guided between two rotary cutters by a frame suitably constructed for the purpose, and after being severed the stalk falls upon an endless apron, which is driven by the revolution of the wheels of the vehicle, and carried to the dropper, when they are deposited in rows on the ground. The machine presents many advantages not heretofore obtained in this class of harvesters.

MISCELLANEOUS INVENTIONS.

Mr. Charles Gerber, of York, Pa., has patented a combined shirt collar and necktie which is so constructed that the collar may be reversed so as to be worn either side out, and the tie still conceal the ends of the collar band.

To obviate the use of handles upon coffins, Mr. M. L. Johnson, of Galena, Ill., has patented a basket or rack of any light material into which the coffin or casket is placed, enabling the latter to be more easily handled.

An improvement in the form of an incidence window has been patented by Mr. F. Bredehorst, of Bremen, Germany. This window is provided with lenses arranged horizontally in a frame with the deflecting faces upward, for the purpose of deflecting the light into the apartment.

A device for arresting fumes in the flues of chimneys in metallurgical works has been patented by Mr. Max Freudenberg, of Ems, Germany. The flue is provided with a series of parallel plates, whereby the superficial area of the walls of the flue is increased and more surface is exposed upon which the particles of metallic dust are deposited.

A bottle stopper useful for druggists and others has been patented by Mr. F. F. Jewett, of Oberlin, O. The stopper is provided with a shield which extends over the neck widthwise of the bottle to cover the entire mouth. A flange at the outer edge fits the outer rim of the neck, and effectually prevents all dust from collecting at the mouth of the bottle.

Mr. A. A. Trowbridge, of Danbury, Conn., has patented an optometer, which is an improvement upon a patent granted to the same inventor in August, 1882. This improvement is designed to provide a means for ascertaining the proper remedy for those defects of sight which can be remedied by convex or concave spherical lenses.

Mr. Robert Dugan, of New York city, has patented an improved umbrella fixture. In this improvement the ribs of the umbrella and the braces which support the ribs are provided at their ends with balls which fit into the socket on the stick of the umbrella, thus allowing greater freedom of movement at the joints than the old method.

Mr. John G. Keller, of Monticello, Ill., has patented a chimney protector which consists in a metal strip attached to the roof; around the base of the chimney, projecting above the roof between the strip and the chimney, a packing of rubber is introduced, which prevents water from running down the sides of the chimney into the building.

Mr. Andrew J. Harper, of Unionville Center, O., is the patentee of an improvement in wagon hounds for which he obtained a patent in 1882. This improvement consists in hounds formed of iron braces bolted to the axle and bolster, so as to avoid cutting the wood of the latter, and in the connection of the iron braces to the tongue, and in the connection of said braces in the rear of the axle.

A very simple device for clamping saws to be breasted down, set, or filed has been patented by Mr. Lewis Davis, of Jackson, O. The advantages of this clamp is that it may be quickly set up for use, that the clamp extends the whole length of the blade of the saw, so that it is not necessary to change the clamp during the process of filing, and further the clamp serves as a guide in breasting down the old teeth.

An improved furnace designed to facilitate and cheapen the operation of oxidizing ores has been patented by Mr. W. E. Harris, of New York city. The hot air and the gaseous products of combustion are forced from the ore chamber, underneath the ore grate, whereupon they are passed up through the grate on which the ore is placed, a continuous circulation being thus maintained until the ore is completely oxidized.

Mr. Alfred H. Oliver, of Poughkeepsie, N. Y., is the patentee of an improved cover for sewing machines. This cloth cover is eminently adapted for the use of traveling agents of sewing machine companies to put over the machines to protect them from dust, sun, rain, etc. The cover is equally useful for protecting sewing machines in salesrooms or whenever they are not in constant use.

Mr. Edwin Bennett, of Baltimore, Md., has patented a novel earthenware tea pot which is so made that the spout is firmly connected with the body of the pot in a manner rendering it not liable to be broken off. The spout is connected throughout its entire length with the body of the pot, and the lower half projects inside of the pot, and is provided with the usual strainer.

A draught equalizer, which is an improvement upon a patent granted to Mr. Thompson in October, 1876, is the subject of an invention of which Mr. Andrew Wickey, of Quincy, Ill., is the patentee. This device is so constructed that a strong horse has no advantage over a weak horse, but the draught is so distributed that the stronger animal is made to do a greater amount of work than the other.

