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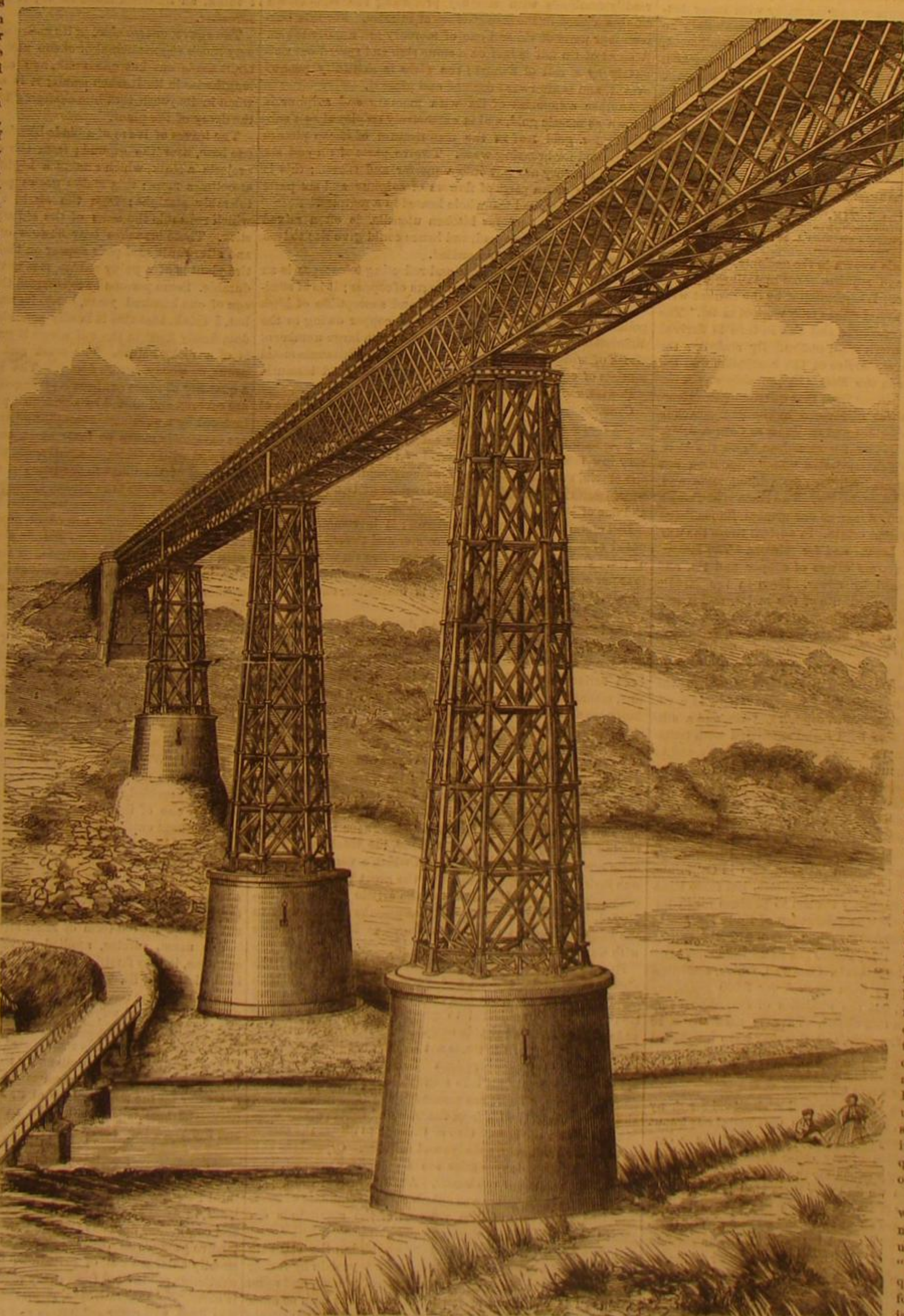
The Cere Viaduct.

The viaduct which we illustrate this week crosses the Valley of the Cere, near Ribeyres, and is situate on the line of railway between Figeas and Aurillac, which forms a portion of the central network of the Paris and Orleans Railway, France. The viaduct, which carries the rails at a hight of 181 feet 6 inches above the water level, consists of five spans of lattice girders supported by masonry abutments and by piers formed of clusters of cast-iron columns rising from bases of masonry. The three central spans are of 164 feet each and of the two other spans, that on the one side is 145 feet, and the other 139 feet. The length of each abutment is 118 feet, the total length of the viaduct being 1,012 feet. The width of the viaduct between the rails is 14 feet 9 inches, and it carries a single line of rails. Each of the piers consists of a cluster of eight cast-iron columns united by cross bracings, and fixed to the top of a brickwork base of elliptical shape. Each pier measures 16 feet 5 inches by 8 feet 2½ inches from center to center of columns at the level of the capping, and the columns are disposed at such an inclination that their center lines, if produced upwards, would all meet at a point at 123 feet 1½ inches above the level of the rails. The side columns of each pier have thus a batter in the direction of the line of the viaduct of 1 in 30, and the end columns a transverse batter of 1 in 15, and as all the piers are of the same size at the top, the dimensions of each at the bottom vary with the hight. The brickwork bases of the piers have also their sides built at such inclinations that they form portions of a cone, the apex of which would be at the point of junction of the center lines of the columns before mentioned. The foundations of the viaduct were commenced in June, 1863, the erection of the girders in May, 1865, and by the following October a connection had been formed between the two abutments.

When complete the superstructure was tested by a load of 4,000 kilog. per meter, or about 8,000 lbs. per yard run; and under this test the central piers were compressed 3 millimeters, or about an eighth of an inch. At the same time the central span was deflected 15 millimeters, or three fifths of an inch, and the two spans on each side of it 12 millimeters, or nearly half an inch.

Its total cost was $171,000 in gold. Each of the main piers contains 71 tuns 13 cwt. of cast iron and 51 tuns 10 cwt. of wrought iron, and the cost per yard in hight of the iron portion of the pier was about $400.

The viaduct was constructed under the direction of M. Déglin, engineer-in-chief of the Ponts et Chaussées, and of Mr. Bortoux, acting engineer. The design was by M. Wilhelm Nordling, engineer-in-chief of the northern part of the Reseau-Central.



VIADUCT ON THE PARIS AND ORLEANS RAILWAY, FRANCE.

Railway Economy.

There seems to be a great difference of opinion among railway managers as to the meaning of economy as relating to the roads they operate. By far the greater number apparently holding that it is in cheapness of first cost, without regard to service to be rendered. This has been *the* fault, not only in the working, but in the construction of American railways.

Originally, owing to the scarcity of capital and the necessity of rushing the enterprise through to completion, the roads were hastily graded, insufficiently ballasted, and laid with any iron that could by any possibility be considered as at all suitable, and which cost the least sum per net tun. So, in rolling stock, wheels which have so much to do with the safe transmission of the passengers and freight, were not purchased because of the quality of material used in their composition and the care bestowed upon their casting; but the only question asked was, "What is your price?"

It is no wonder that under such circumstances as these American railways have made themselves illustrious as one of Grim Death's most efficient allies. We believe that an examination of the causes of casualties on rail roads will show that of every hundred, ninety-nine have arisen from either a defective wheel, or axle, or rail.

The expenditure of one or two cents a pound more for axles, of three or four dollars additional per wheel, and a few dollars per tun extra for rails, would, we firmly believe, do more to reduce the list of accidents on railways than any other course of action their managers could pursue. Railway supply manufacturers are not slow to discover that it is cheapness, not quality, that secures orders.

Pity 'tis that railway managers have not been as quick to understand that the "penny wise" are frequently the "pound foolish;" that the best is always the cheapest in the long run; that that policy which shall secure to them the most complete road-bed and the most thoroughly reliable equipment, is the one which will also enable them to reduce cost of track repairs per mile, cost of car repairs per tun per mile, and loss and damage to goods and passengers to a mere nothing, compared with what they would be under the reverse rule. Safety and speed can both be increased, and with these comes, what all are striving for, larger traffic. Surely, it seems to us, it is not very difficult to see that when a wheel which would cost $22 would prevent an accident involving the payment of thousands of dollars of damage caused by a wheel whose price was $18, it is better to pay the $22. Yet managers buy the $18 one, and trust to good fortune to protect them from ill-consequences.

The public, who risk life and property on railways each and every day, have a most unmistakable interest in these things, and an undoubted right—we had almost said duty—to declare through their representatives, that it shall be a crime, properly punishable, for railway managers to decrease safety in order to secure cheapness.

We are glad to know that some of these gentlemen can see their own and the public's interest without any forcing, prominent among whom is the superintendent of a road some sixty-four miles long, running through a difficult country, all grades, and tunnels, and trestle-work, and yet the record of whose accidents will compare *most* favorably with many better located roads, and his secret is, testing the materials he uses in his track and on his motive power and car equipment, testing them thoroughly, and then purchasing that which shows best service, whether its first cost is greater than the others or not.

If managers generally were as wise, we should soon have the pleasure of reporting a decreased mortality and a lessened damage account on railways.—*Railroad and Travellers' Journal.*

[For the Scientific American.]

ON TIN.

BY PROFESSOR CHARLES A. JOY.

Tin is one of the metals known to the ancients, although it does not occur native, and requires some metallurgic knowlege for its preparation. It is mentioned by the earliest writers, and was called by Homer "the easily worked metal." The Greek name for it was *cassiteros*, and this in turn is derived from the still older Sanscrit word *castira*. By studying the derivation of the name we arrive at the conclusion that the metal was well known in the East, and probably was introduced to the Western nations from that quarter of the globe. Later in our history it was discovered by the Phœnicians in what they called Cassiterides and we know as Cornwall.

The Romans called the metal "white lead," and the Celts *stean* or *ystaen*, from which we derive "tin." Stannum was first used for argentiferous lead, then for white metals, and, finally, in the fourth century, for tin. The Latin name which is used in pharmacy, and affords us our symbol, Sn., is therefore of comparatively recent origin. In ancient times the uses of tin were chiefly for bronze and for mirrors. The famous mirrors of Brundusium were alloys of copper and tin, and were afterwards replaced by silver. Even in the Middle Ages there was a very limited use of the metal, and it is a curious fact that no specimens of antique tin have come down to us. The alchemistic name of tin was Jupiter, and many were the attempts made to convert it into gold. The chief ore of tin is the oxide or tin stone, from which it is easily separated by coal. The easy working of the ore accounts for the knowledge possessed of it by the ancients. There is a tin pyrites, or compound of sulphur, copper, and tin, and a silicate. The metal has also been found associated with tantalum, tungsten, and columbium, in certain rare minerals, and, in Bolivia and the Ural mountains, is said to occur native. Traces of tin have been discovered in mineral waters, to which, however, it imparts no poisonous properties. We do not find that it plays any conspicuous part in the animal or vegetable kingdom. America otherwise so rich in metals has hitherto produced very small quantities of tin. There are rumors of its occurrence in large quantities in Missouri, also in California, in Durango, Mexico, and in New Hampshire, but these localities have not been sufficiently worked to produce much impression on the market. The production of tin in Europe in 1865 amounted to 19,140,000 lbs., the value of which was about $4,740,000 gold; of this 18,590,000 lbs. came from Great Britain. It is said that the mines in Cornwall, which, according to some authorities, have been worked for 3,000 years, are gradually giving out, but the statistics of the annual production do not confirm this rumor. There is naturally more demand for tin than formerly, and this may have occasioned the rumor of the falling off in the Cornish mines.

The mode of extracting metallic tin from the ores is fully described on page 79, current volume.

The properties of tin have been well understood for many centuries. It is rare, indeed, to take up a metal our knowledge of which has been so slightly increased, as is the case with tin. The literature of any other metal, especially of the rare metals, is very copious for the last twenty years, but under the head of tin we find very little that is new. It is true that the number of its compounds has been materially increased until there are about two hundred and fifty of them described in the text-books and journals. To some portions of an able lecture recently delivered by Professor Stone, at the Cooper Union, we add a few scattered facts obtained from recent publications.

Tin has a well-known white color, with a yellow tinge and a high metallic luster. At 212° Fah. its ductility is so far increased that it can be drawn into wire. At ordinary temperatures it is not very ductile. The malleability of the metal is one of the chief occasions of its usefulness, as it is in the form of foil that it has such extensive application. An ingenious method for the manufacture of tin foil was invented by Mr. Crookes, of New York city, it consists in hammering plates of tin by placing them on top of each other. As fast as a given sheet becomes large and unwieldy, it is cut off and laid on top, and in the course of time one hundred sheets are piled one on the other, like so many quires of paper. They do not adhere together, and the workmen can, in this way, produce very thin foil. Much of the work can be done by machinery, but as the inspectors of tobacco require a foil of a particular thinness, the exact point can only be ascertained by the fingers. It requires a very expert workman to decide when the foil has reached the exact fineness to suit the officers, and no machine can take his place. Metallic tin imparts a characteristic odor to the moist hand, it also has what is called the tin cry when it is bent. This property affords a means for testing bars of tin to distinguish them from solder. Plumbers are in the habit of holding the ingots to their ears and giving them a bend. They can thus separate bars of tin, lead, and solder from each other. Cadmium is the only metal that resembles tin in this respect. Although tin melts at so low a point as 442° Fah., it is not sensibly volatilized. It requires a high heat to convert it into a vapor. The metal slowly tarnishes in the air, and is rapidly oxidized at a red heat. It readily combines with mercury, producing the well-known amalgam used in the manufacture of mirrors. For this purpose four parts of tin and one of mercury are usually taken. A sheet of tin foil is laid on a stone slab and spread out uniformly by a roll of flannel; the glass is skillfully pushed over it, and is afterward drained and pressed.

Another compound of tin with mercury and sulphur is known as mosaic gold, and is extensively employed as a substitute for gold leaf in the manufacture of cheap picture frames and for bronzing wood. Twelve parts of tin and six parts of mercury are put into a mortar and stirred; this is mixed with seven parts of flowers of sulphur and six parts of sal ammoniac, and the whole heated in a matrass.

Tin, such as is used for kitchen utensils, is often mixed with eighteen per cent lead, and hence could give rise to lead poisoning if incautiously handled.

Speculum metal for mirrors and reflecting telescopes is an alloy of one part of tin and two parts of copper; it is of steel-white color, extremely hard, brittle, and susceptible of high polish. It is difficult to unite tin and copper owing to the different densities of the metals. There are a large number of alloys of which tin is a valuable constituent. Britannia metal consists of equal parts of brass, tin, antimony, and bismuth.

Pewter, four parts of tin and one of lead.

Common spoons, queen's metal, nine parts of tin, one of antimony, one of bismuth, and one of lead.

Rose metal, which is used for safety plugs, and melts at a very low temperature, is composed of two parts of bismuth, one of tin, and one of lead. Plumbers' solder is made up of equal parts of tin and lead; fine solder of two parts of tin and one of lead.

Bell metal is variously constituted; it is sometimes composed of seventy-eight parts of copper and twenty-two parts of tin. Gun metal has less tin. Bronze less tin with three or four per cent zinc. It is an interesting fact that bronze cooled slowly, is brittle, and, suddenly, is malleable, exhibiting a property just the opposite of steel.

Tin is used by calico printers and dyers for making "spirit mordants" and "stannate salts," and imparts crimson hues and azure colors to various materials. This application has been seriously interfered with by the new industry in aniline, where the colors are of a greater variety and the mordants are albumen instead of metallic salts. There was a period in our history when we imported nearly all of the white metal and Britannia ware for the various utensils of the table and kitchen. Now we manufacture most of our table service and also work up great quantities of tin ware. In beauty of design and perfection of workmanship our plated ware is equal to any manufactured in England or France, and we have no longer occasion to send to Europe for such articles. During the year ending June 30, 1869, the total importation of tin amounted to $10,300,000 upon which a very heavy duty was levied by the government to the great injury of many branches of manufacture where the article is largely employed. Tin ware is used by all classes—the poor as well as the rich—and ought to be encumbered as little as possible with duties and taxes.

How to use waste scraps profitably has long attracted the attention of metallurgists, and various methods have been employed. In New York city the scraps are put into circular iron baskets and subjected to great heat. The tin runs off and is collected in a suitable receptacle. The iron remaining after the removal of the tin, is not wasted, but is employed in various metallurgical operations. Sometimes the tin is economized by converting it into stannate of soda used as a mordant in dyeing. There are numerous ways of accomplishing the separation of the tin from the iron and subsequently combining it with the soda. One of them is to digest the scraps in a proper mixture of soda lye and sulphur. Crystals of sulphate of soda or glauber salts are a secondary product, and collect on the sides of the vessel. After filtration, the liquid is evaporated to dryness, and affords cakes of stannate of soda. Sometimes twelve to fifteen per cent of the stannate is obtained in this way from the scraps.

A fine green color is obtained by combining the stannate with a salt of copper, and a pink color for porcelain by fusing together stannic acid, quartz, bichromate of potash, and some chalk. The poisonous properties of lead have been so often fatally tested that many efforts have been made to substitute tin tubing in its place. The cost of the material has hitherto been a serious drawback, but the invention of a method of producing lead-incased tin pipe has obviated much of this difficulty, and encouraged the hope that tin pipe can be generally substituted for lead. The use of tin and its salts, as reducing agents, is one of the most recent additions to our knowledge of its properties, and there are numerous applications for the 250 compounds of the metal, an account of which we omit from want of space and may recur to hereafter.

[For the Scientific American.]

THE CENTURY PLANT.

BY JOHN RAMSAY GORDON.

The *Agave*, or *Caretas*, is one of the genus of plants known to botanists as the *Amaryllidaceæ*. The American aloe and century plant are names by which it is commonly known.

This plant grows abundantly in tropical climates, particularly in South America and the West Indies; it is called the caretas in the French colonies and in some of the other adjacent islands. The name, agave, is derived from a Greek word signifying glorious, which, I suppose, was given to it on account of its gorgeous appearance when in bloom, combined with its majestic growth; and, it seems, indeed, an appropriate one.

Though not aware of the origin of its French name, I believe it is mentioned by the celebrated writer, Pierre L'Abbat, in his description of the Antilles. Century plant is, I think, an incorrect name for it; of this I shall say more hereafter.

The agave, or tree aloe, in its entire appearance resembles very much the medicinal or shrub aloe; but, unlike the latter, it sends out but one stalk, and each leaf is rolled up lengthwise in itself when small; it is of a dark green color when in its youth, that hue changing to an olive shade with the decay of the plant.

The leaves of it are of a blade-like form, all growing from one base, near the ground; from the center of them there projects a stalk, which attains a hight of twenty feet, and sometimes more; this stalks grows perpendicularly, and is tolerably straight; from the stalk, there grow branches, which resemble the arms of the old style of saloon candlestick. These branches bear flowers on attaining maturity, and afterwards seed pods appear on them. Though the entire plant is of a pulpy nature, it is nevertheless strong and durable. Some persons have asserted that it attains the great age of one hundred years, hence its name of century plant; but, I think, that this is hardly possible, as its roots are seldom firmly fixed in the soil where it grows, which in general is of a rocky nature. The stalk and branches become ligneous, or woody, before decay. The leaves are composed of a quantity of fibers or threads arranged longitudinally, which are covered and united by a greenish pulp, and the whole is inclosed by a substance resembling parchment. These blades are extremely sharp at their ends, and, at their edges, are provided with a series of small acute thorns, extending from the heart of the plant to the point of the blades.

When the agave is in bloom, the appearance of it is rather imposing, and the perfume which it emits is equal in effect to the night blooming cereus or any other essence of the toilet, and birds and insects gather about it in numbers to suck the nectar from its flowers. There are daily to be seen, also, innumerable swarms of bees gathering their food. One species of the trochilus, or humming-bird, known in the West Indies as the doctor bird, frequents, too, the localities where the aloe is to be found; and I have seen it with its plumage of brilliant hue, fluttering its tiny wings, and, while suspended in air, sipping its luscious draft of nectar.

I have before remarked that it has been stated that the plant attains the age of one hundred years; were it possible that this could be, I can safely affirm that the poor century plant would not stand one day after some jolly follower of Neptune had set his eye upon it.

Sailors! What will they not conceive? One Sabbath evening—the sailor's vacation—I watched a number of men who had provided themselves with axes, making an attempt to secure one of these plants, which they could not accomplish without cutting its surrounding leaves; and, as I was desirous of knowing what use they would make of it, I approached and questioned them. One of the men informed me that they made razor strops of the stalk, and that it furnished tolerably good ones too. It was cut into lengths of three feet in order to be portable, and at leisure it would be cut into the desired form of razor strops.

The name, caretas, applied to this plant by the French colonists, is very familiar to me as it is that which is employ- in the island of St. Thomas whence I hail.

It seems to me that the caretas could be rendered very serviceable in several ways; and I think that it would furnish very good rope, as the fiber which exists in the leaves of the plant, when spun, makes strong cord; in fact, it is employed by the South American Indians for this purpose, though not to any great extent on account of the want of machinery necessary for the manufacture of it. I believe that it is also converted into medicine by the natives of South America and the West Indies.

Louisiana State Fair.

The fourth grand State Fair of the Mechanics and Agricultural Fair Association of Louisiana, will be held at New Orleans, in April of this year, commencing Saturday, the 23d, and continuing nine days. The Fair will be held on the extensive grounds of the Association in the above city, and a greatly enlarged list of premiums is offered. Visitors and exhibitors are invited from every section of the country. It is announced that railroads, steamships, and other transportation lines, will carry exhibitors and their wares at half price. The Secretary of the Association is Mr. Luther Homes, who may be addressed by parties wishing further information.

ON A NEW METHOD OF STRAIGHTENING HIGH CHIMNEYS.

Condensed and adapted from "Zeitschrift für Bauwesen."

It is a well-known fact that high chimneys, however carefully built, often lose their original straightness soon after their erection, and assume an inclined position or a curved shape. This frequently takes place to such an extent that the stability of the chimney is endangered so that it becomes necessary to straighten it. This is generally done by making an incision, or several, in the chimney on the side opposite to that to which the chimney is inclined. This operation is performed by means of large saws. Recently, however, a very high chimney erected by Messrs. Wesenfeld & Co. in their chemical establishment at Barmen (Prussia) was straightened successfully by a different method.

This chimney is 331 feet high. Its exterior shape is octagonal, with a clearance of 8 feet throughout its whole length. This gives it an interior sectional area of 53 square feet. The socle is quadratic in section, 20 feet wide and 40 feet high. The upper, or pyramidal part of the chimney is octagonal, 291 feet high. The exterior diameter of the latter is 17 feet at the base of the pyramidal part. This diameter is reduced 2¼ inches on every ten feet upwards. The masonry is 7 bricks thick in the basement, 5 at the base of the pyramidal part, and 2 at the top.