An improved corkscrew has been patented by Mr. Monroe Green, of Brooklyn, N. Y. The corkscrew proper is fastened to the lower end of a rod which passes through a screw tube, which is supported by a frame. When the screw tube is turned downward, the corkscrew will be forced into the cork; but the screw tube may be turned in such a way that it will no longer turn the corkscrew, but will force it up with the cork from the bottle.

A device to be applied to reed organs for the purpose of giving an increased resonance has been patented by Mr. W. E. Leighton, of West Pembroke, Me. The main wind chest is extended upward and provided with a partition, so that the air is made to circulate up and down the wind chest extension. A chamber is arranged in front of this extension to give a better resonance and a more full and ringing tone to the organ.

An improvement in cams for stamp mills has been patented by Messrs. R. H. Butler and W. C. Mount, of Gainesville, and J. W. Alexander, of Atlanta, Ga. This relates to cams for operating gold and silver stamping mills, and consists in a certain construction of a clamp cam, whereby, in case one of the cams should become broken or worn out, a new cam may be put in its place without taking down the shaft or removing any of the other cams therefrom.

A bagasse furnace of improved form has been patented by Mr. John Hill, of Independence, Kas. The object of this invention is to construct a furnace in which green bagasse may be used for fuel in the manufacture of sugar and molasses in localities where fuel is expensive. The furnace is provided with a chute through which the green fuel is passed, and where it will be exposed to the heat of the furnace, so that by the time the fuel reaches the fire grate, it will be thoroughly dried and ready to burn.

An improved cable stopper for handling anchors on board ships has been patented by Mr. J. B. Lynch, of Leadville, Colo., administrator of the estate Mr. Owen Lynch, deceased. A frame having an opening at the center is provided with a door formed of two pieces hinged together, one being secured to a shaft having a lever for operating the same, and the other having a slot so constructed that when the door is shut the slot closes on to the link of the chain and holds it fast.

A hand stamp printing press is the subject of an invention of which Mr. T. B. Cosley, of New York city, is the patentee. This device is designed to facilitate the printing of cards, bill heads, etc. The stamp is mounted on a spring with the ink pad placed underneath. The paper to be stamped is placed on a sheet carrier, which is then slid beneath the stamp, while the ink pad is supplied with fresh ink by a piece of felt cloth, which is attached to the bottom of the sliding carrier.

A portable ice freezing house is the subject of a patent granted to Mr. A. Von Krause, of New Brighton, N. Y. This house is provided with removable ends to facilitate the removal of the blocks of ice after they have been formed. The house is provided likewise with a series of pendent wires upon which water is sprinkled, and this becoming congealed forms partitions of ice surrounding the wires. The ice gradually forms between these partitions, whereby a solid block is formed, when the wire may be withdrawn, and the ice cut in blocks for removal from the house

Business and Personal.

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

NEW BOOKS AND PUBLICATIONS.

HOW TO MAKE PHOTOGRAPHS; A MANUAL FOR AMATEURS. By T. C. Roche, and edited by H. T. Anthony, Esq., well known for his practical knowledge of photography. New York: E. & H. T. Anthony & Co.

This book contains a concise description of "How to Make Photographs," intended for beginners in photography. All of the latest and best formulas are briefly stated. It contains two characteristic photographs, is finely printed and abundantly illustrated. A valuable work for those wishing to learn this interesting art.

Notes & Queries

HINTS TO CORRESPONDENTS.

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

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

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

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

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

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

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

(1) A. K. writes: On the evening of April 26, one of the armature journals—Babbitted box—of a 20 light dynamo electrical machine became highly heated, melting the Babbitt, which after examination was found, as it were, welded to some portions of the journal and could only be removed by use of cold chisel and file. The only apparent and usual thing to do was to true up the journal, which was badly cut, and pour a new box. But owing to the location of the machine this was difficult to accomplish, besides necessitating considerable delay. The idea thus suggested itself of inserting a lining of sheet lead between journal and old box. After running the machine at a slow speed on the old bearing, and being fully convinced that it would heat rapidly, I procured a piece of sheet lead—from the covering of a tea caddy—about one sixty-fourth of an inch in thickness—and inserted it under the journal, started up the machine, and have been running it for hours at a time since then without any signs of heating, the journal soon taking a good polish and being apparently as good as ever.

(2) A. M. V. writes: I have a handsome blued rifle barrel, which has become rusty from lying in a closet against the outside wall of the house. When I attempted to clean it with fine emery paper and oil, I also took off the bluing. Will you tell me if I can reblue it, and if so, how? A. The bluing of a gun barrel is quite an art, and requires some experience. It is done by carefully heating the barrel. We recommend you to have a gunsmith blue it for you. 2. Of what does the ink used in the hektograph or gelatin copying pad consist? A. Dissolve 1 part of methyl violet in 8 parts of water and add 1 part of glycerine. Digest the whole for about one hour; then allow it to cool, and add one-fourth part of alcohol. The black ink is made with nigrosin.

(3) E. A. D.—There is no satisfactory method of preserving rubber hose. The best cure is to use pure rubber. The coating of hose with a solution of sodium silicate or water glass is recommended. Immersion in ammonium hydroxide 1 part and water 2 parts is recommended as giving new elasticity to the hose.

(4) L. J. D. asks: Will you be kind enough to answer the following questions through the columns of Notes and Queries in your valuable paper: I have a lot of tan which has been used for tanning leather and is of no use now. Can you tell me how to mix it with coal dust so that I can press it into cakes about the size of brick, dry it quick, and break it about the size of stove coal? Give me the amount of coal dust and other ingredients to be used with the tan. I would also like to know the quickest way to dry the tan when mixed, and where to get machinery for mixing and pressing the tan into bricks. I would also like to know how to make a liquid to keep the polished work on engine bright. Something that I can use when the engine is running and that the heat will not affect, such as steamer polish that is sold in liquid form in the stores. A. Spent tan bark can be dried in the air cheapest, or in a steam drying oven at the cost of handling and the heat, which is probably more than the tan bark is worth as fuel. You can mix asphalt with the tan bark and coal dust and press warm into bricks. The quantities will have to be ascertained by experiment. Those that make brick machines can make the proper machines for your purpose. The waste coal dust of the mines can be had free, we believe, by taking it away. Use oxalic acid and water for brass work; tripoli and oil for iron work.

(5) A. T. S.—The difference in illuminating power in reflectors depends very much upon the fineness of polish. As a general rule, 60 to 70 per cent is the value of a reflecting telescope as compared with a refractor of the same aperture and focus. Both being the same in defining power, and sharp, you should be able to see the companion to the pole star bright and clear; the companion to Rigel faintly. Among the close faint stars, Zeta Hercules, *a*, 3d mag., *b*, 6th mag., distance 1·2 seconds; No. 37 Pegasus, *a*, 6th mag., *b*, 7½ mag., distance 1·1 seconds; Lambda Ophiuchus, *a*, 4th mag., *b*, 6th mag., distance 1 second; if you can separate this, you have a first class telescope.

(6) J. C. H.—For cast iron bells you will need, for bringing out a good tone, a hard, crystalline grain which will also be tough enough not to crack easily. This can often be done where you have a good selection from the different grades of iron. No 3 iron or its equivalent, by mixing Nos. 2 and 4, or Nos. 1 and 4, makes a good tone. No. 2 and good tough scrap make a good mixture. If you are casting general machinery or agricultural work from all sorts of mixtures, and have a few bells to cast, then you may make a good alloy with tin—tin scrap, or copper, from 1 to 3 ounces to a 75 pound ladle. Draw into the ladle when the best metal is running, then put in the ingredient, and thoroughly stir and pour. Antimony has also been used for toning iron bell metal—one to two ounces of antimony to 100 pounds iron, and possibly a little more according to the grade of iron you are using. You will need to make a few trials with a 20 or 30 pound bell, so as to get a good tone and also to secure toughness of metal to prevent cracking.

(7) A. W. M. asks how to wash rags that have become saturated with benzine, coal oil, and resin varnish, so as to enable them to be used again. A. Soak the rags in a bath of naphtha or benzine, and when sufficiently cleaned the benzine or naphtha can be driven off by exposure to the sun.