For the sake of comparison we here add the following table:

TABLE CONTAINING THE MOST IMPORTANT DIMENSIONS OF SOME REMARKABLE CHIMNEYS (br.—length of brick)

Number.	Hight, including foundation. h	Hight, excluding foundation.	Exterior diameter. below. g	Exterior diameter. above.	Thickness of masonry. below.	Thickness of masonry. above.	Decrease of diameter on every 10 feet of hight.	Relation of the hight to the diameter of base. $\frac{h}{g}$	LOCALITY
	ft.	ft.	ft.	ft.			Inches.		
1	—	441	31	12 3-8	5·1 ft.	1 1-2 br.	5·09	14·19	Port Dundas, near Glasgow (Scotland).
2	434	430	39 1-3	13 1-8	3 1-2 br.	1 1-2 br.	7·49	10·67	St. Rollox, near Glasgow (Scotland).
3	345	331	18	11 1-6	5 ft.	1 1-2 ft.	2·47	18·33	Chemical factory at Barmen (Prussia).
4	347	330	29	11 1-2	6 1-2 ft.	1 1-2 ft.	6·36	11·38	Cast Steel Works at Bochum (Prussia).
5	—	274	18 1-2	10 3-4	4 ft.	1 1-4 ft.	3·4	14·82	Dye Works, Hagen (Prussia).
6	225	221	17 5-6	7 5-8	3 1-2 br.	7 in.	5·53	12·42	Pontasser's Chemical Works (England)
7	—	175	20 3-4	7 1-2	4 5-6 br.	8 3-4 in.	9·07	8·44	Alois Iron Works (France).
8	173	155	17	6 3-4	3 br.	1 br.	7·91	9·14	Hepburn's Tannery on the Tyne (England).
9	167	161	13 1-2	5 1-8	3 3-4 ft.	10 in.	6·08	11·93	Dye Works, Barmen (Prussia).
10	162	150	16 2-3	6 2-3	4 1-2 br.	10 in.	8·0	9·0	"Einer Graben" Chemical Works, Barmen (Prussia).
11	144	132	11 1-2	5	3 1-2 ft.	10 in.	5·90	11·50	Eisengarn Factory, Barmen (Prussia).
12	133	126	9 1-8	4 1-3	2 1-2 ft.	10 in.	4·54	13·86	Dye Works Ochde, near Barmen (Prussia).
13	—	123	10 1-3	4 1-2	3 1-2 br.	1 br.	5·45	12·43	St. Ouen, near Paris (France).
14	131	126	15 1-2	6 3-4	4 br.	1 br.	8·31	8·14	White's Factory (England).
15	136	124	11 1-2	6 1-2	3 ft.	10 in.	4·82	10·81	Rolling Mill, Hagen (Prussia).

In looking over the table it might appear strange that the proportions of the hight to the diameter of the base has been taken so very high in the construction of the chimney No. 3, which is the subject of the present paper. For, by comparing this proportion to those used in the construction of any of the other chimneys mentioned, it becomes evident that this high proportion has been chosen against all previous experience and practice. The explanation of this is found in the circumstance that this chimney was to have, according to the original design, a hight of 260 feet only, which by a later resolution was changed to 331 feet. As the construction had then been commenced, and was proceeding in a very satisfactory manner, it was considered best and sufficiently safe to increase the hight without altering the dimensions of the base. The consequence, of course, was that every square foot of a section through the masonry of the lower part of the chimney was subjected to a very high, and indeed, abnormal pressure.

An exact calculation has shown that one square foot of masonry in the lowest part of the chimney proper carries a weight of 21,335 lbs. or 149 lbs. per square inch.

For comparison the highest pressure existing in the chimney No. 4 (see table) erected at the Bochum cast steel works, was calculated and found to be 18,429 lbs. per square foot, or 128 lbs. per square inch. The difference amounts to 21 lbs. per square inch, or little below 1½ atmospheres, which constitutes the excess of pressure in the masonry of the chimney at Barmen over that of the Bochum chimney.

The chimney at Barmen (the straightening of which we propose to describe hereafter) was built with the greatest possible care. A good underground was available, consisting of a stratum of hard and coarse gravel. The foundation and the socle were built in the summer of 1866, the pyramidal part in the summer of 1867. The foundation was made of large, flat quarry stones with terrace mortar (1 lime, 1 river sand, 1 terrace, which is a kind of puzzolana). The socle was made of brick with ordinary mortar (1 lime on 2 river-sand).

The mortar was prepared fresh every morning by the masons themselves. Cement mortar (1 cement on 2 river sand) was used on rainy days. The crown of the chimney was built with cement exclusively. The joints of the masonry were flushed up with cement, and gradually as constructions proceeded.

The three masons who did the whole work daily changed their positions on the chimney so as to equalize any unevenness in the masonry that might be caused by imperceptible differences in the manipulations of the different individuals. At distances of fifty feet single layers of brick work were painted black outside to afterward facilitate an estimate of the hight of any point of the chimney above ground. The chimney was built from the inside without a scaffold, the materials being hoisted by a steam engine put up temporarily near the place of construction. The motion was transmitted by three rollers or drums. The frame which supported the upper drum was moved higher up after the completion of every three or four layers of brick, and was at the same time turned horizontally from one side of the octagon to the next one to equalize the effect of the pressure of the frame on the masonry. The holes made into the masonry to support the frame, were filled up with brick and mortar immediately after the removal of the frame to a higher level.

The construction of this chimney was thus successfully completed in October, 1867, and answered perfectly the requirements for which it was erected. It was perfectly vertical and straight.

However in the spring of 1868, remarkable for vehement and long-continued gales and storms, this chimney suddenly assumed an inclined position toward the north-east. The injurious action of the south-west wind was probably favored by the bold proportions of the structure, by the yet subsisting softness of the mortar, and by the large size and the shape of the richly ornamented chimney crown. This crown caught the wind, and thereby caused it to act as on a long lever. The chimney was thus bent, and the mortar not perfectly dry, the brickwork did not yet possess the necessary elasticity to return to its original shape.

The deflection of the chimney was considerable at the end of May, and seemed yet to increase, and threatened an overthrow.

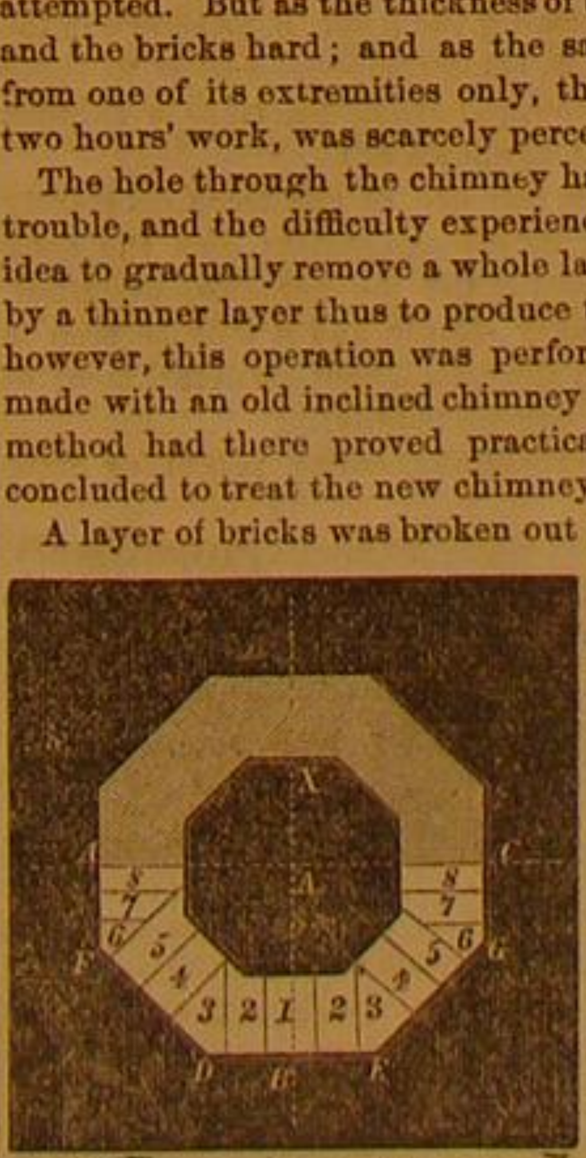
As above mentioned, some layers of bricks in the chimney at distances of fifty feet from each other, were painted black outside. The hight of these black lines above the socle being known, these lines were, by means of a theodolite projected on a plank situated on the socle of the chimney to find the deviation from the vertical line at these different hights. It was thus ascertained that the chimney at a hight of

251 feet was out of line........................45 inches.
210 feet " " ....30 "
160 feet " " ....16 "
110 feet " " ....5 "

The socle stood perpendicular. As the deviation was still increasing, and as it would have done too serious an injury to the manufacture of the establishment to set the chimney temporarily out of use, it was necessary that immediate action should be taken in the matter. The ordinary method of straightening chimneys was at first resorted to. A hole was made through the whole thickness of the masonry on that side of the chimney which required lowering four feet above the top of the socle. Into this hole a saw was introduced with which a horizontal cut through one half of the chimney was attempted. But as the thickness of the wall was considerable and the bricks hard; and as the saw could be manipulated from one of its extremities only, the effect of sawing, after two hours' work, was scarcely perceptible.

The hole through the chimney having been made without trouble, and the difficulty experienced in sawing led to the idea to gradually remove a whole layer of bricks, replacing it by a thinner layer thus to produce the desired slit. Before, however, this operation was performed, the experiment was made with an old inclined chimney 120 feet high. When the method had there proved practicable and successful, it was concluded to treat the new chimney in the same way.

A layer of bricks was broken out by means of pointed cast-steel bars, from 1½ to 5 feet in length. The annexed figure shows a horizontal section of this layer, the inscribed numbers, 1, 2, 3, 4, etc., indicating the succession in which the different parts or divisions of the layer have gradually been removed. When the division, 1, was broken out, it was replaced by thinner bricks covered with terrace mortar. After this the two divisions, marked 2, were broken out and replaced by thinner bricks, then the two divisions, marked 3, and so on until one half of the whole layer was thus exchanged.



Flat shovels with long handles were used to lay those bricks which had to be placed near the inside of the chimney. A space of 5 inches was left each time between the newly-laid bricks and the old ones of the next division, to break out the latter with greater facility.

The width of each single division was 2 feet to 2½ feet. The masonry was sufficiently dry above not to give way when a layer of that width was removed below it. The replacing bricks were taken thicker gradually as the operation drew nearer the points, A and C (see engraving), so as to get the slit wide in the middle and gradually extenuating towards its two extremities at A and C. As soon as the slit reached these points, the chimney began to move, and by slight oscillations slowly settled down on the new layer of bricks, and when it had reached it, remained quiet.

The act of settling by oscillations lasted from 18 to 36 hours, corresponding to the width of the slit which was different in the different cuts performed in a similar way at different hights of the same chimney. The oscillations were the greater and the livlier the higher up the cut was, which produced them.

At the highest cut, 100 feet from the top, the oscillations were such that the masons became frightened and left the place, the slit became alternately wider and narrower by ⅛ of an inch. The facts before mentioned seem to prove the elasticity of the whole structure. Four cuts were made into this chimney; the

1st. 4 feet above the socle, greatest width..... ⅞
2d. 100 feet " " " 1⅛
3d. 140 feet " " " 1⅛
4th. 191 feet " " " 1⅞

After the completion of these operations the chimney continued during several weeks to settle slightly in the direction opposite to its former inclination, the brickwork on that side being now subjected to a higher pressure than before.

This circumstance has to be carefully considered beforehand, or else the slits would be made too wide and produce an inclination of the chimney in the opposite direction. A severe storm which occurred on the 6th and 7th of December, 1868, and which threw over several chimneys in the neighborhood, did not affect the above. The result of the straightening operation before described is perfectly satisfactory, and the structure is now stronger and steadier than ever.

We have yet to speak of the means by which the upper parts of the chimney were made accessible to perform the upper cuts. This was done on a new and interesting plan. Standing on the lowest platform, the masons made a number of holes all on the same level, 4 feet above the platform, into the exterior wall of the chimney. They stuck iron bars into these holes and fixed boards to them so as to form another platform. Standing then on the latter, they made another one four feet higher up in the same way, and so forth. Every second platform was again removed, so that the remaining platforms were 8 feet apart. They were then joined by ladders, to make the ascent possible and easy. This method is, however, only practicable when the chimney has a considerable diameter, and when the mortar is sufficiently dry not to give way under the one-side pressure of the bars and platforms, which would make the arrangement loose and unsafe.

In December, 1868, another chimney at Duisburg was straightened by the method above described. But as the diameter of the chimney was not as large as that of the Barmen chimney, and as the mortar was yet soft, a wooden scaffold was erected around the chimney to get at the upper points which required cutting. The breaking cut and replacing of the bricks could not be done there in divisions wider than 5 to 10 inches, otherwise the upper masonry not being dry, would have settled down. When the chimney was straight, a further settling towards the side of the cut was prevented by driving iron wedges covered with mortar into the slit.

We shall finally not omit to remark that it is advisable to straighten a chimney as soon as there is a decided evidence of its deviation from the vertical position. For while the mortar is not hardened, the deviation gets worse and worse, and the operation more difficult and more expensive.

Varnish for Iron.

The following is a method given by M. Weiszkopf, of producing upon iron a durable black shining varnish: Take oil of turpentine, add to it, drop by drop, and while stirring, strong sulphuric acid, until a sirupy precipitate is quite formed, and no more of it is produced on further addition of a drop of acid. The liquid is now repeatedly washed with water, every time refreshed after a good stirring, until the water does not exhibit any more acid reaction on being tested with blue litmus paper. The precipitate is next brought upon a cloth filter, and, after all the water has run off, the sirupy mass is fit for use. This thickish magma is painted over the iron with a brush; if it happens to be too stiff, it is previously diluted with some oil of turpentine. Immediately after the iron has been so painted, the paint is burnt in by a gentle heat, and, after cooling, the black surface is rubbed over with a piece of woolen stuff, dipped in, and moistened with linseed oil.

According to the author, this varnish is not a simple covering of the surface, but it is chemically combined with the metal, and does not, therefore, wear off or peel off, as other paints and varnishes do, from iron."

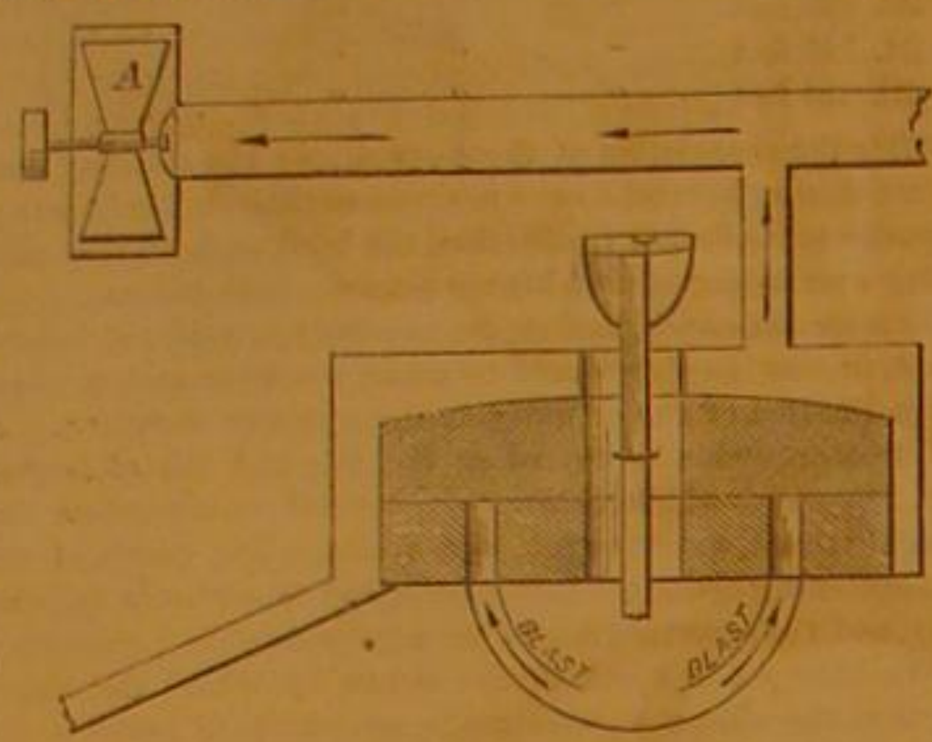
HENRY CAREY BAIRD'S CATALOGUE.—We are in receipt of the revised catalogue of practical and scientific books for 1870, published by Henry Carey Baird, 406 Walnut street, Philadelphia. A glance at the contents shows that this enterprising publisher has placed within reach of all classes technical and practical information on nearly all industrial subjects. A peculiar feature of these publications is that among them may be found those suited to men of limited education, as well as those of a higher order for the fully educated and informed. It is their practical character that has given the publications of Mr. Baird their great popularity. The present catalogue is the finest collection of this class of literature we have ever seen. Sent by mail free of postage to any address.

WORKING MILLSTONES WITH AN AIR BLAST.

Extensive litigation, relating to the use of an air blast in running millstones, have, for some time, occupied a prominent position in English courts. These litigations possess little of interest to our readers, but the patented process which has given rise to the suits, has features of considerable value.

Mr. Bovill, the plaintiff in the action of Bovill vs. Smith, in his specification says:

"When working millstones with a blast of air I introduce a pipe to the millstone case, from a fan or other exhausting machine, so as to carry off all the warm dusty air blown through between the stones to a chamber, as hereafter described, by which the dust in the mill is avoided, and grinding improved, and this part of my invention relates only to sucking away the plenum of dusty air forced through the stones, and not to employing a sufficient exhausting power to induce a current of air between the millstones without a blast, this having been before practiced."



Mr. Bovill, in his English patent of 1846, published an arrangement for employing exhausting power to get the desired current of air through the grinding surfaces of the millstones, and at the same time avoid the inconvenience of passing the meal through the exhausting machine, and in 1846, a Mr. Debeaune registered under the Utility Designs Act, a plan of a set of millstones arranged round a central receiver, from the top of which a fan was to carry away, by exhaustion, the stive. The inconvenience sought to be avoided by Mr. Bovill's English patent of 1846 was one supposed to attend the working of Newton's earlier patent of that year, whose drawing showed the exhausting apparatus attached to the meal spout itself, so as to draw both meal and air through the grinding surfaces, and discharge both from the pan into a receiver. Mr. Bovill proposed to draw air through the grinding surfaces by exhaustion, but to avoid passing the meal through the exhausting apparatus, while Debeaune proposed to use the exhaust only to draw away the stive from the receiver, without seeking to increase the current of air between the grinding surfaces.

The defendant in Bovill vs. Smith used exhausting power only to draw away the stive from the millstone cases, and to blow it either into the open air, or into a non-porous stive room.

The general method in dispute is shown in the accompanying diagram, in which the stones are shown covered in, and made as near as possible air-tight, being supplied with air from the cold blast, which, when having passed through the stones, is drawn off by the extracting fan, A, thence into a small room, and into the open air.

The method has in various ways been modified and changed in its details; and so many have had a hand in its improvement that it is little wonder extensive litigation has grown out of it. In some instances both blast and exhaust fans have been employed. The air charged with flour dust is in some instances, passed through porous cloth to arrest the flour; and in other cases it is passed into a large room in which, the air emerging through ample screens with little force, the flour settles and is economized.

The advantages claimed are that the stones are kept much cooler, and thus a higher speed may be maintained, and a larger quantity of work performed; but so far as we can learn it has never been very popular in this country, although it has been tried in several large flouring establishments.

How Dualin is Made.

Wood of soft texture (for instance, pine or poplar) is reduced to small grains, resembling sawdust, treated with diluted acids, and then boiled in a solution of soda. After having been thoroughly dried, by a quick drying process, the cellulose is mixed with—

"No. 1. Niter and nitro-glycerin; or,

"No. 2. Being first changed into nitro-cellulose, by being treated with nitric acid (48° B.) and sulphuric acid (66° B.), it is then mixed with nitro-glycerin.

"No. 3. The dried cellulose is mixed with anhydrous glycerin, until the mass becomes of the consistency of thick broth. This is gradually treated to a bath composed of a mixture of sulphuric acid (66° B.) and nitric acid (48° B.) of eight to ten times its quantity, during which process the greatest care must be taken to stir the heated mixture, and cool it. The stirring is continued for at least half an hour, after which the mixture is placed in a water bath of ten times its quantity. The acid-water being repeatedly drawn off, and replaced by pure water, the mixture is now placed in a bath of diluted soda-lye. In this, it is stirred from one to two hours, again washed in pure water, and then rendered anhydrous by means of hot water heating, and treating it with concentrated sulphuric acid and chloride of calcium. After having been rendered anhydrous, it is mixed with cellulose, prepared by process described under No. 1, 2, or 4, until a dry and not very greasy powder is obtained. The dust is sifted out, and this, if packed into cartridges, is serviceable.

"No. 4. The cellulose is charred, finely pulverized, boiled in concentrated niter-lye, and after soda has been added, is rapidly dried, and mixed with nitro-glycerin or dualin, prepared by process No. 1, 2, or 3.

"No. 5. The process of preparing nitro-starch, another ingredient of dualin, is also new. It will prevent the formation of lumps after the starch has been subjected to the acids, and also render the dried preparation less sensitive to dampness.

"*a*. Starch is thoroughly dried until it assumes a yellowish-brown color. It is then finely pulverized, and mixed with anhydrous glycerin. The mass is slowly placed in a mixture of nitric acid (48° B.) and sulphuric acid (66° B.) of ten times its quantity, during which process the greatest care must again be taken to stir the mixture, and cool it. The stirring is continued for half an hour, when the mixture is placed in a water bath. The acid-water being repeatedly drawn off, and replaced by pure water, the mixture is now placed in a bath of soda-lye, then placed in another water bath, and finally rendered anhydrous by means of hot water heating, and treating it with concentrated sulphuric acid and the chloride of calcium. It is now pressed through a fine sieve, and mixed with either dried pulverized starch that has been treated with niter-lye, or it is mixed with cellulose, prepared as above described, until a dry and not very greasy powder is obtained.