(8) C. D. & Co. write: Will you please inform us through the SCIENTIFIC, the proper speed for driving grindstones with safety, for surface grinding? A. There is considerable difference in the strength of grindstones. The soft, coarse kind will bear 700 feet peripheral velocity per minute up to 4 feet diameter. Hard stones fine and compact will bear a speed of 900 feet as above. These speeds are sometimes exceeded, but we do not know that there is any advantage derived. This will be from 60 to 75 turns per minute for a 4 foot stone.

(9) F. A. G. asks: 1. What is the number of your paper in which you describe a new double revolving plate electric machine; and is the description minute enough to enable an amateur to construct one? A. See page 71, current volume SCIENTIFIC AMERICAN. 2. What is the best kind of paper to use for the armatures of the Toepler-Holtz machine, also the best adhesive to use in applying it? A. Use drawing paper, secure it to the glass with starch paste. 3. In what respect do the Toepler and the Voss improved machines differ? A. Mainly in details of construction.

(10) G. H. W.—For case hardening large articles like locomotive links and blocks, pack the pieces in bone charcoal or bone meal such as is sold for fertilizers, if you do not care about the smell, in an iron box—thick sheet iron or tank iron is the best, but cast iron will do. Pack so that the faces required to be case hardened shall have the benefit of the carbonizing substance; the rest may be filled in with sand. Heat in a slow fire to a cherry red for from a half to two hours according to size of piece or depth to be case hardened, and harden as with steel. Charcoal pulverized with 10 per cent of its weight of prussiate of potash is good.

(11) T. S. G. writes: I expect to burn screenings under my boiler; would there be any advantage by taking the hot air from chimney? If so, is there a blower made for that purpose? A. We cannot recommend drawing air from the chimney for feeding a fire. If your combustion under the boiler is perfect, there is no free oxygen left in the gases of the chimney.

(12) J. H. Z. asks: Can you give me through your SCIENTIFIC AMERICAN a receipt for a paste that will paste gum or leather soles on gum boots? A. Rubber cement is prepared by dissolving India-rubber in carbon disulphide, chloroform, or benzine; apply it to both portions of the soles. 2. Also, how can I keep flowers from withering when plucked from the bush, and kept out of water? Is there anything better than sprinkling them with cold water? A. Keep the stems in water in which 25 grains ammonium chloride have been dissolved.

(13) H. R. E. writes: In using a 3 inch achromatic object in a telescope like the one described in SUPPLEMENT 252, can I use the same eyepieces, and what power do I get with them? How can I make a celestial eyepiece of high power for the above? What is the best focal length for a 3 inch object—36 or 48 inches? A. The 1¼ inch and half inch combinations in SUPPLEMENT 252. A three-eighth single lens, which will give you a power of 90 with a 36 inch object glass, or 128 with a 48 inch O. G. You can make higher or lower power by following the proportions as described in SUPPLEMENT 252. The shorter focus is the best, provided the form, definition, and achromatism are perfect.

(14) D. H. writes: I have been watching your Notes and Queries column for a long time, for a liquid that will give a gloss to a black surface; it must not be sticky, and must dry in three or four hours. A. Use an ordinary shellac varnish.

(15) J. W. asks: Will you give directions that will enable us to dye feathers a "glossy jet black?" A. Try the following: First thoroughly cleanse the feathers with ammonium carbonate and wash them out. Steep over night in a bath of iron nitrate at 7° B., then rinse them in water. Boil out equal parts of logwood and quercitron bark, enter the feathers at a hand heat and turn them frequently, raising the temperature slowly to a scald, but not to boiling point. Let them steep in it till perfectly black, take out, and wash in warm water. Dissolve 3½ ounces potassium bicarbonate in 5 quarts of hot water and stir in 17½ ounces of olive oil till an emulsion is produced; take them openly through this at hand heat for a short time; then gently draw all the wet out with the thumb and fingers, and then well shake them till dry over a stove or in a well heated room.

(16) S. L. M. writes: Will you please give me recipe for making a good liquid glue from common glue? A. Fill a glass jar with broken glue of best quality, then fill it up with acetic acid, keep the jar in hot water for a few hours, until the glue is all melted, and you will have an excellent glue always ready.

(17) J. L D. asks for the best mode of destroying stumps of trees that have lately been cut, and how are they burned by petroleum. A. The method by which stumps are removed by petroleum consists in allowing the stumps to become completely saturated with petroleum, and then setting them on fire. The method by using saltpeter consists in boring holes into the head of the stump and putting into each 1 ounce of saltpeter, and after leaving it to become wet and penetrate the substance of the stump, the latter is set on fire, when it will be completely consumed.

(18) J. L. C. asks: Will you please give a recipe for making good wine from cherries? Also, the best cherries for making wine. A. Ripe fruit, 4 pounds; clear soft water, 1 gallon; sugar, 3 pounds; cream of tartar dissolved in boiling water, 1¼ ounce; brandy, 2 to 3 per cent; flavoring as required. A better and stronger article may be made by adding 1 or 2 pounds each additional of fruit and sugar.

(19) R. W. M. writes: 1. I have a rare old German coin with some curious designs upon it, and some of my friends would like a copy of it as a curiosity. I made a plaster of Paris mould of it, and poured in, first lead and then type metal, but although the metal fills the mould it does not run into the fine crevices. Please tell me how to proceed or what to use to make it a success? A. See SCIENTIFIC AMERICAN SUPPLEMENT No. 17, page 272. 2. Please tell me how to dissolve gum copal in alcohol so as to make a good varnish for oil paintings. A. Fuse 8 pounds of very clean pale African gum copal, and when completely fluid pour in 2 gallons of hot oil; let it boil until it will string very strong, and in about 15 minutes, or while it is very hot, pour in 3 gallons of turpentine. Perhaps, during the mixing, a considerable quantity of the turpentine will escape, but the varnish will be so much the brighter, transparent, and fluid, and will work freer, dry quickly, and will be very solid and durable when dry. After the varnish has been strained, if it is found too thick, before it is quite cold heat as much turpentine and mix with it as will bring it to a proper consistence. 3. Please give a good receipt for "black heads" or "flesh worms?" A. See page page 52, vol. xlvi., SCIENTIFIC AMERICAN, January 28, 1882.

(20) J. J. B asks: Can you give the receipt of how to make imitation turtle shell? Can celluloid be softened and cast in moulds? A. The dark spots in horn that are made to represent tortoise shell are produced by using a strong aqueous solution of silver nitrate mixed with gum arabic so as to flow properly from a brush. A little red lead may be mixed with it to give body. After standing an hour soak in soft water for several hours before finishing. Pieces of horn may be united by softening the edges with boiling water and then submitting to powerful pressure while surrounded with boiling water. For description, etc., of celluloid, see SCIENTIFIC AMERICAN SUPPLEMENT No. 227, page 3617.

(21) W. C. asks if there is any process whereby beef bones can be softened so as to be used in moulds. The bones can be softened by placing in dilute hydrochloric acid, which extracts the calcium salts.

(22) F. J. R. asks: What would be the size of a boiler (of the same construction as that shown in SUPPLEMENT No. 158, January 11, 1879, built by H. S. Maxim) that I need for a steamboat, 16 feet long, 3 feet 4 inches beam, of good shape, so as to be able to run it at least 10 miles an hour, the engine being 3 inches bore and 3 inches stroke? What size, shape, pitch, and weight of a propeller wheel would I need? A. To make 10 miles per hour you will require a screw 2 feet in diameter, 4 blades. Pitch 45° on edge, making over 300 revolutions per minute. This would be hard work for your little cylinder. If you could be content with 6 or 7 miles per hour, a wheel of 18 inches diameter would require 250 revolutions of engines per minute which could be possible with 60 pounds steam and a good boiler of 20 square feet heating surface.

(23) T. B. asks: Is the expansion of metal lengthwise the same in all thicknesses, say for instance in two pieces 24 inches long, one 16 wire gauge and the other half an inch round. In the raising of the temperature from 32° Fah. to 90° Fah. will the longitudinal expansion be the same in each, or will the half inch expand more, in proportion to the larger amount of metal in it? A. The wire No. 16 gauge and the half inch round iron should expand exactly the same, provided they are both annealed and are the same quality of iron. A hard drawn wire cannot be expected to expand exactly in unison with a hot rolled iron rod. The differences in lateral dimensions should not make an appreciable difference in longitudinal expansion until the difference becomes so great as to involve a considerable change in crystalline structure.