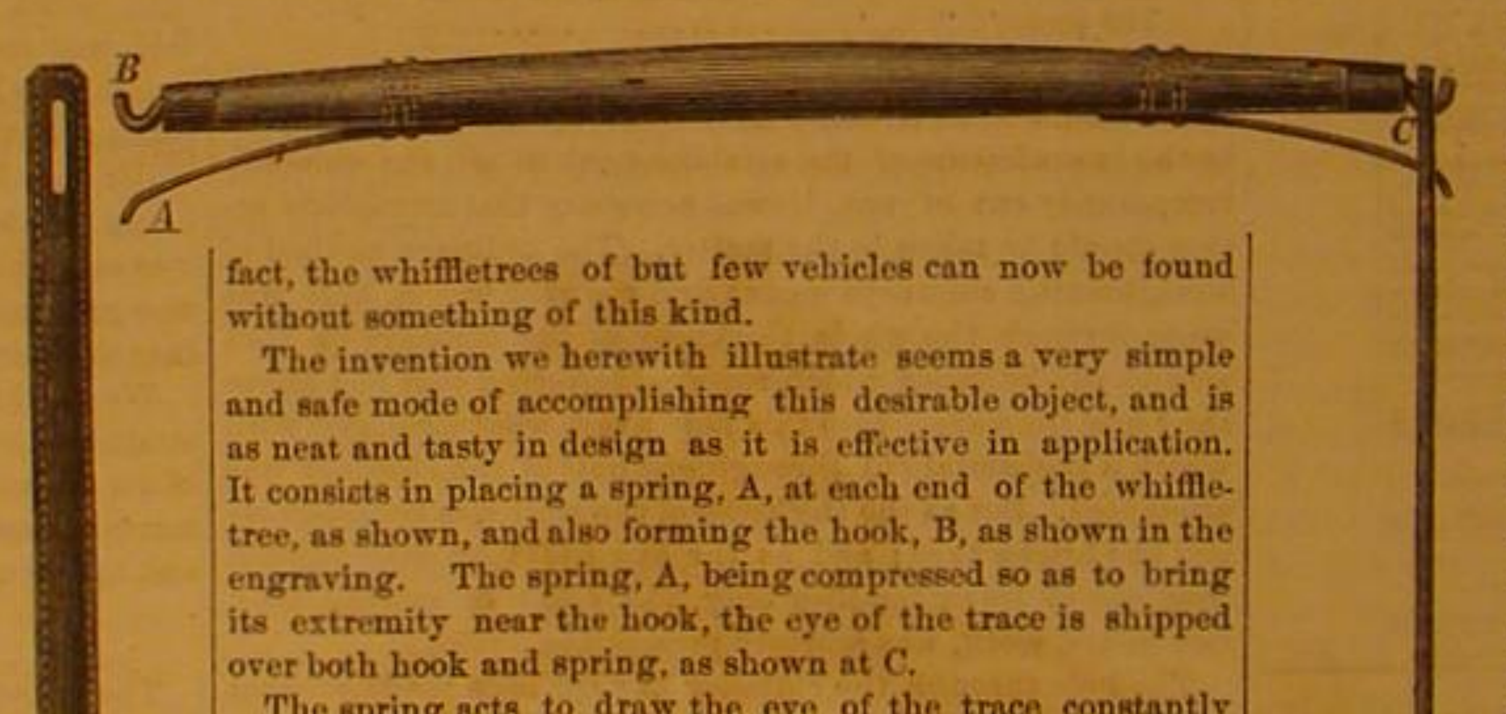
"*b*. After the starch has been dried, it is mixed with pulverized cellulose, or with the dualin-dust prepared by process No. 3. This mass is then placed in a mixture of nitric acid (48° B.) and sulphuric acid (66° B.), and for the rest, treated as described by process No. 5.

"No. 6. In an entirely analogous manner, mannite is mixed with anhydrous glycerin, and compounded with the other ingredients of dualin."

WILLIAM'S IMPROVED TRACELOCK.

The detachment of a trace from the whiffletrees of carriages is an accident which has often endangered, and not unfrequently sacrificed the lives of their occupants. When the occupants have escaped without injury, many a young and promising horse has taken fright and has been ruined for life.

Many devices designed to lock traces so that they cannot become detached, unless by design, have been made, and many of them have justly attained a wide popularity. In fact, the whiffletrees of but few vehicles can now be found without something of this kind.



The invention we herewith illustrate seems a very simple and safe mode of accomplishing this desirable object, and is as neat and tasty in design as it is effective in application. It consists in placing a spring, A, at each end of the whiffletree, as shown, and also forming the hook, B, as shown in the engraving. The spring, A, being compressed so as to bring its extremity near the hook, the eye of the trace is shipped over both hook and spring, as shown at C.

The spring acts to draw the eye of the trace constantly forward so as to prevent its disengagement from the hook except when it is compressed in the manner above described.

The device is exceedingly simple, and it will be seen is very easy to manipulate in the attachment or detachment of the traces. It deserves to become popular.

The inventor will sell either the entire patent or State rights.

Patented, through the Scientific American Patent Agency, Dec. 7, 1869, by Samuel P. Williams, of Rutland, Vt., who may be addressed for further particulars.

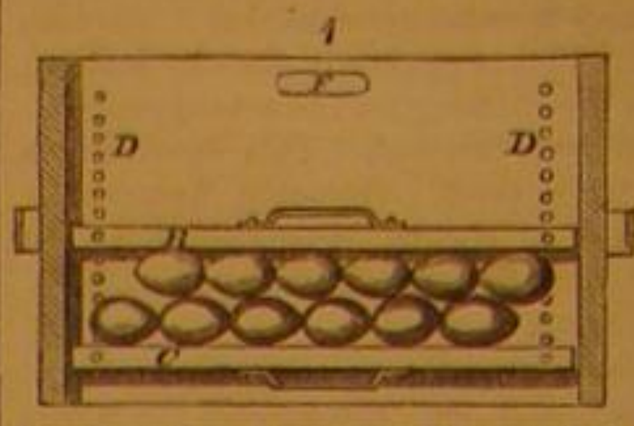
J. D. MICHAEL'S PATENT EGG BOX.

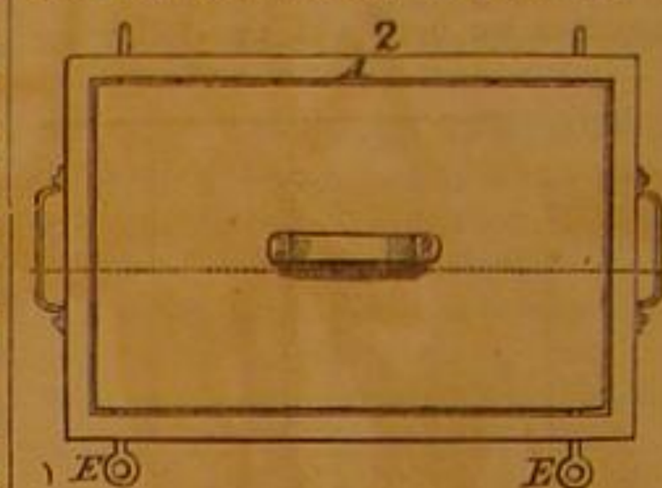
It is generally known that eggs keep much better and longer if frequently turned over, for if left lying on one side any length of time, the yolk will settle or sink until it reaches the shell; the egg is then too stale for use, and will soon be rotten. If turned over every few days, the yolk will not reach the shell so soon, and consequently the egg will keep a great deal longer.

It is a well known fact to persons conversant with natural history and the breeding of fowls, that the fowl when setting is known to turn her eggs over every day. She is taught by instinct that this is necessary. If the eggs were allowed to lie on one side during the three weeks required for hatching, the yolks would settle so that the eggs would spoil or not hatch. The heat from the fowl's body would hasten the spoiling of the eggs if they were allowed to remain in one position.

The design of this box is to provide a package for eggs, in which they can readily be turned over all together, whether the box be full or partially filled. This box would be very useful to parties who buy eggs and ship to market, also to persons who have a great many fowls, and especially useful to retailers of eggs, and in large families. An improvement has been made in the manufacture of these boxes, which will do away with the use of the rods, and make the box simpler and cheaper. For shipping purposes they can be provided with locks to prevent pilfering, while in transit.

Fig. 1 is a side view. Fig. 2 a surface or plan view of the same. The invention consists of a case or box, A, open at top and bottom, provided with boards, B C, arranged to be moved up and down and secured at any point within by running the rods, E, through the holes, D, and through holes bored in the ends of the boards, B C. Four iron eyes may be attached to each board, B C, to run the rods, E, through, and thus dispense with boring holes in the boards, B C. An additional board like B C, and two additional rods, E E, may be provided to be placed in the middle of large boxes to prevent breakage of eggs by accumulation of weight. Eggs for shipment should be packed with chaff or other packing to prevent breakage. Small boxes for local use need no packing.





These boxes would be useful for packing and shipping choice varieties of fruit in, by providing several boards to separate them into thin layers, and by making proper openings for ventilation. They may be also used for packing fruit and other articles.

This invention was patented through the Scientific American Patent Agency, Jan. 4, 1870, by J. D. Michael, No. 125 McElderry's Wharf, Baltimore, Md., who can be addressed for further information, rates of territory, etc.

The Moon as a Terrestrial Motor.

The *Railroad and Travelers' Journal* thus discourses:

"An ingenious civil engineer of Marseilles has discovered a mode of using the force of rising and falling tides as a motive power, and he thinks that this new motor can be made serviceable at a great distance from the sea. The name of the discoverer is Ferdinand Tommasi.

"The power of the moon's attraction has been used practically for a long time. The inhabitants of Long Island, while still colonists of Great Britain, ground their wheat and sawed their lumber by moon power. The ocean tide was suffered to fill mill ponds at flood, and the water so gathered was confined and used to drive undershot wheels after the tide had nearly ebbed. By this process, however, only an insignificant part of the tide power was employed. On every mile of ocean coast the power of the tide is sufficient to raise ten million tuns a distance of ten feet twice every day. The tidal power exerted in Delaware Bay alone would more than suffice to drive all the machinery now in use in the world. The chief difficulty in applying tide water as a mechanical motor is the want of strength in metals. If a cheap substance could be had of ten times the strength of steel this tide power could be gathered up and utilized. With such a metal a spiral spring, weighing a few hundred lbs. and wound up by the power of the tide, might be made to propel a railway car a hundred miles by means of a system of wheels like those which are driven by the main spring of a watch. While tidal power is in amount scarcely conceivable for its vastness, it is very slow in its vertical motion, the machinery by which it can be made directly available must therefore be of great strength and dimensions. The utilizing of the tidal motor has long been a subject of study among mechanicians and inventors, but the insufficiency of the strength of metals has been constantly in the way of a successful result. The same want is experienced in almost every branch of mechanical invention or improvement. The discovery of some chemical means by which the strength of steel could, without additional cost, be doubled, would realize the dreams even of those who seek the means of useful aerial navigation, and it would result in the application of steam-water and electro-magnetic power to very many new uses."

TO PREVENT THE ESCAPE OF GAS FROM INDIA-RUBBER TUBING.—India-rubber tubing is slightly permeable to gas. The amount which escapes through the walls of the tube is, however, very small; it may be advisable sometimes to render any escape impossible. This can be done by giving the tubing a thin coating of a varnish made by dissolving one part and a half of treacle and two parts of gum arabic in seven parts of white wine and three and a half parts of strong alcohol. The treacle and gum must first be dissolved in the beer or wine, and the alcohol must be added very slowly, constantly stirring the mixture, or the gum will be thrown down.

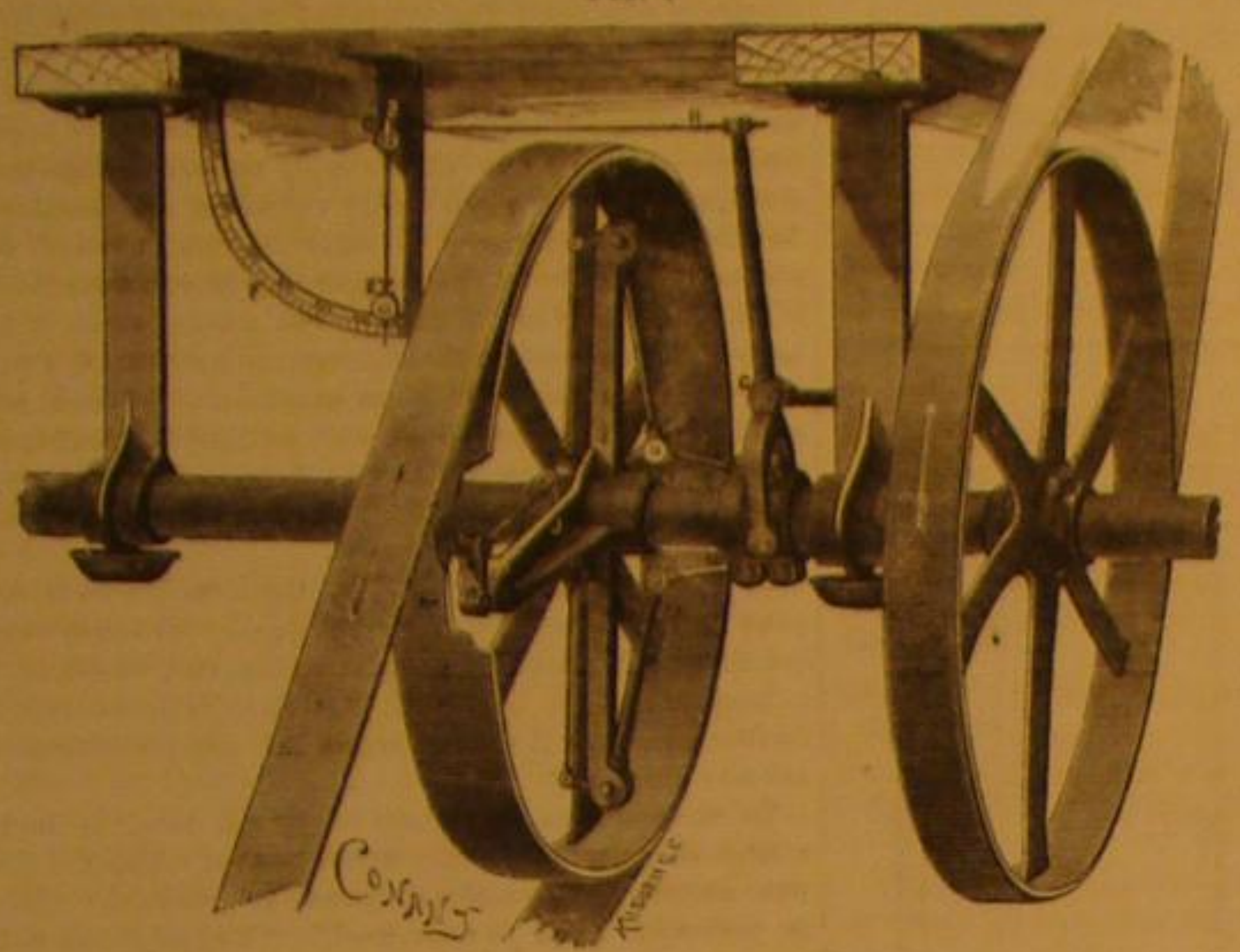
A PATENTEE, whose business had been conducted through this office, says: "I believe I have made enough from the few lines notice of my invention, printed in the SCIENTIFIC AMERICAN, to pay the cost of my patent."

The Measurement of Power---Emerson's Dynamometer.

The time when people were content to estimate the power of motors by guess is passed. If there is any one thing more than another that indicates the advance of mechanical science at the present day, it is the perfection of appliances whereby accurate knowledge of the relative performance of boilers, engines, water wheels, and motive power of all kinds can be accurately measured and determined.

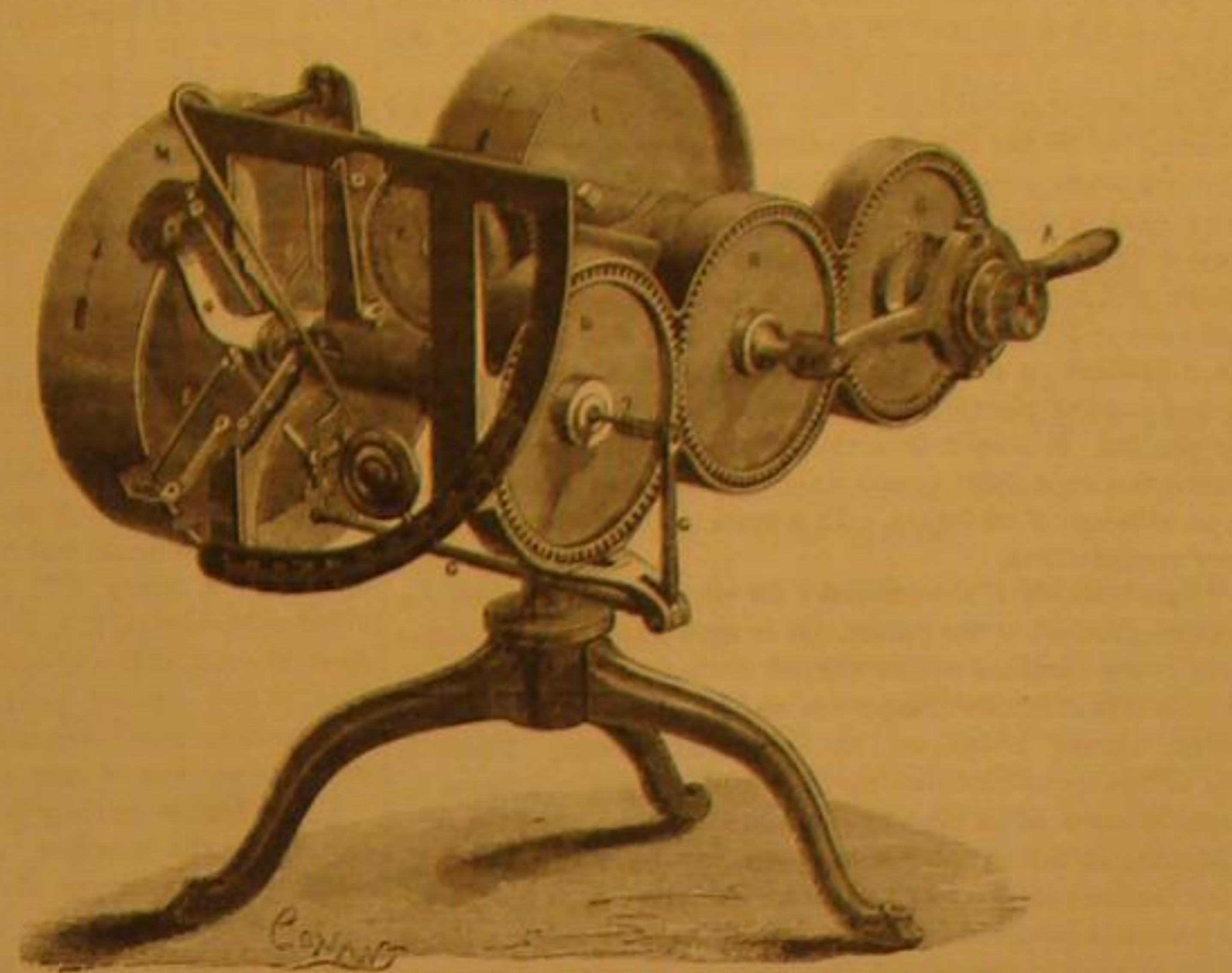
We this week give illustrations of the dynamometer invented by Mr. James Emerson, formerly of Worcester, now of Lowell, Mass. The stationary form of this instrument was illustrated and described on page 1, Vol. XX of the Scientific American, but the parts were not as fully shown as is desirable, and we herewith present another engraving, with a portion broken away to more fully exhibit its construction.

Fig. 1



EMERSON'S STATIONARY DYNAMOMETER.

Fig. 2.



EMERSON'S PORTABLE DYNAMOMETER.

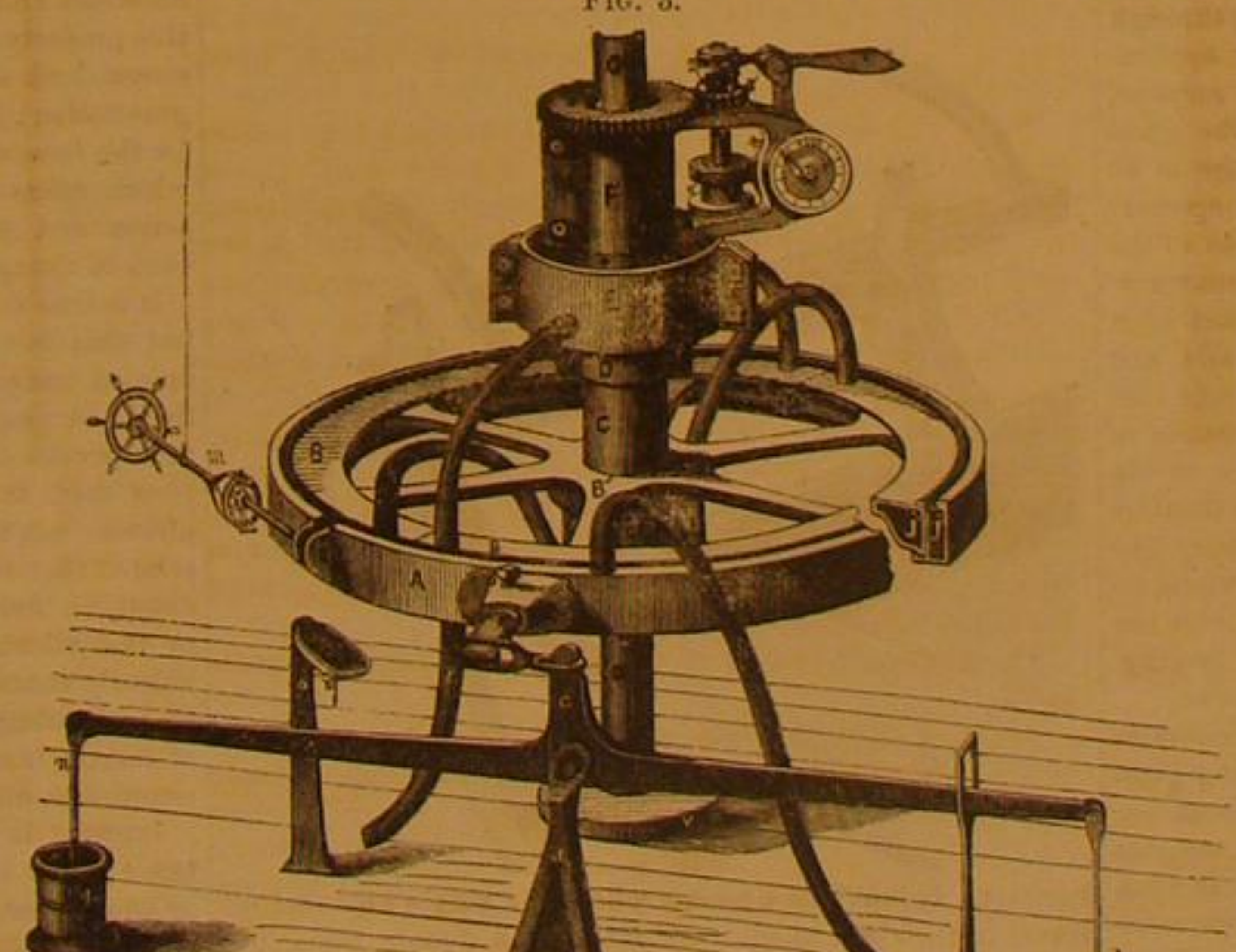
The pulley, A, is loose upon the shaft, but is made to revolve with it by the levers connected to its rim from the spider, J, which is keyed to the shaft. These levers are connected to the pendulum E. The arrangement is that of the platform scales, made rotary. The index is graduated and the whole tested by sealed weights, the same as any other scales. It is placed permanently upon the shaft, so that the power used may be known at any time. Its introduction demonstrates what we have often stated; namely, that little reliance can be placed in the common methods of estimating the amount of power used. We are informed that in one place, where it was claimed that but four-horse power was used, the dynamometer gave sixteen. Examination proved that one half was wasted by bad arrangements. In another case, 231-horse power was claimed; the dynamometer gave 145, and it was found upon examination that the head of water had been estimated from the bottom of the "pit" to the surface of water in the flume, and that the wheel was clogged with sticks and leaves, which were removed; then the dynamometer gave 190-horse power. Engines have been found that used abundance of fuel without giving out much power. A large dynamometer, measuring 250-horse power, in use at the Wamesit Power Company's works, at Lowell, Mass., for nearly two years, is seemingly as perfect and sensitive now, as the day it was put on.

The portable form of the dynamometer is shown in Fig. 2. The power to be measured is received from the motor shaft by the pulley lettered L, transmitted through the wheels, B, and the weighing apparatus to the pulley, M, which imparts it to the machinery to be driven.

This form of instrument is made of different sizes for testing pickers, looms, spinning frames, or any kind of mchinery.

It may be used where power is rented, but the stationary kind is far the best for that purpose. A tenant can always favor his power where the dynamometer is applied temporarily.

Fig. 3.



TESTING THE POWER OF TURBINE WATER WHEELS.

Fig. 3 is an engraving of Mr. Emerson's turbine dynamometer. The wheel, B, is secured to the shaft of the water wheel, and its speed controlled by the friction band, A, which is connected to the scale beam, as shown, the point of connection describing a circle of 13 feet. The rim of the wheel and the friction band are hollow, and are kept cool by a stream of cold water passing through them.

We are informed that in some tests made at Beloit, Mich., the scale beam was found to be readily balanced with an ounce weight, and the whole apparatus was so delicately constructed that a two-ounce weight added to the beam at *d*, equaling $2\frac{1}{2}$ pounds at the point of connection with the friction band, would cause a decrease of two revolutions when the wheel was running at 130 revolutions per minute. Substantially the same instrument was used at the Lowell tests dur-ng the last su[illegible] fall.

We are informed that in each case where two wheels, of the same kind, were tested the past season, a difference of two or more per cent was found, thus proving the necessity for each builder to have a place where his wheels can be readily tested and worked up to their best points.

The effect of the test, the past season, upon the water wheel trade, renders the fact patent that hereafter mill owners will require facts from actual test before purchasing wheels, and without doubt there will be plenty of testing the coming season; Mr. Emerson, with his dynamometer, will make arrangements by which it can be done at much less expense than heretofore; any one may have a private test, but henceforth, if a wheel is entered as a competitive wheel, the result will be published without fear or favor. Further information relating to these dynamometers, or in regard to test of water wheels, engines, or power, may be obtained of the patentee, by addressing James Emerson, Box 502, Lowell, Mass.

Metallic Spectra.

M. Robert Thalén has communicated to the Royal Society of Upsala, a memoir on the characteristic metallic lines of the spectrum, especially with reference to their wave-lengths. As ordinary spectroscopes do not give entirely accordant readings, varying as they do with temperature and other incidental circumstances, it is necessary in all cases to make the solar spectrum the basis of reference. Augström's "normal solar spectrum" was accordingly the normal starting-point of the author's researches; and, with this as his guide, he has succeeded in constructing a chart, which gives, in millimeters, the wave lengths of metallic lines within about 0·0000001 of their true value. Forty-five metals have been thus investigated, and their spectra mapped. Of these, the following give lines coinciding with those in the solar spectrum: Sodium, calcium, magnesium, iron, manganese, chromium, nickel, cobalt, and titanium. The discovery of the last-named coincidence is due to M. Thalén himself.

The Japs in California---An Interesting Sketch of the Colony near Gold Hill.

Up to this time the Japanese have accommodated themselves in their household matters at considerable inconvenience; but this will soon be at an end, and in a few weeks they will be settled down as comfortably as you please, with houses of their own, each family reposing "under its own vine and fig-tree." Among their number are four carpenters, and these men are now engaged in erecting buildings for the use of the party. The houses are to be twelve in number, dimensions thirty-six by thirty, each containing four rooms, and built after the real Japanese fashion, with low, pitched roofs, the eaves extending far over the sills, and forming a balcony or awning around the entire house. The outer walls and partitions are all of sliding pannels, that can be shut together at the corners and folded into boxes, leaving nothing but the roof and its supports during the hot summer days, affording a luxury that can only be exceeded by "taking off your flesh and sitting in your bones." The partition walls are of paper, the outer walls of wood; one room is to be used as a sleeping room, another as a kitchen, and the two others—in each house—for silk raising, where the worms will be kept and nursed, and the silk woven and otherwise manipulated. I had omitted to mention that silk culture will form an important branch of this enterprise, fifty thousand mulberry plants having already been set out for a beginning. The Japanese carpenters are ingenious workmen, and their work is done with marvelous neatness. A curious feature of their houses is that they do not contain a nail, all of the joints and timbers being dovetailed together by many ingenious devices, and the whole work, even to the rafters, is as smooth as if it had been polished down with sand-paper. And the Japanese are a neat people, for they use no paint to hide any blemishes of construction or ornamentation, no filigree work or plaster of Paris gewgaws, but every stick in the building is exposed. Every morning, as regularly as she cooks the breakfast or sweeps the floor, the Japanese housewife takes a wet cloth and scours the whole interior of the dwelling, leaving no part untouched, and no stain or dirt spot to mar its cleanly appearance. Then the Japanese do not come into the house with muddy boots after the style of the American "sovereign;" but having covered the floor with a neat matting, always removes the dirty sandals before stepping upon it.

I stood and watched the Japanese carpenters at their work for some minutes, and noticed the peculiarity of their movements. The Japanese works "toward him"—that is, instead of shoving a plane from him, he reaches out, sets the plane upon the board at arm's length, and pulls it toward him; and he cuts, saws, and chops in the same way. His saws are fixed in handles, like a butcher's cleaver, and the teeth slant or "rake" toward the handle. The planes are constructed like ours, but the wooden portion is very thin and wide. The adze is fastened to the end of a hooped stick like the handle of one of the crooked canes that are worn on the arm on Montgomery street, and altogether their tools are different from ours, yet I cannot observe that they are awkward in appearance or awkwardly handled. The men are bright, intelligent, and polite, lifting their hats and bowing gracefully to strangers; and the women stay at home, do their cooking, take care of the babies, keep the house in order, and manage pretty much as American housewives, even to the wearing of the Grecian bend. Take them all in all, they are in every respect a superior race to the Chinese, and resemble them in no manner except in their physical appearance.—*San Francisco Paper.*

Keeping Iron and Steel Goods from Rust.—Iron and steel goods of all descriptions are kept free from rust in the following manner: Dissolve ½ oz. of camphor in 1 lb. of hog's lard, take off the scum, and mix as much black-lead as will give the mixture an iron color. Iron and steel goods, as well as machinery of all kinds, rubbed over with this mixture, and left with it on for twenty-four hours, and then rubbed with a linen cloth, will keep clean for months. If the machinery is for exportation it should be kept thickly coated with this during the voyage.

[For the Scientific American.]

PLATINIZED LOOKING-GLASSES.

BY C. WIDEMANN.

NO. III.

It is now unnecessary to use glass free from color or to require parallelisms of the two surfaces. Bubbles of air, stripes, foreign bodies, pieces of the pots, etc., etc., do not interfere with the process. There is then an economy of 50 per cent in the glass.

In order to manufacture a looking-glass of 5 millimeters thickness, they use at the St. Gobain works a plate measuring 10 millimeters thickness. At the Wailly-sur-Aisne works plates are used having but 7·5 millimeters thickness, as it is only necessary to polish the glass on one side. From this a saving is made of 25 per cent on the thickness of the glass.

Very correct calculations show that Mr. Dodé secures an economy of 80 per cent on platinized glasses, as he uses for that purposes only inferior glass, commonly used for flagons; even common brittle glass can be used without the least difficulty. To this saving there is another to be added, which will astonish the reader. A square meter of glass absorbs about 183 grammes of mercury and 550 grammes of tin, representing about a cost of 4 francs, 40 centimes. A square yard of platinized glass costs 1 franc and 20 centimes for platina. It results from this, that at the Wailly-sur-Aisne works, the superficial square yard of platinized glass is sold at an average of 25 francs. This price is doubled in the mercury manufacture.

There is another circumstance for which this new process is recommended to the public. It is with great difficulty that mirrors are obtained with a curved surface. By the platina process this difficulty disappears, and it is as easy to manufacture curved, round, etc., as horizontal mirrors. There is also no inconvenience arising from upsetting the glasses in transportation, or in placing them in the frame.

Already in this country a company has been organized to manufacture reflectors by the means of silver mica leaves on the posterior face, and fastened together so as to obtain a large reflective surface possessing the desired curves. They are cheap, and easily repaired; but they meet with two great difficulties: the quick alteration ofthe silvery surface caused by the hydrosulphurous gases of coal with which locomotive reflectors are always in contact, and the want of transparency of the mica and its yellow color. I have no doubt that by the adoption of the platina these evils would have found their remedy, for, as it has been seen before, the reflecting surface is on the anterior part of the glass.

A quite peculiar property of the platinized mirrors will no doubt be applied by architects. The platinized glasses forming mirrors are transparent when the light passes through them. A person placed in the rear of an office can see everything going on in the front office without himself being seen. I insist particularly on this property; it appears to me to give to the platinized glass quite a new application which will increase its sales. This transparency is easily explained considering the small quantity of platina deposited on the glass, which quantity is not large enough to give opacity to the glass and prevent the luminous rays from passing through it. This transparency has received a very amusing application quite lately in Paris, mirrors called *mirrors á surprise*, are sold, which, when a black paper at the back of the glass is removed, allows a photograph or any other image to be seen through the metallized surface appearing as a specter; this photograph is simply applied at the posterior side of the reflecting part, and oiled in order to add to its transparency This toy is varied in very different ways, and has just been applied in the new play of "The White Cat" at Paris, and has caused an immense sensation. So I have no doubt that the inventive mind of the Americans will find thousands of applications for this property, either in applying it to the decoration of stores or to external ornamentation. In theaters or concert halls among flowers it produces the most fairy-like effect. The window glasses of a parlor made thus would be transparent in day time, and at night, when the shutters are closed, the whole window would appear as a large looking-glass, and reflect all lights and objects in the apartment.

The manufacture of glasses with amalgam necessitates great labor. In order to obtain 50 meters of looking-glass a large number of hands and a large plot of ground are required. These glasses must remain loaded with weights from 15 to 20 days; then 20 days more are required to eliminate the superabundance of mercury, and three months more are required before they are salable; not to mention all the precautions that have to be taken at every moment in the shipping and setting in frame. Mr. Dodé & Faure are able to platinize a surface of 800 meters a day, with only the aid of a few hands, as one workmen is able to platinize 50 meters of glass in 12 hours' work.

To Soften Putty and Remove Paint.—To destroy paint on old doors, etc., and to soften putty in window frames, so that the glass may be taken out without breakage or cutting, take 1 lb. of American pearlash, 3 lbs. of quick stone lime, slack the lime in water, then add the pearlash, and make the whole about the consistence of paint. Apply it to both sides of the glass, and let it remain for twelve hours, when the putty will be so softened that the glass may be taken out of the frame without being cut, and with the greatest facility. To destroy paint lay the above over the whole body of the work which is required to be cleaned with an old brush (as it will spoil a new one), let it remain for twelve or fourteen hours, when the paint can be easily scraped off. This recipe has been used by a tradesman, a painter and glazier by trade, for years.

[For the Scientific American.]

APPARATUS FOR PURIFYING THE AIR BY THE EVAPORATION OF COAL TAR, PITCH, CARBOLIC ACID, PHENIC ACID, OR ANY OTHER DISINFECTANT FOR APARTMENTS, OR HOSPITALS.

BY C. WIDEMANN.

This apparatus consists of a zinc box, A B, C D, into

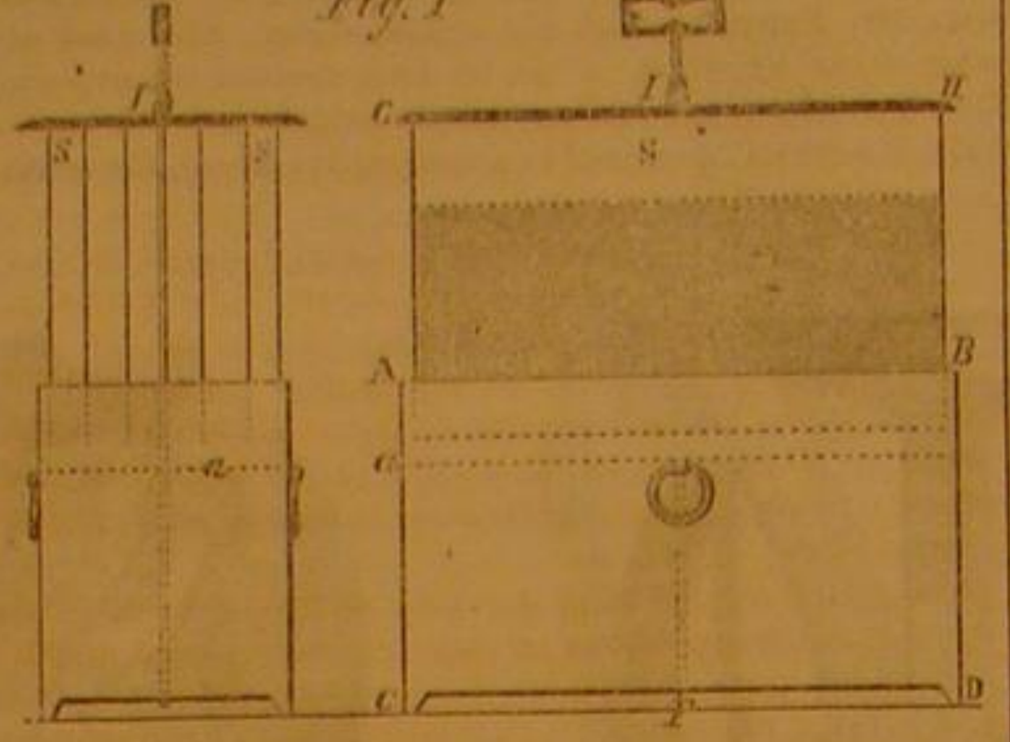
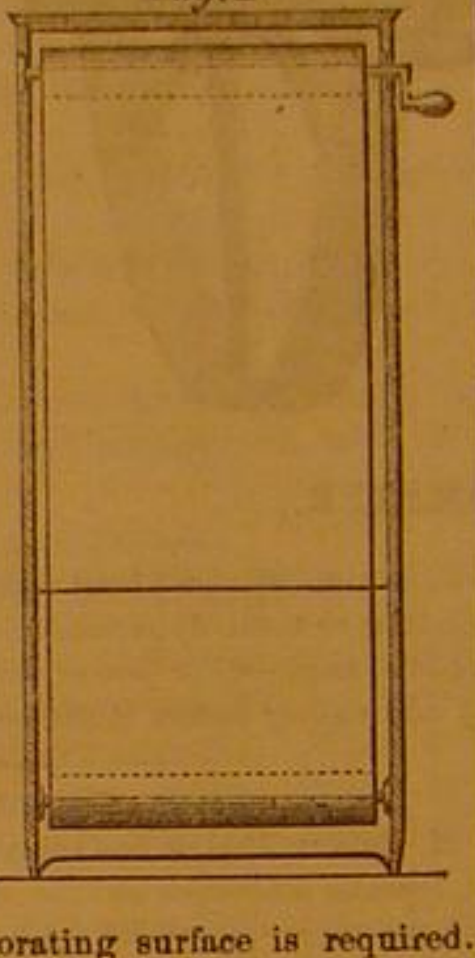


Fig. 1

which the liquid to be evaporated is poured, until it reaches *a, a*. In the middle of the box a rod, E F, passes, this rod is provided at its upper end with notches. A cover, G H, provided with blades, S, S, slides down the rod, E F, and can be fixed in any desired position by a hook spring, I, engaging with the notches of said rod.

Fig. 2

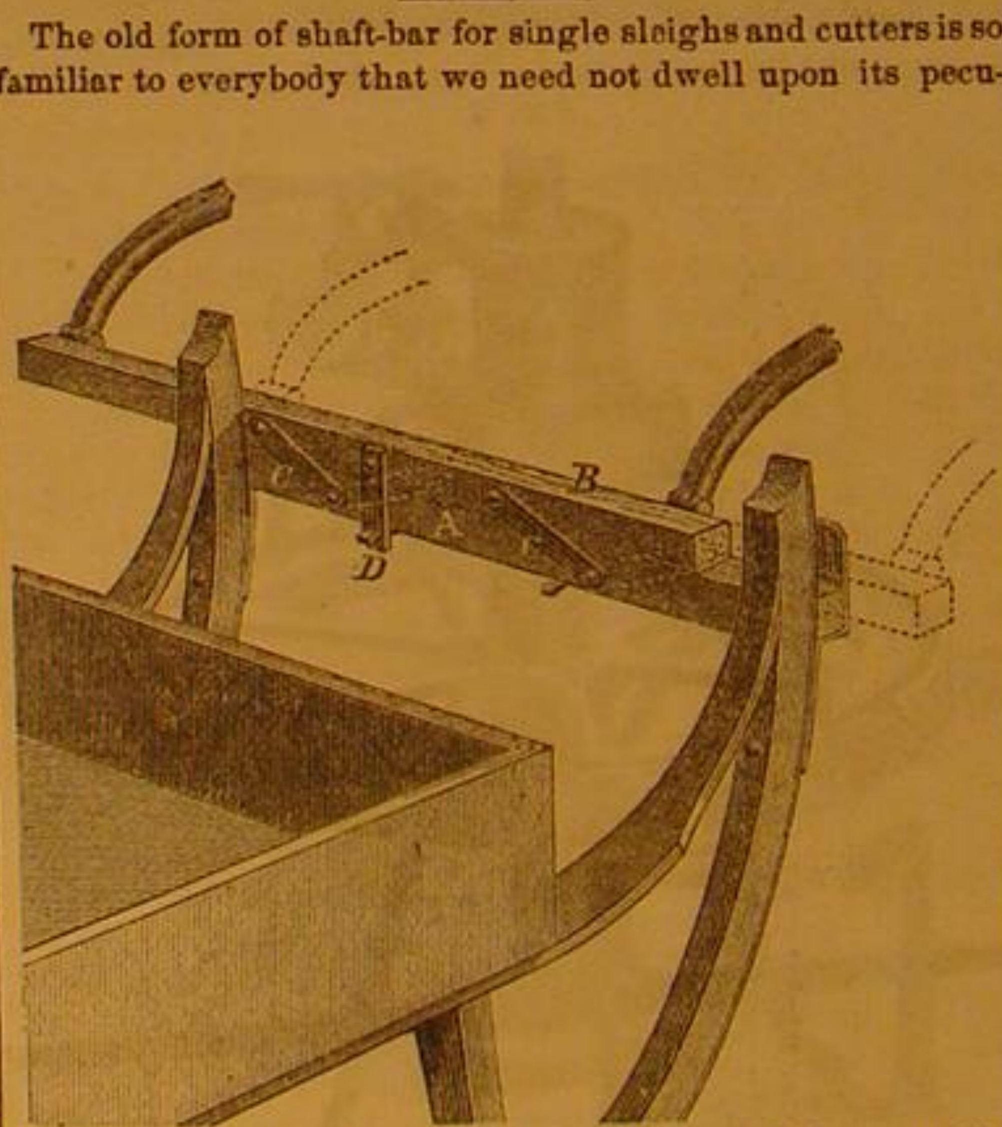


These blades having been dipped in the solution, are raised by sliding them along with the cover, and the air passing through them is saturated with the disinfecting agent. As soon as these blades begin to dry, they are re-dipped in the liquid, and raised as above described—Fig. 1.

This apparatus is very simple, and can be made of wood, tin, or any suitable metal. For hospitals the apparatus is a little modified, as more evaporating surface is required. It consists in an endless cloth passing over two rollers, and dipping in the solution, as shown in Fig. 2.

L. S. CLARK'S IMPROVED SHAFT-BAR FOR SINGLE SLEIGHS.

The old form of shaft-bar for single sleighs and cutters is so familiar to everybody that we need not dwell upon its pecu-



liarities. It provided a means whereby a single horse might travel in the right hand track made by a double team, but whenever it was desired to place the horse directly in front of the sleigh, it was found necessary to have a second pair of attachments. To make the change occupied some time, and required frequently the use of a hammer and wrench to effect it.

The device we herewith illustrate provides a means whereby this change can be effected in an instant of time without tools, and without even taking the horse out of the shafts.

The shaft-bar is double; one portion, A, being permanently fixed to the runners of the sleigh, and the other portion, B, being connected by two bars, C, with A. The bars, C, are pivoted to both A and B. When the horse is desired to travel in the right-hand track, the bar, B, is placed in the position shown, and locked at the fixed bar, A, by the spring latch-bar, D.

When it is desired to have the horse travel directly in front of the middle of the sleigh, all that is necessary is to release D, and throw B over so that it occupies the position shown by the dotted outline, and fasten it there by the latch, D. The change is effected by the hands alone, and scarcely three seconds are necessary to make it.

Patented, through the Scientific American Patent Agency, February 8, 1870, by L. S. Clark, of Bethel, Conn. For town, county, or State rights, address G. M. Lyon & Co., Bethel, Conn.

Correspondence.

The Editors are not responsible for the Opinions expressed by their Correspondents.

Inertia---Vis Inertiæ---What are They?

Messrs. Editors:—In a late work, entitled "Force and nature," it is strenuously denied that there is any such thing as inertia in matter. The author bases this denial simply upon the alleged fact, that all matter is in motion; showing that he conceives inertia to be something that pertains only to matter at rest. He is evidently one of those amateur philosophers who enter the temple of science through its third or fourth-story windows,and never take the trouble to descend and examine its foundations, its axioms and definitions; yet he thinks himself competent to demolish the entire fabric and reconstruct it on a new plan, simply because he has traveled much, and seen a great many volcanoes and earthquakes. As the book is destined to early oblivion, it would be unnecessary to notice its error concerning inertia were this error to be found only in its pages; but similar views of inertia have been expressed in the Scientific American, a publication which is rarely at fault on questions of physical science, and to which thousands look with well-placed confidence for sound advice and instruction on this and other subjects. Errors in such a publication are the more likely to mislead, because they are of rare occurrence.