(24) E. J. K.—A boiler that is just large enough for your work with fresh water is too small for the same work with salt water. Your boiler should be blown off enough to keep the water inside clear or far below the point of saturation. It requires the same kind of care that is given to marine boilers. Again, an upright boiler is unfit for salt or brackish water under any circumstances. Boilers for salt water need large evaporating surface.

(25) S. W. asks when that motion commonly called "kicking" is given to a gun. Whether at the time the powder is ignited, or at the moment the

charge leaves the gun. A. The kicking or recoil of a gun commences at the instant that the ball begins to move. The impulse lasts until the ball leaves the muzzle. The recoil continues after the ball leaves, from the momentum generated by the first impulse.

(26) J. inquires: 1. How to prepare a rust cement for iron? A. Wrought iron filings, 65 parts; sal ammoniac, 2½; sulphur (flowers), 1½; sulphuric acid, 1. The solid ingredients are mixed dry, sulphuric acid diluted with sufficient water being then added. This cement dries after two or three days, and unites with the iron, making a very resisting and solid mass. 2. Also an iron cement for high temperatures? A. (1.) Iron filings, 20 parts; lime powder, 45; borax, 5; common salt, 5; permanganate of potash, 10. The borax and the salts are dissolved in water, and are then mixed with the two first named ingredients as quickly as possible and used. This cement changes at a white heat to a glassy mass, which is perfectly airproof. (2.) Permanganate, 25 parts; zinc white, 25; borax, 5. These are treated with a solution of soluble glass, and used at once. This cement must be left to dry slowly, and then it will resist the highest temperatures.

(27) G. H. asks for the process of preparing a bichromate solution for a small electric light battery. A. M. Trouve in his improved electric battery takes 150 grammes of bichromate of potash powder to a like amount of water, and after slaking adds, drop by drop, 450 grammes of sulphuric acid. The liquid warms and the salt dissolves, while no crystals are formed on cooling, nor are chrome alum crystals deposited in the cell. The elements are arranged with two carbons to each zinc, the latter being so placed that it can be drawn from the solution. With 12 elements and the solution above described, it is stated that 10 incandescent lamps can be kept at work for five hours, each lamp giving 10 candles. There is thus 100 candle power for five hours.

(28) J. H. writes: Please inform me if there is a method known to ascertain whether there is any moisture left in kiln dried timber, or in other words to find out when timber used in carriage building or any equal mechanical branch is dry enough. Is there any cheap chemical test to detect the presence of water in timber, warm yet from the kiln? If so, what is the agent, and how is the test performed? Can timber like hickory or oak be dried too much, and if so, is the original tenacity lost for good, or will exposure to the atmosphere restore it again? A. There is a way of ascertaining the quantity of water left in timber after kiln drying, first by putting a known quantity by weight, as a sample, into an iron retort and subjecting it to a heat that will discharge all the water, and then weighing the remainder for ascertaining the amount discharged. The best and most reliable way of determining is by practice and experience, as to the heat of the kiln and time used in drying. You can dry the wood too much and make it brittle, or kill its toughness. Over dried wood works crisp under the tools. Exposure to moisture only partially restores it.

(29) R. R. C. asks: Will you inform me of the nature of the composition or the kind of metals used for the regulation of the heat, by reason of the expansion or contraction of the metal, in artificial hatching machines, hot houses, or for other purposes where a standard degree of heat is desired? A. Metallic regulators should be made of metals having the greatest difference of expansions if possible such as steel and zinc, combined in a spring. Iron and brass make good regulators by making the strips one or two feet long, soldering together, and coiling up like a clock spring.

(30) W. W. M. asks: 1. Will you inform me what will make hoof and horn material pliable, so that it will not get hard and brittle, and how may it be welded? A. Horn may be welded or joined by heating the edges until they are quite soft and pressing them together until they are cold. It may be softened, after sawing it into plates or sheets; by exposing it to powerful pressure between hot iron plates. Before pressing, the pitch must be removed, and the horn softened, first by soaking for some days and then boiling in water. 2. What will prevent sulphuric acid from destroying woody and fibrous materials? A. Nothing; sometimes a coat of varnish or paraffin may be applied with advantage, but it is very difficult to prevent the acid from getting through. 3. In making an electrical machine, as in SUPPLEMENT 161, could the electro magnets be made similar to an ordinary horseshoe magnet? A. The machine may be made in the manner described. 3. Will the electrical force generated by one dynamo run another? Yes, but at considerable expense of power.