On pages 217 and 297, Vol. XX., the term inertia is objected to as having received various definitions: as being negative, indefinite, and uncertain in its meaning, and, therefore, liable to mislead; and it is alleged, that there is no occasion for its further use, since it had its origin in "notions of force which are now obsolete."

To the assertion that there is no such thing as inertia in matter,an appropriate reply would be that which the Romans were accustomed to make to absurd propositions: *Nil intra in pruno, nil extra in nuce duri!* "You might as well tell me that prunes have no stones, and nuts have no shells!"

That there is in matter a property which makes it necessary to employ force to impart motion to it, or to increase, diminish, or change the direction of a motion already imparted, is a fact,as well known to us as that prunes have stones, or that nuts have shells; as well known, indeed, as the existence of matter itself; for it is one of the chief characteristics whereby we recognize the existence of matter as a substantive entity. This is the property to which physicists have given the name of inertia. It is not a negative but a positive property, pertaining alike to all matter irrespective of the question whether it be in motion or at rest.

This property of matter was recognized, and received its name, prior to the time of Newton. Newton recognized it and accepted the name, declaring it to be well chosen, as happily indicating the nature of the property; and under this name he made inertia one of the fundamental axioms of his system of physics in the Principia. It is no more possible to construct an inductive system of physics without recognizing this property of matter as a fundamental axiom, than to construct such a system without recognizing the property of gravitation; indeed, to ignore the one, is to ignore the other; for the force of gravitation can have no influence upon matter which offers no resistance. The functions of the two, like action and reaction, are necessary correlatives, inseparable even in thought.

It is true that many definitions have been given of inertia; but this fact does not imply that there is any difference of opinion among physicists as to the nature of the thing defined. A property of matter can only be defined by reference to its modes of manifestation. The property of inertia manifests itself in various ways, thus admitting of as many definitions; but these different modes of manifestation are so correlated that each necessarily implies all the others, so that a definition founded upon any one of these, points us directly to that which is the common cause of all of them, and sufficiently characterizes it for all the purposes of a definition. The following, however,is perhaps a more complete definition of inertia, inasmuch as it is founded upon a feature which is common to all of its modes of manifestation.

Inertia is that property of matter whereby it offers resistance to the action of any force which imparts motion to it, or which increases, diminishes, or changes the direction of a motion already imparted.

Vis inertiæ is the resistance thus offered, viewed with reference to some standard of measurement that comports with its nature as a magnitude.

We see, then, the difference between inertia and vis inertiæ: the first is the property of matter which causes its resistance to changes of motion; the second is the resistance itself considered as a measurable quantity. The "notions of force," entertained by those who recognized inertia as a property of matter and gave it its name, and which are alleged to have become obsolete, were the same as those entertained by Newton, and upon which he constructed his system of physics. He employed the term force to denote a simple quantity, expressible by the single algebraic symbol F, having but one dimension, and referable to simple gravity as its standard of measurement. He did not give that name to the products of of F by other quantities, as by time, F t, or by space, F s; nor to what has been called "the force of a moving body," meaning its power to produce effects during the extinction of its motion; a power which is proportional to the product of its mass and velocity, M v, when the effect to be produced is the extinction or production of motion in other matter, and to $M v^2$, when the effect contemplated is such as belongs to the department of terrestrial mechanics. Subsequent writers have used the term force not only to denote that which Newton expressed by F, but also to denote all those other varied and complex quantities totally differing from F, and from each other in their natures as magnitudes. It is this abuse of the term force which has led to all the confusion and error complained of in the articles referred to: and we shall not escape from this "slough of metaphysics" by adding another to the things miscalled force, as is proposed in the proposition "force is motion and motion is force." The true way of escape is to go back to the employment of the term to signify nothing but F,—force pure and simple.

It has been supposed by some, who perhaps have given little thought to the subject, that the theory of Tyndall, and other philosophers, in regard to the convertibility of force into various modes of molecular motion, causing, as they allege, the different phenomena of heat, electricity, etc., and the re-convertibility of these into force, is destined to change all our previous notions of force, and even of the nature of matter itself. It was, perhaps, in view of this theory, and of the attention which has been drawn to it, that the old "notions of force" are alleged to have become obsolete. There could be no greater mistake than this. These philosophers themselves take no such view of the bearing of their theory, but regard it as tending only to extend, not to subvert the Newtonian philosophy. They suppose their molecular motions to be produced, and changed from one "mode of motion" to another, by force, acting upon the inertia of the molecules in perfect accordance with, and obedience to the laws of motion, as laid down by Newton.

This theory of molecular motions is purely speculative, and may or may not be true. It owes the attention which it has attracted, more to the reputation of its authors, and to the enthusiasm and persistency with which it has been urged, than to the force of the facts to which they appeal for its support, or to any intrinsic probability of its truth. When those adventitious supports are withdrawn, and the theory is left to stand upon its own merits, it may become obsolete; but Newton's "notions of force" and inertia, being simple conceptions of facts and truths of nature as they actually exist, can never become obsolete while any sound philosophy remains, nor until truth itself becomes obsolete. ELI W. BLAKE.

New Haven, Conn.

Dying Wool Green---An Invention Wanted.

MESSRS. EDITORS:—I find an article on aniline green, on page 121, current volume, of the SCIENTIFIC AMERICAN, and as I am a practical dyer I feel an interest in these matters. I, therefore, take the liberty to address you on the subject.

Inclosed please find a few samples of iodine green on wool and cotton. The wool was boiled for two hours.

I find that the best way is to ascertain the nature of a new article, then proceed accordingly. The color is not injured by boiling, if no silicate of soda is used. We ought in coloring always, if we can, to use such substances as will not be affected in contact with the chemical influence of light. Any soda combination and the neutralization thereof with sulphuric acid does not accomplish this end. I find that tin oxide has more affinity for oxygen and is better adapted to secure permanency of the color, and not using any combinations of soda the color will not be destroyed by heat, and consequently the wool will be thoroughly colored through.

Professor Hofmann and Dr. Reimann have done great things in aniline dyeing, but it must be admitted that those practical chemists only peep, for want of time, into practical dyeing, while we practical dyers have only time to peep into the beautiful science of chemistry. I wrote a work, now out, on practical dyeing, a circular of which I inclose for your kind perusal.

Apropos, as I am now writing, I might mention that my brother writes me from Minnesota that after thrashing time "the heavens will be lighted up by fires of burning straw," the ashes of which give a universal fertilizer. But he says the straw plowed in keeps the land stronger for raising crops. I advised him to wet it with ammonia water and heap it up, as its length is objectionable to plowing, then it would rot and crumble. He replied that a straw cutter attached to the thrasher to cut the straw fine in one operation would be profitable to an inventor, and beneficial to the farmers of that and other sections. E. C. HASERICK.

Lake Village, N. H.

[The specimens of green sent us are certainly very fine.—EDS.

Soft Solder and Silver Solder for Jewelers' Use.

MESSRS. EDITORS:—In your issue of February 26, current volume, you give a recipe for soft solder. Lead and tin equal parts. A stronger, easier flowing, and whiter solder for jewelers' use is composed of lead one part and tin two parts. When the lead is melted put in the tin and then throw in a small piece of resin as a flux.

In soldering fine work wet the parts to be joined with muriatic acid in which as much zinc has been dissolved as the acid will take up. It is cleaner than the old method of using Venice turpentine or resin.

The best method of making silver solder may be useful to some of your readers—young mechanics especially who have not obtained the information during their apprenticeship. Put into a clean crucible pure silver two parts, clean brass one part, with a small piece of borax. Melt and pour into ingot. Formerly I used to return the solder to the crucible for a second melting, but it is not necessary. The solder flows easily and clean.

Solder made from coin, as it frequently is, often melts with difficulty, and remains lumpy around the joints requiring the use of the file to remove it, while the addition of any of the inferior metals to the solder causes it to eat into the article joined by it. ALEX. ALLAN.

New York city

Cheap Cotton Presses.

MESSRS. EDITORS:—I have noticed, with much interest, in your issues of January 1st and February 12th, some remarks concerning cotton presses.

I am of opinion that both correspondents are laboring under mistaken notions concerning the real wants of the planter. I believe it to be impracticable to construct a baling press that will be cheap and as powerful as would be required to bring cotton to a density of forty pounds per foot. Admitting it could be done, there are two great obstacles to be overcome, which I am of the opinion the combined efforts of all the press builders could not surmount.

1st. The planter in the Mississippi Valley pays freight per bale, and not by the 100 pounds, and the cry is for presses of greater capacity, instead of a reduction as advocated.

2d. Purchasing agents receive orders from home and foreign speculators and manufacturers, to buy a quantity of cotton of a certain grade; to do so, every bale must be sampled in order to know whether they are obtaining the quality of cotton required.

It is laborious to force the sampling auger into a bale with a density of ten or fifteen pounds per foot. Imagine the "knights" of the auger trying to penetrate the heart of a bale of cotton at two, three, or four places with a density of forty pounds per cubic foot to ascertain if it is exactly what he is looking for. He could produce a similar effect on a pine log when seasoned, or a better one, perhaps, as it is of less density than forty pounds per foot.

When manufacturers and speculators agree to purchase cotton without sampling, and steamboats carry by weight, then it may do to compress on the farm, providing a cheap press can be invented to do the compressing to the satisfaction of the planter.

It is asserted that manufacturers would receive their cotton in better order. Admitting this to be so, they are certainly laboring under a great disadvantage by not knowing the quality of a single bale of cotton in their storehouse, provided such an arrangement were perfected. As it is now, they receive the cotton sampled, classed, and marked; by the marks and classifications any grade can be selected readily. Not so, if compressed on the farm, and sold regardless of samples, which must be the case if compressed. I have ascertained by actual measurement that the average size of bales are about thirty-five cubic feet, and as the average weight is less than five hundred pounds the density is less than fourteen pounds. Compressed cotton will average about eighteen feet after expansion, and about twenty-eight pounds per cubic foot. Now if some inventive genius can construct a very cheap press that will handle two or three hundred bales per day, and bring them to a density of forty pounds per foot, I have no doubt but he could do a flourishing business in seaports in opposition to hydrostatic and steam presses.

Memphis, Tenn. E. L. MORSE.

Value of the "Scientific American"---Portable Saw Mills.

MESSRS. EDITORS:—Allow me to express my sincere thanks for your generous advice and prompt manner in obtaining a patent for my concrete pavement.

I am and have been a constant subscriber for your valuable journal since 1865, and expect to be as long as I live. I frequently find one single paragraph in it that repays me for a whole year's subscription. I especially remember one in regard to setting boilers. I have a tubular boiler that was more expense than profit to me until I learned the proper way to set it; and I am sure, in the article referred to, the information has paid me more than the price of a dozen years' subscriptions.

I notice in No. 8, current volume, that one of your correspondents, who signs his name C. E. Grandy, has discovered a new way to burn green wood, and has sawed 10,000 feet of lumber in nine and a half hours with a 20-horse power engine.

I think his plan in burning wood for fuel is excellent, but I think the above amount of lumber is a great deal to saw with a 20-horse power.

I will not dispute his word, but I have built a number of mills and I never could make them saw so much. The only one I tried was a 12-horse power; the belt ran direct from the crank-shaft pulley to the saw arbor; circular saw 46 inch; speed 600 per minute; with all the modern improvements, and the most I could saw was 2,500 feet, ¾ boards, from white wood logs. HIRAM M. CONKLIN.

Carlstadt, N. J.

Construction of Portable Boilers.

MESSRS. EDITORS:—I am a practical boiler maker of over thirty years' experience, and as such I feel safe in answering C. E. Grandy's question in your issue of the 19th February.

The fire will not injure the rivets providing the boiler is kept clear of deposits, and the true way to arrive at this very desirable result is to pump up the boiler to the upper gage once a day, and blow out with a full head of steam to the middle gage (there should be at least three gages attached to all boilers). Mr. Grandy had recourse to a very ingenious device in alteration of furnace, but this would not be at all necessary if the boiler possessed proper proportions. The grate surface being so small (26 by 36 in.) and the furnace so low (26 in.) the heat from fuel passed into the tubes in form of smoke, and having no chance to expand, passed out of smoke stack in same condition; now having his furnace built in brick work beneath the boiler, his original furnace answers as a combustion chamber, where the smoke ignites into a clear flame, and hence the result; but the great primary cause of this trouble lay in the boiler not being of sufficient capacity to do his work.

It would be much more satisfactory (at least to me) if he had given the diameter of cylinder, speed of engine, etc., than to state that his engine was 20-horse power. Herein lies the great mistake of many manufacturers of steam engines, particularly of the portable kind, they do not give sufficient boiler to generate the necessary amount of steam except by the use of the very best fuel. Now I will give you what I consider the right proportion of a 20-H. P. portable boiler: Steam cylinder, 10 in. diameter; stroke, 18 in.; speed 120 revolutions per minute; boiler furnace 52 in. long, 38 in. wide, 40 in. high; 88 tubes 2 in. diameter by 7 feet long. Thus you will perceive that this boiler is as it should be, large enough to supply the engine with steam with green sawdust and slabs as fuel, running a 54-in. saw, and in many instances a shingle mill; and each boiler tested before leaving the boiler department at least 160 pounds hydrostatic pressure.

I am a constant reader of your valuable paper; it is of infinite value to me. I consider it worth more than all the story trash of your city put together. It makes my blood run cold when I read in your paper of so many explosions of steam boilers—at least one half caused by misconstruction of new, and improper care and repairs of old boilers.

PATRICK QUINN.

South New Market, N. H.

Dangerous Stoves.

MESSRS. EDITORS:—Permit me to address you upon a subject fraught with interest to all who use *stoves*, as one of the victims of one of the vilest annoyances and dangers incident to civilized domestic life. I allude to those most provoking and dangerous things—as much to be dreaded and shunned as an ignited bomb-shell, or an "infernal machine"—stoves made with *insecure "feet,"* legs or supports; with these indispensable appendages pretended to be fastened (?) to the stove, or provided with a means of attachment in setting it up in its place.

It sounds very amusing, sometimes, to read or hear descriptions of the "miseries" of stove and pipe placing, fitting, and adjusting, under the head of "Putting up Stoves," but there is quite another and more serious point of view of the whole subject. After many a most vexatious experience with stoves ill fitted and ill furnished with feet, the following occurrence recently took place in the writer's own family. An "air-tight," wood-consuming stove, connected with a long range of pipe, and a large "drum" in an upper room, was well supplied with fuel, and contained a glowing fire. One of its feet was discovered to have *fallen* out, by a little child who happened to be alone in the room at the time. The child, fearing the stove would fall over, attempted to replace the stray foot, when the stove fell over with a crash, endangering the life of the child, and scattering pipe, ashes, fire, and danger in all directions over the carpeted floor, besides consternation all over the house, and breaking the stove. It was a narrow escape from a serious calamity, but it was at the same time excessively alarming and troublesome, calling for much labor in two stories of the house.

Is there no simple, and at the same time effectual mode, not only of attaching, but of securely *fastening* the feet of stoves *to* the stove, as to form part and parcel of it, whether standing, or when moved from place to place, instead of the miserable tapering "dove-tail" insertion so commonly in use for stoves of all sizes and descriptions? And should it not be classed among the "catalogue of crimes," for stove makers to make and sell stoves with a "make believe" appendage at the bottom, which will be either so loose as to fall out of its place from its own weight or a slight jar, or so tight as only to go half way in?

Is there not in existence, in some available shape, the desideratum above alluded to? If so, your correspondent would be pleased to be informed what it is like, and also why it is not in general use among founders? If there is such a thing, why, in the name of common sense and common safety, do we not have the benefit of it accordingly, as well as of the thousands of inventions of minor importance? And why should stove makers not be compelled to provide for safety in this respect, as well as those using steam engines to see to the safety of their boilers? *

A Suggestion to Boiler and Engine Builders.

MESSRS. EDITORS:—I have had considerable experience in the brass and machine business, and have experienced a great deal of inconvenience in the practice of the different machine shops and boiler makers in tapping holes for cylinder, gage, and pump cocks with a variety of different threads and sizes. I take this method of suggesting to the boiler and engine builders, through your valuable paper, a uniform system of size and thread by using the standard gas taps, which are suitable, and, I think, could be adopted with considerable advantage to all concerned throughout the United States.

ISAAC B. POLK.

Columbus, Ohio.

CEMENT FOR CLOSING CRACKS IN STOVES, ETC.—A useful cement for closing up cracks in stove plates, stove doors, etc., is prepared by mixing finely-pulverized iron, such as can be procured at the druggists, with liquid water-glass, to a thick paste, and then coating the cracks with it. The hotter the fire then becomes, the more does the cement melt and combine with its metallic ingredients, and the more completely will the crack become closed.

Improved Washing Machine.

This machine is designed to imitate the action of hand-rubbing, without the use of the washboard, as nearly as can be done by a mechanical device. In fact it both squeezes and forces the water through the texture to be cleansed as gently or as forcibly as desired.

It consists of a water tub or case, A, Fig. 1, of rectangular or other form, within which is placed a revolving cylinder B, Fig. 2. Around this cylinder is placed a casing, C, Fig. 2, made in segmental sections, each so arranged as to be capable of motion to or from the cylinder, and being pressed toward the cylinder by a chain pulley and weight, as shown in Fig. 2.

One of the sections is hinged, as shown in Fig. 1, and may be opened to take out or put in the articles to be washed, and when closed may be fastened so as to act in conjunction with the other sections.

The external surface of the cylinder, A, and the internal surface of the segmental casing, are grooved as shown in Fig. 2, to facilitate the carrying the clothes around between them, and to increase the sqeezing and cleansing action.

The operation of the machine is as follows: The clothes being put in by opening the hinged segment—the interior of which is so constructed that the space narrows toward the cylinder—two turns of the crank brings them under and between the cylinder, and the segmental casing, where they are squeezed and cleansed by oscillating the crank. When sufficiently cleansed, the same number of turns brings them to the hinged segment again, and they are then taken out and wrung by a wringer attached to the machine in the usual manner.

The inventor claims that this machine is superior to any machine heretofore devised, because it imitates the action of hand washing so closely; a constant squeezing being kept up by the action of the grooved surfaces. The boiling is kept up by means of a steam pipe, which conveys steam to the machine from a kettle, range boiler, or any vessel generating steam, and the washing and boiling are thus done simultaneously, the use of the washboard being entirely superseded.

It is claimed that the finest goods can be washed without injury to the fabric, and that family machines will wash from four to six shirts, or two sheets, in from two to five minutes. The steam being confined does not cause annoyance by spreading through the house.

The mechanical arrangement and construction are simple and not liable to get out of order.

Patented, through the Scientific American Patent Agency, August 24, 1869, by Jerome B. King, who may be addressed for further information, corner Horatio and West streets, New York city. Machines may be seen in operation at 71 West Broadway.

Fig. 1

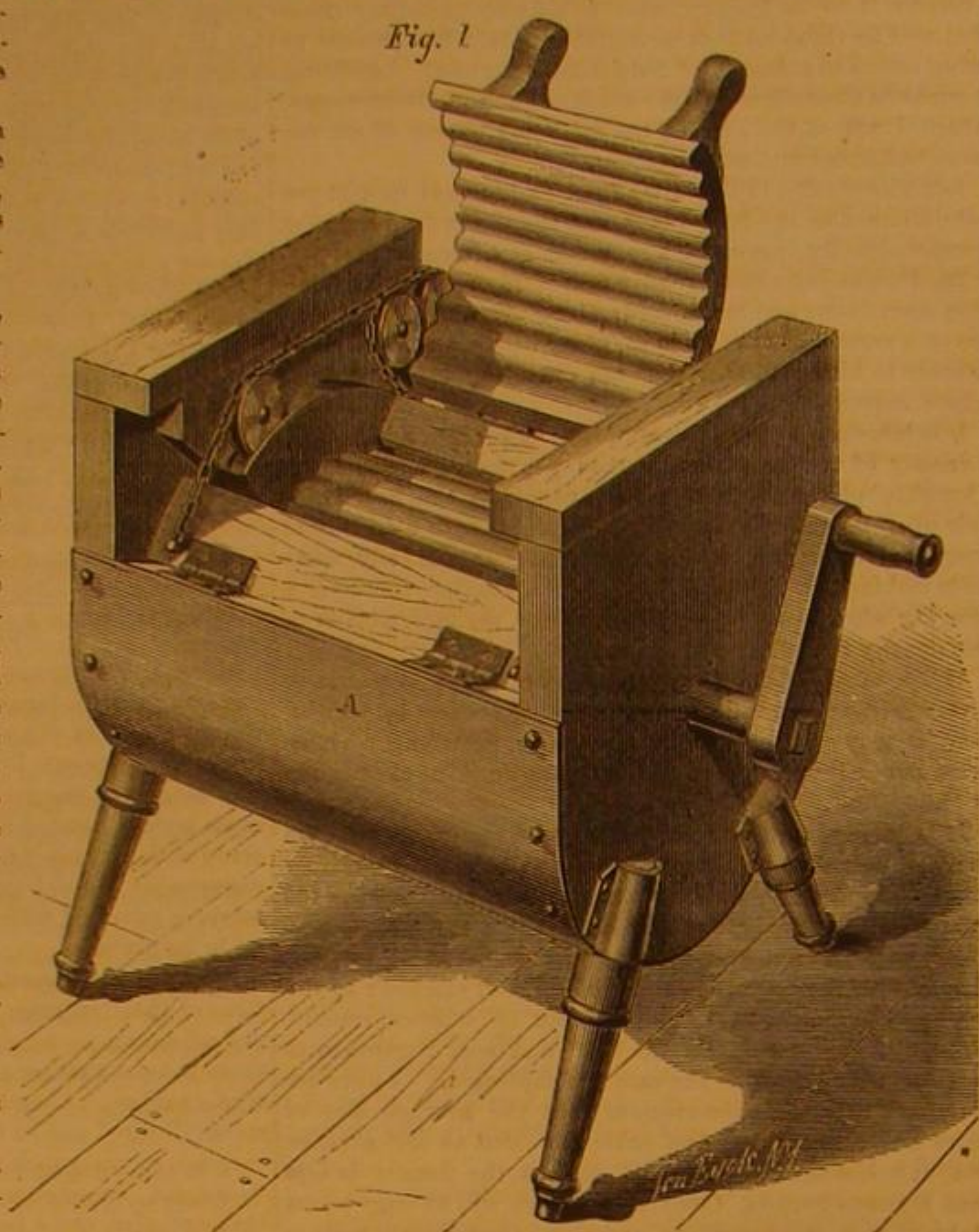
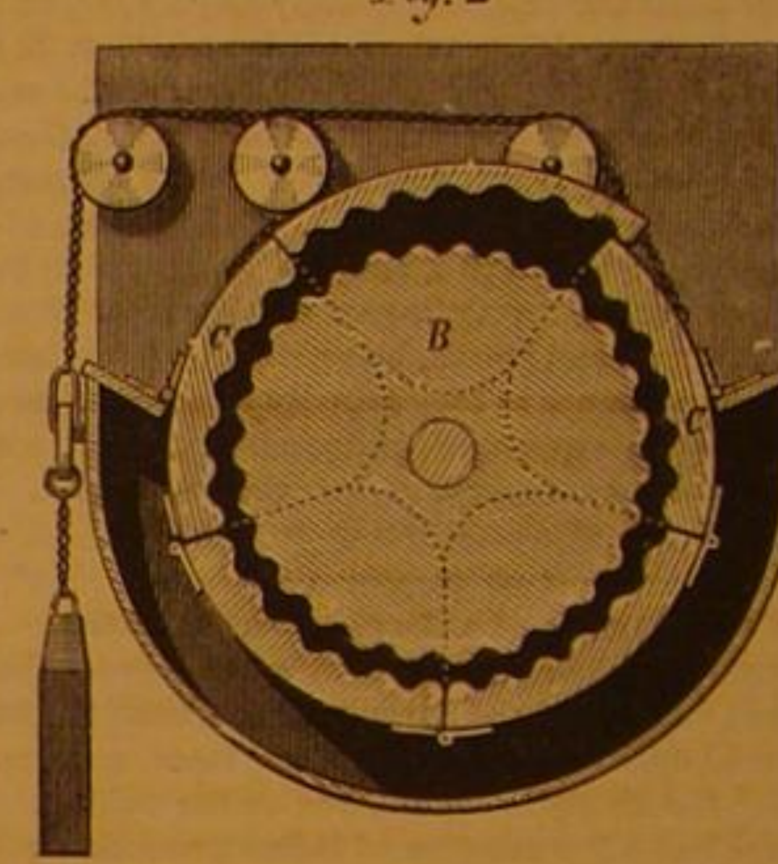


Fig. 2

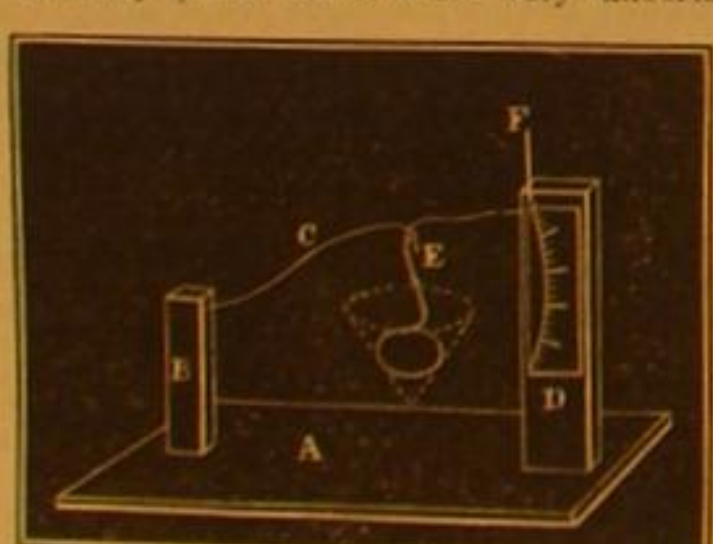


JEROME B. KING'S SELF-ADJUSTING DOUBLE WASHER.

SPRING BALANCE FOR CHEMICALS.

A contributor to the *Illustrated Photographer* writes:

"On trying some chemical experiments lately, I found that my ordinary photo scales were very uncertain with



quantities less than one or two grains. So I constructed a spring balance, which I find so very delicate and useful that I think a description of it may be of service to fellow-subscribers.

"A is a deal stand 12 by 3 inches; B is a hard wood block, fimly attached to A; C is a spring; D is an index pillar; E is a scale-holder; F is a small bent pin, to hold the spring steady while changing the scale pan.

"The spring, C, should be very fine steel wire, bent over so as to form a loop or eye near the index for E to hook into. The index is a slip of card set out with a fine pen. The scale pan is of thin letter paper; circular, and folded something like a filter paper. Indicated by the dotted line.

"I find that with it I can tell off, with the greatest accuracy, the minutest fragment of a grain.

"Or, by substituting a stouter wire, grains, on the index, read drachms or ounces."

Improved Paddle Wheel.

In very rough water the paddles are exposed alternately to the extremes of being too deeply immersed, or working almost or completely out of water. In all intermediate conditions the surface is inclined constantly in various directions, and the paddles arranged in the ordinary way, strike gently or gradually, commencing at one end or the middle, and the contact with the water progressing gradually along the length of each float. But when working in smooth water, which is or ought to be the best condition for favorable working, it is found that the percussive force with which the broad surface of a long paddle strikes against the water, is not only a serious annoyance but exerts a very destructive influence on the machinery by its continuous concussions. On some of the western rivers an approaching steamboat may be heard long before she is in sight by the rapidly-recurring blows of the paddles on the water.

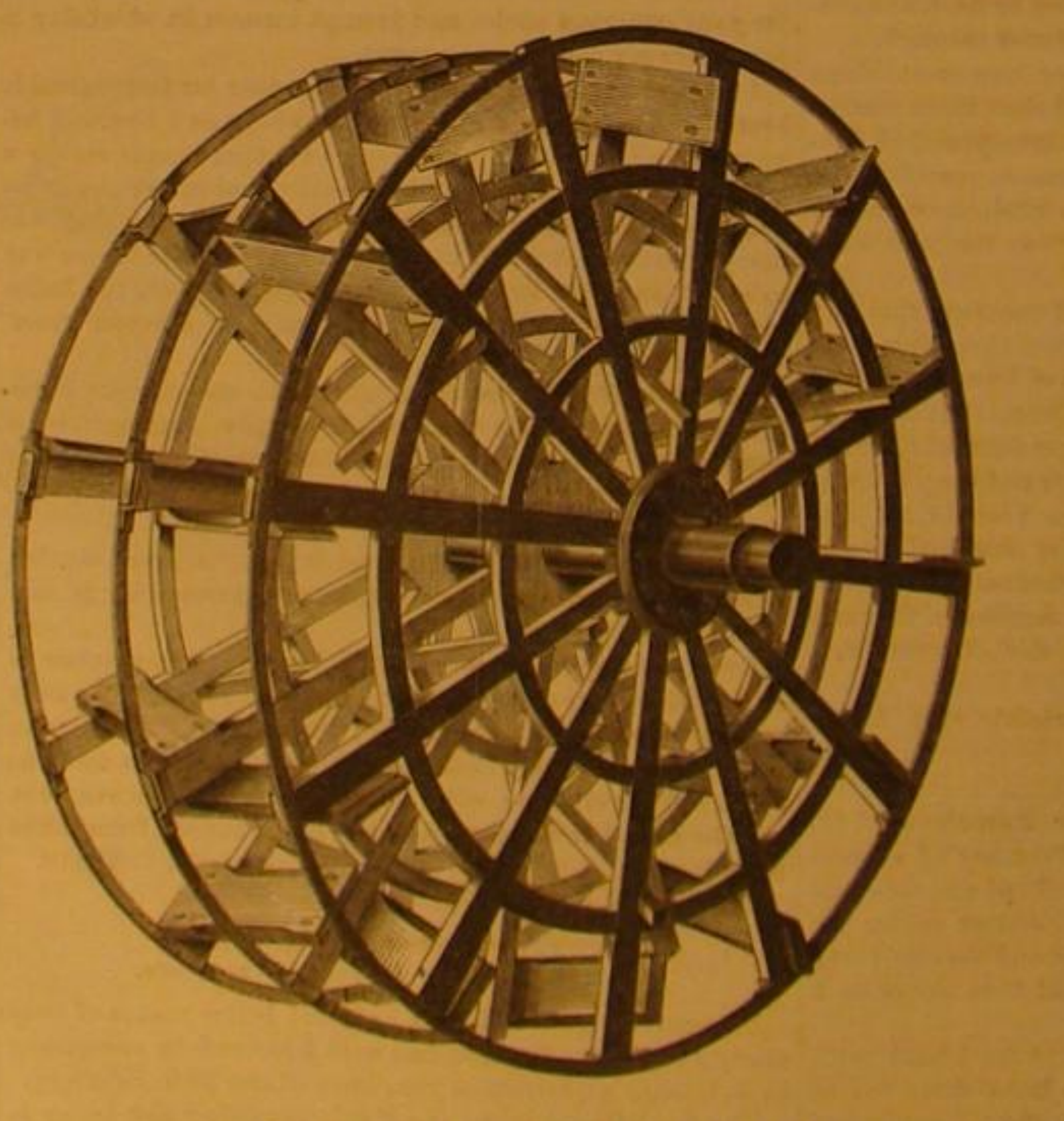
Some machines, built apparently like others, have peculiarities, idiosyncracies, perhaps some college professor might say, a sort of personal peculiarity which it is rather difficult to explain. A lot of locomotives made in the same shop, from the same pattern and by the same men, will not work exactly alike. Three Peck Slip ferry boats were once made in this city, as near alike throughout as skill could make them; and two steered well, and one nobody could steer with satisfaction. From the same unexplainable reasons, probably due to slight differences in materials or form, some steamers are peculiarly susceptible to the ague from the cause now referred to.

The matter attracted the attention of a practical engineer, Mr. James Mahoney, formerly the Chief Engineer of the Boston, Newport, and New York Steamboat Company, who attained a solution of the difficulty by very simple and apparently very obvious means. All paddle wheels are divided into two breadths by a central beam, that is, there are three rims or slender circles of iron, with three sets of arms extending out from the shaft thereto. The paddles are bolted to these arms. The Mahoney wheel has the buckets divided into two lengths, and placed so as to alternate in position, and each half length is placed a little oblique or inclined. It is found that the obliquity need not be very great to obviate all or nearly all the trembling. The steamer, *What Cheer*, running on Providence river and vicinity, was one in which the concussion was very severe. Her paddles were five feet eight inches long and twenty inches wide, and the wheels sixteen feet in diameter. The alteration of the paddles, according to Mr. Mahoney's plan, as is officially certified by the captain and engineer, obviated the jar, trembling, etc., fully one half, and increased the speed of the boat, giving a gain in this latter respect of five minutes in each hour with ten pounds less steam.

The steamer *Monahausett*, a larger steamer, running between New Bedford and Edgartown, with wheels twenty-six feet in diameter, paddles seven and a half feet long and twenty-two inches wide, were altered to the Mahoney plan with an entire removal of the jar or trembling and a marked increase in the speed. The average running time with the old wheels was two hours and fifty-five minutes; with the new wheels two hours and thirty-five minutes. Previous to the change the jar or trembling was unusually severe. In this case the same buckets were used, simply cut in two lengths obliquely and rebolted. On this boat the obliquity was eleven inches, that is, each bucket or half length was eleven inches further in at one end than the other. The wheel is now about being applied to the *Ironsides*, now lying at the Erie Basin, Brooklyn.

There has been an almost countless multitude of contorted and curious modifications of the paddle wheel. Some of them have approximated to this idea in various ways. Mr. Mahoney, however, whose invention is illustrated by the accompanying engraving, seems to have made a practical and successful improvement in this important adjunct of navigation. The paddles stand in their ordinary planes, and act on the water in other respects in the same manner as the long approved common paddles. They will, it is presumed, endure all the rough usage among floating lumber and ice of the ordinary wheel, and having demonstrated their efficiency as propelling means, the smoothness of their action, and their relieving the vessel and machinery from concussion, will go far to hasten their general and rapid introduction. Patented Nov. 9, 1869.

Further particulars, rights, or supervision in the application of this invention, may be had by addressing James Mahoney, Newport, R. I., P.O. Box 635, or William Burnett, Supervising Inspector of Steamboats, San Francisco, Cal.



THE MAHONEY PADDLE WHEEL.

The New York Central Railroad, one year ago, issued a scrip dividend of eighty per cent on the capital stock of the road, and having failed to make returns to the Revenue Office, the Company was assessed by Ralph P. Lathrop, United States Assessor for the Albany district, five per cent on the dividend, the tax amounting to $1,152,000. This appears to us to be right. We see no reason why this dividerd tax should not be collected the same as any other.

Incombustible wicks for kerosene lamps are made in Vienna, Austria, of asbestos, which is boiled in wax. They last at least a year.

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NEW YORK, SATURDAY, MARCH 12, 1870.

Contents:

(Illustrated articles are marked with an asterisk.)

WOOD ENGRAVINGS.

Not the least of the means by which science and knowledge are disseminated at the present day, and by which the present stage of civilization has been reached, is the art of wood engraving. So far has its power as an educational means been recognized that scarcely a primary school book is now published without illustrations.

From the ape which helps to impress upon the infant mind the first letter of the alphabet, to the zebra which performs a similar office for the last, through the first primer of arithmetic, and so on progressively to the higher studies of geometry, surveying, astronomy, physics, and chemistry, the pupil finds his imagination aided and cultivated by wood engravings; not rude, uncouth caricatures but really meritorious productions.

In our early school-days the only picture contained in any school book then in use, except the geography, was the frontispiece to Webster's Spelling Book. A picture of a female with a forbidding countenance inviting us to come up to the temple of knowledge, and giving us to understand that if we wanted to win fame, we must devote ourselves to orthography with the utmost diligence.

We are confident we fulfilled our part of that contract, but the female with the forbidding countenance has never fulfilled hers.

At that period a picture in a newspaper was a thing to be wondered at and talked about by a whole neighborhood. Now even the dailies endeavor occasionally to grace their columns with pictures, but as yet such pictures can scarcely be called works of art.

We venture to predict that men of two-score years now, will, ere they arrive at three-score, see illustrations in every daily paper as regularly as they now see the market reports.

Of course nothing good will ever be originated that the spirit of evil will not pervert to its own purposes. There now exist a large number of papers, the illustrations in which as well as the reading matter, are wholly vile, and the influence of which is entirely bad. The strong arm of the law ought to be invoked to suppress these obscene publications.

On the contrary, there are a large number of publications which teem with, in some instances, really superb works of art, the circulation of which cannot be too much encouraged, for their refining and cultivating influence on the masses.

One of the earliest illustrated papers in this country was our SCIENTIFIC AMERICAN, and the educating influence it has exercised has doubtless been to a great extent due to the able manner in which our artists have sustained this feature. In a description of machinery a stroke of the artist's pencil will often do more to elucidate a subject, than a page of verbal description.

Many an invention dates its financial success from its illustration and description in the SCIENTIFIC AMERICAN, and the study and examination of these illustrations have probably originated more useful and ingenious inventions in this country than any other cause.

HARDENING AND TEMPERING STEEL.

When we penned our recent article on the above subject, we had little idea what a sensation we were preparing. Such a shower of correspondence as has fallen upon our sanctum, and fairly snowed us in with arguments pro and con, is something we hardly expected.

This correspondence gives evidence that we did not overstate the diversity of opinion existing among mechanics. The urine theory has, we find, many adherents, one individual going so far as to say that in the variety of qualities of this fluid generated by different animals, nature had no doubt special regard for the wants of mankind. He regards the influence of urine on steel as entirely distinct from any of the ordinary forces of nature.

Of artificial solutions we have no end. Most of our correspondents believe in putting salt in the water, but those who advocate this, base their approval on the fact that it seems to prevent the spheroidal state which takes place in pure water, and thus the water adheres more closely to the iron, and cools the latter more rapidly. We are willing to concede this mechanical action of salt, but it is evident that it would not do for such grades of temper in steel as can only be obtained by slower cooling. Indeed, some tools are best tempered in water with the chill taken off.

On the other hand, we have plenty of letters from practical men who are convinced that all solutions are better replaced with pure water.

One gentleman of very long experience and every way a practical as well as a scientific mechanic, takes this ground; and, in addition to his own experience, furnishes us with the experience of Mr. N. P. Ames, late of Chicopee, Mass., who, some thirty-five or forty years since, succeeded in making sabers, swords, and cutlasses in this country, that would stand the U. S. Government tests. After expending much time and more than three thousand dollars in experiments with various solutions and baths, he found that heating in a charcoal fire, hardening in pure spring water, and drawing the temper in a charcoal flame was the best practice.

A correspondent from Chicago writes us an interesting letter in favor of the pure water practice, which we should be glad to publish, as he evidently has based his views both upon study and long practice; but our friends who favor solutions might deem us partial as we publish nothing on their side of the question. This writer seems to have touched hard pan when he says "let co-laborers discard all superstitions, solutions, incantations, etc., and pay more attention to how they heat steel before hardening, and, my word for it, they will soon lose trust in solutions."

It is time we had a new definition of steel. Any compound of iron hard enough to make some kind of cutting implements now goes by that name. The term has even been extended to alloys of iron with other metals, and when steel is spoken of a very indefinite idea is conveyed. The grade of carbonization, the presence of substances other than carbon and iron, or their proportions if present, are not indicated by the term. Upon no subject is there less accurate information diffused among the masses than that of steel, and in the absence of more precise terms by which to indicate the various qualities of what is called steel, it will be very difficult to impart accurate knowledge.

Finally, we consider that chemical reactions do not take place in the act of hardening and tempering steel, when those terms are understood to mean the process of hardening steel by sudden cooling after heating it and subsequently drawing the temper by heat. This being the case, we see no use of solutions except perhaps as in the case of a brine of common salt they cause the water to hug the metal more closely and thus facilitate the cooling. We are confident, however, that if the character of the steel be thoroughly understood previous to hardening and tempering, and heating and working be regulated accordingly, water, pure and simple, is all that is wanted to secure any degree of hardening, and the proper temper upon subsequent heating, if the latter is performed judiciously.

INERTIA AND VIS INERTIÆ.

A correspondent, in another column, under the above heading, criticises, rather more severely than ably, a recent work entitled "Force and Nature," chiefly on account of its denial that there is any such thing as inertia in matter. This correspondent charges the author of "Force and Nature" with having "entered the fourth-story window of the temple of Science," and having never descended to examine the foundations—its axioms and definitions. He might not have adopted this ingenious figure had he seen how easily the author, whom he has attacked, might turn the tables, and charge that his critic had never been able to climb from the cellar of the temple in which he has ensconced himself, and, therefore, cannot be supposed to know what discoveries and theories go to make up the upper stories of the structure.

Newton was a great man, but scientific knowledge has grown some since his day. Because he thought the term inertia an appropriate one, it is hardly safe to say that everybody who thinks will accept it as such for all time. The subject of molecular motion was very little understood in Newton's time, and, had he known what is now known, he might have modified his views.

But we have not taken up the pen to defend the author of "Force and Nature," with whose conclusions we do not agree. We have other matter of difference with our correspondent, who charges *us* with false teaching on this matter, referring to articles on pages 217 and 297, Vol. XX., for confirmation of this statement.

It is true, that in those articles we took exceptions to the term inertia, as being one variously defined, and, at best, negative in its signification; and charged that it grew out of the obsolete notion that there is a property residing in matter by which it resists motion. And notwithstanding our correspondent's reverence for the opinions of the thinkers of a past generation, we shall, in the absence of more light than we can at present attain, still hold that opinion.

We do not say, that the term inertia is now, or was ever understood by our best thinkers as applying to a state of rest alone, but it has been used, even in modern textbooks to express the idea of resistance of matter to motion. In Silliman's Physics, page 13, we find in his definition of inertia the following: "Matter has no spontaneous power, either of rest or motion." In Bartlett's Mechanics, page 20, we find: "Inertia is that principle by which a body resists all change of its condition in respect to rest or motion." In Ganot's Physics, page 7: "Inertia is a *purely negative property* of matter. It is the incapability of matter to change its own state of motion or rest." In Nichols' Physical Sciences, page 465: "The principle generally named the principle of the inertia of matter is two-fold. The first part of it *is a pure but a convenient hypothesis.* This hypothesis is that *all nature is naturally inert, motionless, lifeless; and that action or activity can be impressed on it solely by external agencies or forces. But in so far as we can form any conception of the constitution of matter, this is physically quite untrue, not an atom existing which is not the center and source of manifold and multiform activities.*"

But we have quoted enough for our purpose. We might go on quoting authors by the dozen to show that this term is not accepted as meaning the same thing by those who write and think upon it; and that it had its origin in the "obsolete notion" of the *naturally inert condition of matter.* Morin, in his Mechanics, does not apply the term to matter, *per se,* but to bodies or masses of matter (see page 8, Bennett's Translation).

The idea of the resistance of matter to motion originally grew out of the fact that time is required to transmit *mass motion.* A team of horses attempting to draw a canal boat, does not instantly move it as a mass, but it moves something immediately. Instantaneously, with the application of the power, there begins to exist the state of matter known as tension, in the harness, rope, etc., and this tension is an increase of motion in the molecules in one direction. Gradually this tension is converted into mass motion, and the boat moves. There is nothing about this to indicate that matter resists motion. It only indicates this fact, that, as we can not by any mechanical means apply power instantaneously to all the molecules of a mass, the power we do apply must be communicated from molecule to molecule throughout the mass, and this takes time.

Now is inertia, loaded down—as is every term born of false conceptions and hypotheses—with different meanings and interpretations, a good term to express this fact that time is required for a mass to impart or to receive motion? With all due deference to other people's opinions, and not desiring to force our opinions upon any one's acceptance, we still submit that it is not.

We insist that it is, as Ganot says, purely a negative property of matter, and is as illogical in its use and application as it would be to define snow as being something not black, not made of whalebone, not good to eat, and not having the property of being agreeable to bare feet. There is no end to definitions, if we accept negatives as such, and their use only blinds the mind to positive facts and just conceptions.

AN INEXPLICABLE POWER.

In Dayton, Ohio, on the 17th of Feb., a terrible boiler explosion took place at the works known as the Western Machine Shops, making a complete wreck of the works, killing five persons, and seriously injuring many others.

The Coroner's jury, after a full investigation of the facts in the case, found that the cause of the explosion was from a low stage of water in the boiler, the result of negligence on the part of the engineer in charge.

We learn that Mr. Fetters, late official inspector of boilers for the district, had, in a conversation with the foreman of the works, pronounced the engineer incompetent, and too careless for such a post. The foreman stated that he was afraid of the concern, and had several times complained of the matter.

The boiler was a nearly new one and in excellent order.

An intelligent engineer sends us now an article called forth by this accident, clipped from a paper the name of which is not given, entitled "An Inexplicable Power," which is really a curiosity in its way, and we therefore give it entire.