(31) A. E. S. asks: 1. How can flowers be preserved in their natural form and color? A. Insert their stems in water, in which 25 grains ammonium chloride (sal ammoniac) have been dissolved. Flowers can be preserved in this way for 15 to 30 days. To preserve them permanently for several months, dip them into perfectly limpid gum water and then allow them to drain. The gum forms a complete coating on the stems and petals, and preserves their shape and color long after they have become dry. 2. What is a cheap and effective disinfectant for outside use about house and barn, etc.? A. Carbolic acid or zinc sulphate, both of which are poisonous.

(32) A. S. writes: W. R. asks how to use charcoal in casting brass, in No. 14 of Notes and Queries, SCIENTIFIC AMERICAN of May 19, 1883. Tell him to make a flame of the outer bark of the birch tree and thoroughly smoke the mould in every part, and he will get a perfect casting.

(33) W. M. H. asks: 1. What process will enable me to letter or stencil letters and figures upon glass, such as glass signs for advertising purposes, that may be done cheaply and quickly? A. Etch with hydrofluoric acid. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 313. 2. By what process can I drill holes in glass? A. Make a circle of clay or cement rather larger than the intended hole; and use a drill formed of a copper tube and supplied with emery and water.

(34) E. M.—The following method of etching on silvered glass is given by Leclere, of Paris. Glass which is thinly silvered is coated with a very thin coat of asphalt. A photographic cliche or a properly cut pattern of dark paper, pasteboard etc., is laid upon the asphalt coat when dry; and the whole then exposed to the rays of the sun, which will render the asphalt, whenever the latter is exposed, insoluble. The protected asphalt coating is then washed away with benzine, and the silver coating beneath it is etched with nitric acid, while the drawing or patterns will appear in silvered lines and figures upon the glues.

(35) A. C. F.—The following inks afford copies without a press:

1. (Black).

Nigrosine C. P. fine ....10 ounces.
Glucose "A" ....1½ ounces.
Hot water ....1¾ pints.
Glycerine ....1¼ ounces.

Dissolve the nigrosine by trituration in the hot water, then add the other ingredients and strain through a piece of silk. If too thick when cold, dilute to the proper consistence with water.

2. (Blue).

Cotton blue (aniline) C. B. ....6 ounces.
Glucose "A" ....1 ounce.
Glycerine ....¼ ounce.
Hot water ....2 pints.

Proceed as directed for black ink (above). In preparing these inks it is essential that the water should be kept quite hot while the operation of trituration is performed. The trituration should be continued until all of the dye has been taken up by the water. The straining must be performed hot, otherwise the filtering cloths quickly become clogged. In purchasing nigrosine and aniline blue, obtain if possible the purest quality. Cheap grades of these dyes are almost invariably heavily adulterated with dextrine.

(36) P. F. S.—The following varnish is recommended for coating the stalks of flowers for the preservation of their color and general character:

Isinglass ....11 ounces.
Concentrated glycerine ....9 "

The isinglass to be softened by first soaking it in cold water, and then dissolved in the glycerine by digestion and agitation with the latter heated to 212° Fah. over a water bath. When properly prepared this varnish is colorless, and when cold resembles rubber in all but color. Another varnish recommended for this purpose is prepared from:

Bleached gutta percha ....1 ounce.
Deodorized benzole ....7 "

The gutta percha is cut into fine shreds and gradually added to and agitated with the solvent kept hot or (warm) over a sand bath—away from fire. The whole flower may be dipped into this varnish, shaken, and exposed to the air to dry. Another preparation suggested for this purpose is plain collodion diluted one-third and mixed with two per cent of camphor, also dissolved in a small quantity of ether and alcohol.

(37) C. W. N. K. writes: Would you kindly inform me through your paper the size screw it would take to run a boat 12 feet long by 3⅓ feet beam, and whether it would be better to have a two blade or a three, supposing it revolves at the rate of 375 a minute? A. The diameter will depend somewhat on the draught of water. We think 15 inches or 16 inches diameter, two blades, best.