"A number of engineers insist that there was inexplicable power in the atmosphere on Thursday afternoon, which prevented boilers from operating properly, that they were unable to account for. They found it impossible to run their engines evenly. They either got too much steam, or not enough, and there was difficulty about the working of the pumps; and they were not able to account for it. There are times—these men affirm—when boilers will explode without any apparent cause, despite the most careful labor by the most practical engineers to be found anywhere. We conversed with several practical engineers, yesterday, and they all agreed as to the strange influence to which we have referred. 'What is it?' we inquired of one. 'Why, it's in the air,' he replied, 'but I can't explain it. I can't run my engine even: for a few minutes steam is generated too fast, and that which escapes from the valve gets blue as blazes, and makes things fairly sing again; and it's really not safe. Then, suddenly the water gains on me, and, although there's a good fire, it appears to be impossible to generate steam; it won't rise, do the best I can with it. Now, the engine is in excellent order, and the pumps work like a top, and there is nothing in the machinery to induce this condition. I think it must be in the air. It was just so Thursday afternoon, and I worked with my engine for half an hour, after dinner, and getting discouraged, I drew my fires to let the boiler cool, so that I could have a fair look at things. I hadn't been out doors a minute until I heard the explosion at Taylor's. I knew in a minute what it was. If I'd kept up my fires five minutes longer, I'd been blowed to bits—I *know* it. There are certain times when an engineer feels that there's an influence at work in his boiler which he don't understand and which he is powerless to control. An engineer who don't know and feel this, will explode a boiler. There may be a shade of superstition in this, but the speaker was in real earnest."

We are able to give a full exposition of this inexplicable power, as it is called. It does not reside in the air, as supposed, although it may easily be traced, as we shall see. It produces a great deal of mischief, other than exploding steam boilers. It is the *love of money*. Avarice is the mysterious agent that is blowing up boilers and destroying property.

The mischief is not in the air, it is in the pocket. All talk about any other "inexplicable power" is inexplicable bosh. Here was a confessed ignoramus and a *careless* ignoramus repeatedly complained of, but still allowed to retain his position until his carelessness resulted in a wholesale murder. We do not gather how much was paid him for his services, but if it was two or three dollars a week less than a competent man would have demanded, that would be a sufficient inducement for many employers to risk the lives of their employés.

If this sort of thing goes on much longer, it will correct itself. People working in steam factories will demand so much greater wages for the extra risk they take, that it will be much cheaper to employ competent engineers.

As to the tantrums of boilers described by engineers (sic) in the above quotation, they are simply sensational moonshine. There has been enough of this kind of endeavor to saddle ignorance and incapacity upon Providence. There is nothing mysterious about boiler explosions, in general. In some cases there is absence of knowledge as to the particulars in which neglect or carelessness has been permitted, but in ninety-nine cases out of every hundred, there has been some neglect. Boilers explode from the disruptive force of steam, aided sometimes by the force of unequal expansion in the iron; and if weakened by age or bad usage, they explode more easily than when sound and strong. This is the whole story in a nutshell. Put ignorance and steam in contact, and you have a very dangerous combination. Place integrity, fidelity, and intelligence in charge of steam generators, and keep them there from the time the first plate is cut, and the first rivet driven, till the boiler is pronounced unfit for service, and boiler explosions will become as rare as they are now abundant.

LOCKAGE WASTE ON OUR CANALS.

The following extract from the *Pittsburgh Commercial*, has been referred to us for opinion:

There seems to be some doubt entertained as to whether a sufficient supply of water can be had on the higher "levels" of the Erie Canal to accommodate the large tunnage that will undoubtedly seek transportation over this line when it is enlarged to the capacity of a ship canal! In discussing this phase of the subject your correspondent, "Observer" (Mr. John F. Bennett), raises the question of the possibility of passing boats through the locks with a less expenditure of water than is commonly required. This is a pertinent inquiry that can be very satisfactorily answered. If boats have never yet been passed through canal locks without the usual waste of water and water power, it must be because *that* economy has not been needed, for a very little practical knowledge will establish the fact that the *power due to the water falling from the higher to the lower level* in passing boats up and down, DOES NO WORK in raising or lowering the tunnage, and may be employed in pumping back into the higher level a volume of water almost equal to the entire lockage. Moderately efficient machinery ought certainly to return more than one half, and thus add more than one half to the ordinary capacity of the canal. No fears of a scarcity of water need operate to deprive us of this great improvement.

In its construction, the locks may be at once made large enough to accommodate any probable future traffic, leaving the "levels" to be enlarged from time to time as the demands of business shall require.

To make the water power that now goes to waste available in preserving the maximum of water in the levels, it is only necessary, instead of letting the water into the locks through the ordinary wicket gates, to let it pass into the lock *through a turbine wheel*, and employ the wheel in driving suitable pumping machinery that will lift water from the lower to the higher level, and in emptying the lock let the water *pass out through the same* or another wheel, and again employ the power in raising a further quantity of water to the higher level.

When the immense power thus to be utilized is not needed to assist navigation by returning the lockage water to the higher levels, it can be readily made available for other uses, and along the entire line may be the source of no small income to the company owning the canal.

The general theory of mechanical saving in water waste given above is correct, and has attracted the attention of hydraulic engineers for many years, as to convenient and useful *modus operandi*, one favorite idea being to make the summit locks double acting by balanced frames, so that an emptied chamber on one side would in part restore a supply to the upper level. If, however, the gentleman who has advanced this suggestion, with a slight *coleur de rose*, will patiently work out the process by exact calculations of the power available for the net return, and more carefully examine the various sources of loss which go to make up canal waste, as a whole, he will see that the economy is far less demonstrable than the primary impressions indicate.

The lockage waste itself, on a canal of any length, between points of supply, though undoubtedly a large item, does not measure the whole waste.

If we take, for instance, the estimated water supply for the "Improvement of the Champlain Canal," as given on page 98 of Mr. McElroy's Report in 1867, it will be observed that the items for one summit group of locks, on 11¾ miles of canal, 225 and 100 feet lock, were for

	Cubic feet.
Lockage per day	5,203,167
Evaporation, filtration, and weirs	2,368,800
Gate waste	720,000
Total	8,291,967

about 62 per cent being lockage waste on a short length like this.

Taking into account then the restriction of this mechanical device for return supply at the upper lock, the limited quantity of water which is delivered with a descending boat, the absolute limit to time of filling and discharging on any important canal, the necessity of an entire rearrangement of the methods of inlet and outlet, the fluctuating head under which the pumping machinery must work, and the probable or possible ratio of return supply, engineers who have carefully studied the general subject have rather been induced to advise the use of an independent pumping establishment. It would, however, be a professional service, if any detail and careful analysis is presented of the advantages of a local and special lock return, on the general plan above mentioned, by which the actual merits could be carefully estimated.

RESTRICTIONS ON THE WEIGHING OF COAL.

Granted that coal dealers are on the average as honest as any other class of men, and that they are no more disposed to rob the poor than their neighbors who have less opportunity for so doing; is it safe to tempt men as coal dealers must be tempted?

Not one man in fifty, when he orders a tun of coal delivered at his house knows whether he gets full weight; and the coal dealers are perfectly aware of this fact. They know that if a purchaser stands and looks on while the weighing is performed, that he must, perforce, take the weight of the cart on trust, and therefore that even such vigilance would avail little to prevent fraud in the weighing.

It is so inconvenient for people in general to re-weigh their coal, and so difficult to devise any means whereby in the absence of personal attention, and without extra expense to themselves, they can be secured against fraudulent weighing, that in our opinion the system of selling coal by weight is a bad one. It would be far better to sell it by measure.

There is no doubt that short weights are common in the retailing of coal, and cases have come to our knowledge where such fraudulent dealing has been practiced in the filling of contracts to large manufacturing establishments, which ought to be able to take care of themselves, and therefore are not much to be pitied.

But the poor who are only able to get coal by the very hardest, and who are wholly at the mercy of the dealer, ought to have some protection. This would be afforded were coal sold by measure. They would soon learn to detect frauds in bulk, and thus the power to cheat would no longer exist so far as quantity is concerned.

We do not suppose coal dealers more likely to take an advantage of opportunities to defraud than retail grocers, or even milkmen, but we respect them too much as a class, to wish them subjected to temptation, which might be removed by a prayer to the Legislature to deliver them from it.

THE WATER WHEEL TESTS AT LOWELL.

There are always two sides to every question. Our recent article on the test of turbine wheels at Lowell, has called forth a communication from Mr. Emerson, whose testing apparatus was employed at Lowell, and which will be found illustrated and described in another page of this issue.

We have so far resisted all importunities to publish communications upon this subject, and we shall adhere to this rule; but having given a *resume* of one side of the question, as gathered from our correspondence, we do not wish to commit the injustice of refusing the same for the other side. We therefore, now give the gist of Mr. Emerson's statements, leaving our readers to form their own opinion upon it.

It is denied that the charges made in the correspondence, upon which our former article was based, are true, and a copy of the circular sent to manufacturers inviting them to send wheels to be tested, and stated to contain the only terms ever made in any way whatever, now lies before us.

The statement that the wheels were required to be of a specified power, is not contained in the circular; but, on the contrary, it is distinctly announced that "each competitor will select the size and finish of wheel to suit himself."

The circular further specifies that "for use of flume and weir, competitors will be charged $250; for use of dynamometer and water, enough to cover expenses. Cost of flume, water, and dynamometer will not exceed $300. The arrangements have cost $1,500. If there is sufficient competition, the cost will be divided fairly with all. Each will make their own arrangement with Engineers." It adds that further information may be obtained by addressing James Emerson, and invites all who wish to witness the test.

That anything different from this was communicated by letter in answer to subsequent inquiries, is denied by Mr. Emerson, who positively states that "*these were the only terms ever made.*"

The arrangements alluded to as costing $1,500 was the flume only. The dynamometers cost $1,700 and nearly a year's time was given by Mr. Emerson to the tests, and to preparations for it.

In regard to the cost of the tests, we are informed that as the wheel specified in the circular as one of those to be tested, was distinctly announced as finished in the ordinary manner, it was expected that the others would follow in the same way and without delay; instead of which, four months elapsed before some of the wheels were prepared for the test, and it was well understood by the tardy competitors that the expense would be increased by this delay.

Mr. Emerson states that in return for over a year's expenditure of time, and an outlay of several thousand dollars, he has received in all only $650, a considerable part of which has been paid out for freight on wheels, telegrams, oil, etc. This certainly does not look much like extortion.

In regard to the settling of the flume, we are told that it still stands in the same place, and has been in use all winter for testing large and expensive wheels, and that it is considered as being in good condition.

It is stated that there was abundance of water for months after the test was announced. Early in the autumn there was a slight drought, but before the wheels were ready there was plenty of water again. At the time of the disastrous freshet which occurred in the fall, there was a break in the canal which caused a delay of four or five days, but Mr Emerson states that at the time of testing there was so much water that unless restrained at the head gates it would over flow the flume. So much for the statement that there was a scarcity of water.

In regard to the placing of the wheels, we are told each party placed his wheel as he liked, and if there were any fault the exhibitors were solely to blame, as each party had full control of the flume, while their wheels were tested, cutting out or filling in as they liked.

The steadiness of the brake is attested by Mr. Hiram F. Mills, C. E., under whose supervision the tests were conducted. Our own reporter also stated that when he was present in July (see issue of July 17, 1869), the arrangements seemed perfect and the brake worked satisfactorily.

It seems then that the question resolves itself into one of fact, so far as this controversy is concerned; and we have endeavored to give impartially every essential statement made on either side.

The apparatus for testing turbine wheels, shown in the descriptive article we this week publish, is the same as that used in the Lowell tests, and our readers will be able to judge intelligently of its probable efficiency.

We may, in closing, remark that the terms in which the tests were announced in the circular before us, seem not to be sufficiently specific. There cannot in such matters be too definite an understanding. It would seem that not only the size and finish of the wheels, but the time when they were to be on the ground ought to have been definitely fixed, and no departure from the prescribed conditions permitted. A competitive test will always give dissatisfaction if performed under variable conditions.

An Immense Salt Mine.

The great Humboldt salt mine, near Austin, Nevada, is described by a California paper as looking like a lake frozen over. The salt is as hard and as smooth as ice. Were it not for fine particles which are condensed from vapors arising from beneath, and which cover the crystalline salt to the depth of perhaps one eighth of an inch, it would make an excellent skating rink at all times of the year, except on the very infrequent occasions when it is covered with water. The expanse of crystallized salt is no less than twenty miles in length and twelve in width, without a break or flaw for the greater portion of that extent. The stratum of solid salt is about six or seven inches thick, under which comes a layer of sticky, singular looking mud, about two feet thick, and under this again another stratum of solid salt, as transparent as glass, of which the depth has been found in some parts to be six feet. In summer, this salt plain, glittering and scintillating in the light of an almost tropical sun, presents a brilliant appearance. The frosty covering and the solid salt is as white as the snow, while the crystalline portion, when exposed, reflects dazzling prismatic colors. This immense deposit is remarkably pure, being ninety-five per cent of salt and five per cent of soda—which is purer than what we commonly use for our tables.

Opera House Dirt.

The dust obtained from the places of amusement in New York have recently been analyzed by the scientific officers of the Metropolitan Board of Health. Over one hundred specimens of the particles floating in the air and falling as dust, were collected on plates of glass, and were examined under the microscope. The proportions of the different ingredients varied, but the same substances were found in all the specimens. The composition of the matter subjected to the microscope was as follows: "The dust of the streets in its finer or coarser particles, according to the hight at which it had been collected, with a large proportion of organic elements; particles of sand, of quartz and feldspar; of carbon, from coal dust and lampblack; fibers of wool and cotton of various tints; epidermic scales: granules of starch, of wheat, mainly the tissues of plants; the epidermic tissue, recognized by the stomata or breathing pores; vegetable ducts and fibers, with spiral markings; vegetable hairs or down, either single or in tufts of four or eight, and of great variety, and three distinct kinds of pollens. Fungi were abundant from mere micrococcus granules to filaments of mold. When water was added to a portion of dust from whatever source, and exposed in a test tube to sunlight or heat for a few hours, vibriones and bacteria made their appearance, and the fungous elements sprouted and multiplied showing that they maintained their vitality, and proving that the germs of fermentation and putrefaction are very widely diffused."

Zinc Light.

By digesting metallic zinc in iodide of ethyl, we obtain a volatile liquid which takes fire spontaneously in the air, and is known to chemists under the name of "zinc-ethyl." It can be distilled in an atmosphere of hydrogen, and if this gas be made to pass through the liquid it will carry off some of the zinc-ethyl, and when ignited will burn with a magnificent white flame. It is probable that ordinary illuminating gas would answer as well as hydrogen for this experiment. The light produced in this way can be employed to take photographs, but its actinic properties are not equal to the effects produced by burning magnesium.

Dust and Disease.

Mr. Horace Waller, F. R. G. S., writes to *Nature* as follows:

The extremely important discoveries brought to light by Professor Tyndall will call forth great exertions on the part of thinking persons to carry his plans into operation, and I have no doubt, when due precautions are taken to sift infected air as it passes into the lungs of those whose duties take them where contagion abounds, we shall have the happiest results.

So great will be the tide of interest in this direction, that I am anxious to cast into it a theory I have long held, in hopes that it may drift in some one's way to be turned to use; I commend it to the traveling portion of your readers especially.

While traveling in some very unhealthy parts of Africa, more particularly among the marshes bordering on the Shiré and Zambesi rivers, it was often necessary to camp at night just where the canoe happened to be moored when daylight failed us. Reeds, rushes, and mud were never many feet off, and the accumulation of scum, decaying vegetation, etc., lodged in the sedge, made the situation as delightful to mosquitoes as it was trying to the constitution of the European.

Still, with all this, as long as it was possible to rig up a mosquito curtain, I am convinced that really less danger existed in thus sleeping in the midst of miasma than in other places where less of it was supposed to be present, but where the traveler felt no necessity to stretch this thin covering over him.

I have in this way done canoe journeys of twenty to twenty-five days in length without a day's illness from fever, and I could instance similar experiences on the part of others.

Now the reason I assign is this: the mosquito curtain is to miasma, what the Professor's cotton-wood respirator is to the poison of scarlatina, we will say.

The curtain, after being used once or twice, saturated with dew, folded up while damp and crammed into the limited space generally provided for it in the safest place, becomes just so much affected by this treatment that each thread loses its smooth glaze, and is soon fluffy and fuzzy for want of a better expression.

The little honeycomb holes in the fine "net" are now a series of small six-sided sieves, each covered over with the fine filaments of cotton which have got disturbed and frayed up. Dew, falling upon a surface of this kind, quickly turns it into an exquisitely fine strainer—in fact almost a film of water—through which all the air has to pass which is breathed by the person reposing beneath it.

Now, it is an old notion that the miasma which produces the bilious remittent fever (the pest of this part of Africa in question) and various other diseases of the tropics, cannot pass across water.

I believe that acting upon this theory, the Admiralty provides that boats' crews shall sleep in their boats anchored off shore in malarious rivers. However, be this as it may, I have a strong belief that the "wet sieve" *does* stop the poison in some way or other, and that it is a great safeguard to the voyager in these places.

The whole subject of miasm is in the dark; it is lawless as a cause of disease; it baffles the most astute, but the day may be coming when such hints as those of Prof. Tyndall's shall fit into an organized attack upon it, and we shall be able to overcome it in a measure.

A curtain, properly made, and taken care of with that instinct which alone is begotten by the buzz of mosquitoes, is perhaps the most valuable possession a man can have against deadly attacks in the night while men are asleep; were its merits studied more, we should not find men stuffing their companions so perpetually with quinine, to the keeping up an unhealthy tone by this abuse alone, and to the confusion of this most invaluable medicine when it is really called in to do its duty upon the fever-stricken patient.

The Bulging of Walls—Cause and Prevention.

The ugly protruding curvature commonly called a bulge, to which external and front walls seem especially subject, may frequently be traced to original defects of construction. Bulges very often occur at about the level of a floor, and where there is a floor, the brick work of outer walls is commonly weakest. To avoid running the floor-timbers into party walls, they are generally made to rest on the front and back, and the party-wall will often appear in better condition than the front. Immediately below the level of the intended floor, a timber scantling about 4½ in. by 3 in. is laid along the wall flush with its inner face, to receive the ends of the joists. The joists, let it be assumed, are about ten inches deep, notched to nine inches at the ends, so as to rise the hight of three courses of brick work. Here, then, bond-timber and joists together make a hight of 12 in., or four courses of brick work. The joists will have a bearing of 6 in. on the wall, and the wall may be supposed to be a brick and a half thick. Now wherever the joists occur, there is a complete interruption of the bond on the inner side of the work, while externally it appears unbroken, the outer face, in fact, being carried up half a brick in thickness, and looking as though the whole wall were perfectly solid and uniform; but the backing between the timbers too often consists of bats and small pieces put together in a mysterious though incongruous way. So long as the timber remains sound and of its full dimensions, all is well, but this is seldom very long. The manner of converting balk timber into scantlings precludes the permanent retention of its original form. When felled and squared in its native forests, it is thrown into the first lake or river, formed into rafts, and navigated to some port of shipment, where it is formed into cargoes for conveyance across the ocean. The sea voyage over, it may be assumed to the port of London, the timber is again immersed in the water, which usually constitutes its only place of storage till wanted for actual application to some building. As to deals, an architect may specify dryness as a necessary quality, but he must not expect it in timber. He may say that it shall be sound and well seasoned, but water seasoning is all that takes place previous to conversion, and this fact is noteworthy, because as the subsequent shrinkage may be estimated at three quarters of an inch in the foot, it becomes obvious that so far as the bond timber and joists are to be regarded as forming the inner material of the wall, a subsidence equal to the shrinkage must take place. But the wall does not depend on the woodwork alone, and the irregular filling up between the joists will receive the weight, and so the evil will be deferred. For the time there may be no other visible result than the dropping of the floor from the skirting, and when the latter is of wood, the simultaneous rising of the skirting from the floor. It is when the wooden bond, having shrunk to the minimum dimension of perfect dryness, enters upon its course of decay that the worst consequences of inserting timber constructionally in walls are developed. The inner face then sinks, and the statical conditions are disturbed, and bulging is inevitable.

It was a custom of by-gone days to insert timber very freely in walls. Foundations were fortified, as it was thought by the introduction of a "chain-bond" of large scantling, and many a goodly edifice has suffered from the practice. Great, therefore, have been the improvements adopted in the modern construction of walls. A solid basis is formed by the use of concrete; wrought iron hooping has advantageously displaced wooden bond, and the joists are kept as much as possible out of the walls, their ends being supported by brick or iron corbels. Thus all rapidly perishable matters are excluded, and a lasting character imparted to work so executed. Skirtings also are made of stucco instead of wood, and shrinkage in that quarter got rid of. Thus experience and science are gradually removing one of the old defects and disfigurements of buildings—the bulging of walls.—*Building News.*

DAVIS' PATENT FENCE.—We call attention to the advertisement published in another column of P. Davis' patent wire and picket fence, an illustrated description of which appeared in a recent number of this journal. We are informed that since that publication the demand for this excellent fence has so exceeded Mr. Davis' facilities, that he finds it necessary to dispose of more territory than was at first anticipated.

JOHN LA MOUNTAIN, the celebrated aeronaut, is dead.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is designed for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however, when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

N. K., of Ohio.—You can bleach broom corn brush as follows: Construct at some distance from your other buildings a small building of boards and batten the joints. Hang your brush on suitable frames within this building and make your door to shut pretty tight. At one end of the building and at the top construct a shelf with an outside door so that the shelf may be reached from the outside with a ladder. When the brush is placed in the building, place on the shelf in an open earthen pan, a mixture of four parts by weight of hydrochloric (muriatic) acid and one part black oxide of manganese with two parts of water. Set the vessel—which should be three or four times as large as will contain the mixture, and also broad and shallow—upon bricks, so that you can put under it a bit of candle capable of burning about five minutes before it goes out, the heat of which will start the reaction, then close the door leading to the shelf and leave the whole for twenty-four hours. The bleaching agent developed here is chlorine, and as it is poisonous when inhaled, the building should be ventilated before any one enters it by opening the upper and lower doors, and removing the vessel from the shelf. The quantity of the mixture will depend on the size of the building, and this you must learn by experience. Too much bleaching will rot the brush.

T. K., of La.—A cistern wall laid up with a putty made of ground white lead with as much red lead as will make it of the proper consistence will probably remain tight under the circumstances you mention, if bricks or square stones are employed. It is only necessary to use it for an inch or two next the water; the rest of the joints may be filled with good water cement. If the water is used for drinking, we are informed that this cement may be used as above, and that no contamination of the water will occur if after the putty is perfectly dry the inside of the cistern be plastered.

C. G. B., of Pa.—If you will lay a cellar wall with the cement recommended in answer to T. K., of La., in this column, we think you will be able to keep it tolerably dry. You can ceil over with boards for an out-door cellar, leaving a foot or so of space to be filled in with dry moss, or a couple of feet filled in with shavings pressed in gently but not packed hard. If kept dry by a suitable roof this will keep out frost. Carry up the walls sufficiently high to prevent surface water from running in.

F. G. G., of Conn.—An excellent cement for broken glass and porcelain is shellac melted and run into small sticks. The broken edges must be warmed so that they will melt the cement, and the latter is then thinly spread over them. This cement resists moisture, but of course remelts when sufficient heat is applied. A cement that will resist heat but does not withstand moisture, is made of white of egg mixed with finely-powdered quicklime.