(38) G. B. asks: Can you inform me how mosaics are made? A. The enamel used is a kind of glass, colored with metallic oxides, and it is so fusible that it can be drawn out into threads, small rods, or oblong sticks of varying degrees of fineness, slightly resembling the type used by compositors. These polychromatic rods are kept in drawers properly numbered, so that the artist always knows to which case to repair when he requires a fresh supply of a particular tint or tints. When the picture is commenced the first step is to place on the easel a slab of marble, copper, or slate, of the size fixed upon; and this slab is hollowed out to a depth of about three and a half inches, leaving a flat border all round which will be on a level with the completed mosaic. The excavated slab is intersected by transverse grooves or channels, so as to hold more tenaciously the cement in which the mounts of enamel will be embedded. Then the hollowed slab is filled with "gesso," or plaster of Paris, on which the proposed design is traced in outline, and usually in pen and ink. The artist then proceeds to scoop out a small portion of the plaster with a little sharp tool. He fills up the cavity thus made with wet cement or "mastic," and into this mastic he successively thrusts the "spiculæ," or the "tesseræ," as the case may be, according to the pattern at his side. In the broad folds of drapery or in the even shadows of a background, or a clear sky, his morsels of enamel may be as large as one of a pair of dice; in the details of lips, or eyes, or hair, or foliage, or flowers, the bits of glass may be no larger than pins' heads. The cement, or mastic, is made of slaked lime, finely-powdered Tiburtine marble, and linseed oil and when thoroughly dry is as hard as flint. Sometimes the mastic which fills the cavity is smoothed and painted in fresco with an exact replica of the pattern, and into this the bits of glass are driven, according to tint, by means of a small wooden mallet. If the effect produced wounds the artist's eye, he can easily amend the defect by withdrawing the offending piece of enamel and driving in another while the cement is still wet; and, by observing proper precautions, it can be kept damp for more than a fortnight. When the work is completed any tiny crevices which may remain are carefully plugged with pounded marble, or with enamel mixed with wax, and the entire surface of the picture is then ground down to a perfect plane, and finally polished with putty and oil.

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

F. A.—The specimen is simply mica in clay, of no value at all.

COMMUNICATIONS RECEIVED.

On a New Electrical Condenser. By N.
On the Orbits of Planets. By C. W. H.
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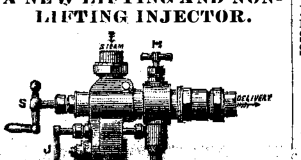

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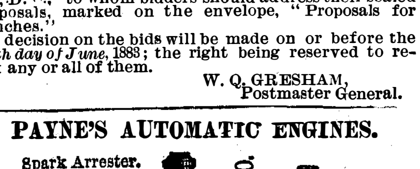

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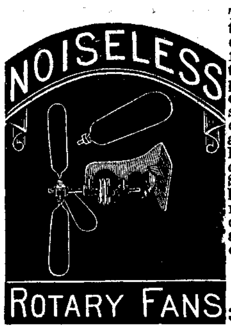

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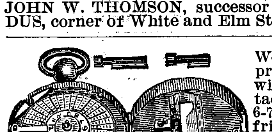

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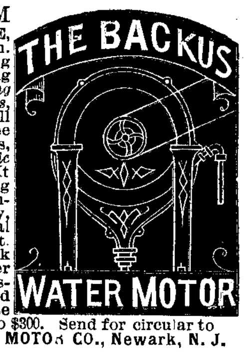

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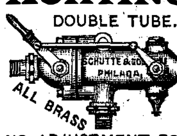

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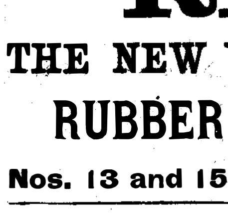

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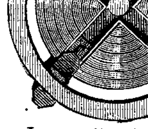

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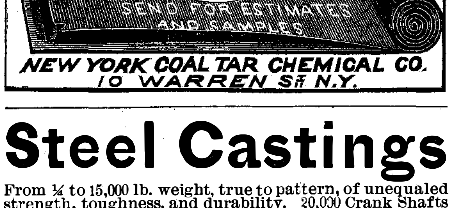

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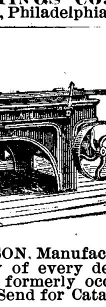

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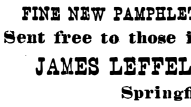

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