F. W. E., of N. Y.—We know of no roofing material that is without a fault of some kind, and it is too much to expect perfection in any human device. We think a flat roof can hardly be made to remain perfectly tight fifty years by any material now known. With sufficient inclination of roof we prefer slate to any other kind of roofing material.

D. F., of Mass.—The tensile strength of aluminum bronze is 73,000 pounds per square inch of section; that of steel in bars is 100,000 to 130,000. These figures are from Rankine's tables. Aluminum bronze is more ductile than steel, but its modulus of elasticity has, we believe, not yet been determined.

W. M. M.—You can use a thin wash of glue or isinglass before painting, into which small articles may be dipped and afterwards allowed to drain; but for articles to be exposed to wet, no sizing, but good linseed oil with red lead, massicot or litharge, will stand long without peeling off.

J. K., of Pa.—An inch of water will make 1,696 cubic inches of steam. Two volumes of hydrogen combine with one of oxygen to form water.

A. W. A., of N. Y.—With the best constructed hydraulic ram, and a fall of four feet, about two and four tenths per cent of the falling water can be elevated one hundred feet.

L. B., of Wis.—It would be impossible to give you a good idea of the shapes of different turning tools without engravings. Watson's "Manual of the Hand-Lathe" gives all necessary information. It is published by Henry Carey Baird, 406 Walnut street, Philadelphia, Pa.

Full Files of this Paper

Can be found in New York, at the office of George P. Rowell & Co., Advertising Agents, No. 40 Park Row.

U. S. Patent Office.

How to Obtain Letters Patent

FOR

NEW INVENTIONS.

Information about Caveats, Extensions, Interferences, Designs, Trade Marks; also, Foreign Patents.

For a period of nearly twenty-five years, MUNN & CO. have occupied the position of leading Solicitors of American and European Patents, and during this extended experience of nearly a quarter of a century, they have examined not less than fifty thousand alleged new inventions, and have prosecuted upward of thirty thousand applications for patents, and, in addition to this, they have made, at the Patent Office, over twenty thousand preliminary examinations into the novelty of inventions, with a careful report on the same.

The important advantages of MUNN & CO.'S Agency are, that their practice has been ten-fold greater than that of any other Agency in existence, with the additional advantage of having the assistance of the best professional skill in every department, and a Branch Office at Washington, which watches and supervises, when necessary, cases as they pass through official examination.

CONSULTATIONS AND OPINIONS FREE.

Those who have made inventions and desire a consultation are cordially invited to advise with MUNN & CO. who will be happy to see them in person at the office, or to advise them by letter. In all cases, they may expect an HONEST OPINION. For such consultations, opinion, and advice, NO CHARGE is made. A pen-and-ink sketch and a description of the invention should be sent.

TO APPLY FOR A PATENT,

A model must be furnished, not over a foot in any dimension. Send model to MUNN & CO., 37 Park Row, New York, by express, charges paid, also, a description of the improvement, and remit $16 to cover first Government fee, and revenue and postage stamps.

The model should be neatly made, of any suitable materials, strongly fastened, without glue, and neatly painted. The name of the inventor should be engraved or painted upon it. When the invention consists of an improvement upon some other machine, a full working model of the whole machine will not be necessary. But the model must be sufficiently perfect to show with clearness the nature and operation of the improvement.

PRELIMINARY EXAMINATION

is made into the patentability of an invention by personal search at the Patent Office, among the models of the patents pertaining to the class to which the improvement relates. For this special search, and a report in writing, a fee of $5 is charged. This search is made by a corps of examiners of long experience.

Inventors who employ us are not required to incur the cost of a preliminary examination. But it is advised in doubtful cases.

COST OF APPLICATIONS.

When the model is received, and first Government fee paid, the drawings and specification are carefully prepared and forwarded to the applicant for his signature and oath, at which time the agency fee is called for. This fee is generally not over $25. The cases are exceptionally complex if a higher fee than $25 is called for, and, upon the return of the papers, they are filed at the Patent Office to await Official examination. If the case should be rejected for any cause, or objections made to a claim, the reasons are inquired into and communicated to the applicant, with sketches and explanations of the references; and should it appear that the reasons given are insufficient, the claims are prosecuted immediately, and the rejection set aside, and usually **Without Extra Charge to the Applicant.**

MUNN & CO. are determined to place within the reach of those who confide to them their business, the best facilities and the highest professional skill and experience.

The only cases of this character, in which MUNN & CO. expect an extra fee, are those wherein appeals are taken from the decision of the Examiner after a second rejection; and MUNN & CO. wish to state very distinctly, that they have but few cases which can not be settled without the necessity of an appeal; and before an appeal is taken, in any case, the applicant is fully advised of all facts and charges, and no proceedings are had without his sanction; so that all inventors who employ MUNN & CO. know in advance what their applications and patents are to cost.

MUNN & CO. make no charge for prosecuting the rejected claims of their own clients before the Examiners and when their patents are granted, the invention is noticed editorially in the SCIENTIFIC AMERICAN.

REJECTED CASES.

MUNN & CO. give very special attention to the examination and prosecution of rejected cases filed by inventors and other attorneys. In such cases a fee of $5 is required for special examination and report, and in case of probable success by further prosecution, and the papers are found tolerably well prepared, MUNN & Co. will take up the case and endeavor to get it through for a reasonable fee, to be agreed upon in advance of prosecution

CAVEATS

Are desirable if an inventor is not fully prepared to apply for a Patent. Caveat affords protection, for one year, against the issue of a patent to another for the same invention. Caveat papers should be carefully prepared.

The Government fee on filing a Caveat is $10, and MUNN & Co.'s charges for preparing the necessary papers are usually from $10 to $12.

REISSUES.

A patent when discovered to be defective, may be reissued by the surrender of the original patent, and the filing of amended papers. This proceeding should be taken with great care.

DESIGNS, TRADE MARKS, AND COMPOSITIONS

Can be patented for a term of years, also, new medicines or medical compounds, and useful mixtures of all kinds. When the invention consists of a medicine or compound, or a new article of manufacture, or a new composition, samples of the article must be furnished, neatly put up. Also, send a full statement of the ingredients, proportions, mode of preparation, uses, and merits.

PATENTS CAN BE EXTENDED.

All patents issued prior to 1861, and now in force, may be extended for a period of seven years upon the presentation of proper testimony. The extended term of a patent is frequently of much greater value than the first term; but an application for an extension, to be successful, must be carefully prepared. MUNN & Co. have had a large experience in obtaining extensions, and are prepared to give reliable advice.

INTERFERENCES

Between pending applications before the Commissioners are managed and testimony taken; also, Assignments, Agreements, and Licenses prepared. In fact, there is no branch of the Patent Business which MUNN & Co. are not fully prepared to undertake and manage with fidelity and dispatch.

FOREIGN PATENTS.

American inventors should bear in mind that five Patents—American, English, French, Belgian, and Prussian—will secure an inventor exclusive monopoly to his discovery among ONE HUNDRED AND THIRTY MILLIONS of the most intelligent people in the world. The facilities of business and steam communication are such, that patents can be obtained abroad by our citizens almost as easily as at home. MUNN & Co. have prepared and taken a larger number of European Patents than any other American Agency. They have Agents of great experience in London, Paris, Berlin, and other Capitals.

A Pamphlet, containing a synopsis of the Foreign Patent Laws, sent free.

Address MUNN & CO., 37 Park Row, New York.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

STEAM PUMPING ENGINE.—Wm. H. Roberts, Mauch Chunk, Pa.—This invention has for its object to secure uniformity of motion in the plunger of a steam pump throughout the stroke.

JACK FOR MOVING THE CROSS-HEADS OF STEAM ENGINES.—John S. Funk, Marysville, Pa.—This invention has for its object to move the cross-heads of locomotives or other engines when disconnected from their piston rods.

AUTOMATIC REGULATOR FOR VALVES, DAMPERS, ETC.—George Miller Sternberg, Fort Riley, Kansas.—This invention has for its object the operation of valves on the principle of gradually opening when a supply is needed, and gradually closing when the supply is obtained. It is applicable to the regulation of any sort of liquid or gaseous current that may be required to flow into or from a receptacle.

DEVICE FOR REVERSING MOTIONS.—Charles F. Hadley, Chicopee, Mass.—This invention is designed for direct-acting steam pumps, engines, or other machinery where reverse motion is required. The object of this invention is to overcome dead points in machinery, where continual reciprocating motion is required.

STOVE.—William Magill, Port Deposit, Md.—This invention has for its object to cause the draft of a base-burning stove to enter at the top, pass over the fuel in the magazine, effecting by its weight, during this passage, the retention of the gaseous products in the region of combustion beneath, and thereby contributing to their more thorough consumption; and, by flowing down a vertical flue at the rear of the stove, to gain a position whence it may strike the fire from beneath.

CHURN.—N. A. Prentiss, Silver Creek, N. Y.—This invention has for its object to furnish an improved churn, simple in construction and effective in operation, doing its work quickly and well.

FOLDING CRATE, BOX, ETC.—Landy A. Lindsey, Jackson, Miss.—This invention has for its object to furnish an improved crate, box, chest, or trunk, which shall be so constructed and arranged that it may be conveniently and quickly folded into a compact form for storage or transportation, and which, when opened for use, will be strong and serviceable.

CARRIAGE TOP.—M. T. Jackson, Montrose, Pa.—This invention has for its object to furnish an improvement for carriage tops by means of which the labor of raising and lowering the top shall be lessened and which will partially support the top when down, taking part of the weight of said top off the bows.

BREAKER ROLLER.—Edwin Douden, Lykens, Pa.—This invention has for its object to furnish an improvement in the construction of breaker rollers by means of which the teeth may be detached and sharpened when required, and which will enable the breaker to split the coal, instead of crushing it, as is the case with breakers constructed in the ordinary manner.

ADJUSTABLE BEDSTEAD.—Wm. O. Reid, Vienna, N. C.—This invention relates to improvements in beds for sick persons, and consists in an arrangement of the bottom in three sections and joining them together, and supporting them on a transverse axis mounted in the side rails of the bedstead, and producing therewith novel arrangements of supporting and adjusting arms, and hoisting and adjusting cords and pulleys, whereby the patient may while lying on the bed, raise himself to a sitting posture, with the feet projecting below the plane of the bottom of the bed, which assumes the position of a large chair; and whereby also he may, while lying on the back, raise the thighs to a perpendicular position, the lower legs remaining in a horizontal position. The said improved bed is particularly adapted for the treatment of diseases requiring the patient to be changed and placed in particular positions, which changes are greatly facilitated by it.

ROCK DRILL.—A. Blatchly, Central City, Colorado Territory.—This invention relates to improvements in rock drilling machines, designed to provide an automatically feeding drill to be actuated by steam power, under a more simple and reliable arrangement than now in use. The invention consists in certain improvements in the construction of the rotary engines for operating the drill, relating to the valve mechanism, pistons, bridges, or dividing plates, and to packing the cylinders; also, in the combination therewith of a cam wheel of peculiar construction, for communicating a reciprocating movement to the drill carriage; also, an arrangement for disconnecting the propelling action of the cams with the drill carriage, previous to the blow of the drill.

BOTTLE COCK.—L. A. Perrault, Natchez, Miss.—This invention relates to improvements in cocks for bottles, jugs, and other like articles, and consists of a cock attached to the cork or other plug, and having a turning plug provided with a loose key for operating it, the said cock having at the end of the tube projecting through the cork, a pair of wing or friction plates, so connected to it and bearing against the inner walls of the bottle, that a sliding tube or a piece of steel or other wire within the cock tube, and acted on by a cock plug, when turned to stop the passage of the liquid will force the wing plates against the walls of the bottle, so as to prevent the withdrawal of the cork.

BUTT HINGES.—A. P. Seymour, Hecla Works, N. Y.—This invention relates to improvements in butt hinges, and consists in an improved arrangement of the same for adaptation for use either as right or left handed hinges, and for self-locking to hold the door or shutter open when working on either hand; also, for unlocking by pressing on the stile of the shutter to which the hinge is connected.

FLOWER POT.—Mathias Ludlum, Williston, Conn.—This invention relates to improvements in flower pots, and has for its object to provide pots from which the plants with the earth enveloping the roots may be more readily transplanted, and an improvement in form calculated to give greater room for the roots.

GANG PLOW.—George R. Duval, Salem, Oregon.—This invention relates to new and useful improvements in gang plows, and consists in the method of raising and delivering the plows from the ground.

PARLOR HOT HOUSE.—Patrick Griffith, Brooklyn, N. Y.—This invention relates to a new and useful improvement in apparatus for propagating and growing plants, cultivating flowers, and for preserving them in cold weather.

WAGON.—J. H. Barr, Mansfield, Ohio.—This nvention relates to a new and useful improvement in wagon gearing, whereby the wagon is made to turn shorter curves, and therefore be less liable to upset than wagons of ordinary construction.

CHAMELEOTROPE.—Smith W. Anderson, New York city.—The object of this invention is to produce a spinning toy, which will exhibit in constant variation, a beautiful array of colors. The invention consists in the employment of a holder or support, which will retain a colored disk eccentric to the rotating shaft on which the said holder is secured. The invention also consists in connecting the said shaft by suitable gear connection with a hand lever, so that its revolutions may be unequal being produced by muscular power.

STOP-MOTION FOR CARDING MACHINES.—C. W. Anderson, Grosvenordale, Conn.—The object of this invention is to provide an attachment to the railway head of a carding machine, whereby any rupture in the fleece or crowding of the sliver between the rollers will at once cause the machine to stop. The invention consists in the use of a pivoted funnel or trumpet through which the fleece is passed, and which, as long as it is acted upon by the moving fibers remains inactive. As soon, however, as the fleece ceases to pass through it and to draw it back by friction, it is thrown forward and releases the shipper bar which throws the belt upon the loose pulley. The invention consists also in the use of a pivoted lever, which acts in conjunction with the afore-mentioned pivoted funnel, to arrest the machine as soon as the upper roller is elevated by the doubling or crowding of the sliver

TOY.—H. J. Heald, Birmingham, Conn.—This invention consists in the combination of a rotating figure, which is propelled by a wheel revolving on the ground, with a rattle, which is a spring elevated by pins on the wheel.

COMPRESSED AIR CYLINDER.—G. W. W. Goodwin, New Orleans, La.—This invention consists in an improved construction of cylinders for holding compressed air, by soldering successive sheets of tin or other thin sheet metal on a cylinder of the same substance to insure great strength, and forming the ends in conical shape, and similar construction the whole being tinned inside and out.

NEW BOOKS AND PUBLICATIONS.

A PRACTICAL TREATISE ON MECHANICAL ENGINEERING. Comprising Metallurgy, Molding, Casting, Forging, Tools, Workshop Machinery, Mechanical Manipulation, Manufacture of the Steam Engine, etc. With an Appendix on the Analysis of Iron and Iron Ores. By Francis Campin, C. E., President of the Civil and Mechanical Engineers' Society, Author of "The Engineer's Pocket Remembrancer, for Civil and Mechanical Engineers," etc. To which are added Observations on the Construction of Steam Boilers, Remarks upon Furnaces Used for Smoke Prevention and on Explosions. By Robert Armstrong, C. E. Revised, with Notes, by John Bourne. Rules for Calculating the Change of Wheels for Screws on a Turning Lathe, and for a Wheel-Cutting Machine. By J. La Nicca. The Management of Steel, including Forging, Hardening, Tempering, Annealing, Shrinking, Expansion, and the Case-Hardening of Iron. By George Ede. Illustrated with Twenty-nine Plates of Boilers, Steam Engines, Workshop Machinery, Change Wheels for Screws, etc., and One Hundred Wood Engravings. Philadelphia: Henry Carey Baird, Industrial Publisher, No. 406 Walnut street. Price, by mail, free of postage, $6·00.

The object of this work appears to have been to bridge a chasm in the literature of mechanical engineering. The author informs us in his preface that when the various works published on the different branches of mechanical engineering are classed they may be grouped under two general heads; that is, elementary works and complete treatises. There has been then an obvious want for a work combining practical method, portability and conciseness, with the exclusion of all unnecessary matter. The present work is designed to meet this want, and it will be seen from the title, which we give in full, that the whole field of practical mechanical engineering has been covered. That this has been done ably and well will, we think, be acknowledged by every intelligent engineer who gives the work a careful perusal. If the many young mechanics who so frequently write to us for information upon various mechanical subjects would possess themselves of this work and give it a careful reading they would find the money and time thus expended, a capital investment.

TROUT CULTURE. By Seth Green. Published by Seth Green and A. S. Collins. Caledonia, N. Y.

This pamphlet, written by one of the first to practice fish culture in this country, and now perhaps the largest and most successful trout culturist in America, is intended especially as a manual for those who wish to raise trout. It is essentially practical in character, and will be read with avidity by all who have any interest in fish farming.

HOWE'S MUSICAL MONTHLY.

We have received No. 8 of this valuable musical publication. It contains twenty-one pieces of music, and is sold at thirty-five cents each for single copies. Terms, per annum, three dollars. Elias Howe, publisher, 103 Court street, Boston, Mass.

BICKNELL'S VILLAGE BUILDER. Elevations and Plans for Cottages, Villas, Suburban Residences, Farm Houses, Stables and Carriage Houses, Churches, Court Houses, and a Model Jail. Also Exterior and Interior Details for Public and Private Buildings. With Approved Forms of Contracts and Specifications, including Prices of Building Materials and Labor at Boston, Mass., and St. Louis, Mo. Containing Fifty-five Plates Drawn to Scale, Showing the Style and Cost of Building in Different Sections of the Country. Being an Original Work, comprising the Designs of Fifteen Leading Architects, representing the New England, Middle, Western, and South-western States. A. J. Bicknell & Co., Publishers, Troy, N. Y., and Springfield, Ill.

We should do violence to our estimate of its merits did we fail to express our most cordial approbation of this large, elegant, and complete work. The title sufficiently sets forth its scope, and all we need say on that head is that it gives only a truthful exposition of the valuable contents of the book. We notice that the elevations are drawn on the scale of one eighth, one twelfth, or one sixteenth, and the details on a scale of from one half to three fourths of one inch to the foot, so that they may be easily comprehended and executed. The book is not characterized by the style of any one architect or locality, but being general in its adaptation, is eminently fitted to meet the wants of village builders throughout the country. To such we recommend it. The style of execution is excellent, and does credit to the publishers. Send for descriptive catalogue to A. J. Bicknell & Co., Troy, N. Y., or Springfield, Ill.

BARNS, OUTBUILDINGS, AND FENCES. By George G. Harney, Architect, Newburgh and Cold Spring, N.Y. New York: George E. Woodward.

This is a series of designs for the different outbuildings required on farms and country places generally, and on village and suburban lots, besides a number of suggestions for gateways and fences, and for rustic structures of all kinds. It contains sixteen designs for stables and a large number of designs for wood-houses, tool-houses, workshops, poultry-houses, together with one for an ice-house, a Swiss Chalet, and one for a small billiard house. It also contains two complete sets of farm buildings, and a large number of designs for rustic fences, inclosures, etc., etc., with descriptive text. The designs are well executed, and the work is printed in quarto form with large type, and on good paper. We commend the work to builders and those who are about to select designs for buildings of this class.

THE TWO GREAT BOOKS OF NATURE AND REVELATION; or, the Cosmos and the Logos. Being a History of the Origin and Progression of the Universe from Cause to Effect; more particularly of the Earth and the Solar System, the *modus operandi* of the Creation of Vegetables, Animals and Man, and how they are the Types and Symbols by which the Creator Wrote the Logos. Illustrated by the First Chapters of Genesis. By George Field. New York: S. R. Wells, 389 Broadway. Boston: H. H. and T. W. Carter, 13 Beacon street.

B. K. BLISS & SON'S ILLUSTRATED CATALOGUE OF HORTICULTURE, FOR 1870. New York: 41 Park Row.

The sixteenth spring catalogue of this old-established house, formerly of Springfield, Mass., is just out. It contains 120 pages, is full of well-executed engravings of every variety of flowers, plants, vegetables, grains, etc., with description and hints as to soil and time to cultivate. It is a publication which every person will take pleasure and derive profit in examining, and which every one in the country who has ever so small a patch of ground, should possess. See advertisement on another page.

THE CARPENTERS' AND BUILDERS' GUIDE. Being a Hand Book for Workmen. Also a Manual of Reference for Contractors, Builders, etc. By P. W. Plummer. Second Edition. Portland: Hoyt, Fogg & Breed, Publishers. St Louis: Keith & Woods.

THE PRACTICAL BRASS AND IRON FOUNDERS' GUIDE. A Concise Treatise on Brass Founding, Molding the Metals, and their Alloys, etc. To which are added Recent Improvements in the Manufacture of Iron and Steel by the Bessemer Process, etc. By James Larkin, late Conductor of the Brass Foundery Department in Reaney, Neafie & Co.'s Works Philadelphia. Fifth Edition. Revised with extensive Additions. Philadelphia: Henry Carey Baird, Industrial Publisher, No. 406 Walnut street. Price, by mail, free of postage, $2·25.

This edition of a well-known and popular work, has been prepared from the manuscript of the author, and is essentially improved and enlarged. It now contains a vast mass of practical information, useful not only to brass and iron founders, but to mechanics of all kinds. It is one of those books that any mechanic can read with pleasure and profit.

GRISWOLD'S RAILROAD ENGINEERS' POCKET COMPANION FOR THE FIELD. Comprising Rules for Calculating Deflexion, Distances, and Angles, Tangential Distances and Angles, and all necessary Tables for Engineers; also the Art of Leveling, from Preliminary Survey to the Construction of Railroads. Intended expressly for the Young Engineer. Together with numerous valuable Rules and Examples. By W. Griswold. Philadelphia: Henry Carey Baird, Publisher, No. 406 Walnut street. Price, by mail, $1·75.

This is a book of reference, designed to aid the memory in field work, and has been prepared from notes taken during a long experience in railroad engineering. It is bound in morocco, with a clasp and pocket, and seems to be in every way adapted to subserve the purpose designed.

Inventions Patented in England by Americans.

[Compiled from the "Journal of the Commissioners of Patents."]

PROVISIONAL PROTECTION FOR SIX MONTHS.

3,188.—APPARATUS FOR SHAMPOOING.—M. L. Winn, San Francisco, Cal. Nov. 3, 1869.

97.—SHARPENING KNIVES.—C. Robbins and H. A. Robbins, Washington, D. C. January 11, 1870.

244.—CONNECTING TRACES TO CARRIAGES.—J. W. Currier, Newbury, Vt. January 27, 1870.

306.—PROPELLER.—C. Kinzler and A. Keppler, New York city. February 2, 1870.

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100,244.—SUCTION HOSE.—Albert F. Allen, Providence, R. I.

100,245.—MAIN SPRING BARREL FOR WATCHES.—John P. Allen, Springfield, Ohio.

100,246.—WATCH REGULATOR.—J. P. Allen and W. E. Banta, Springfield, Ohio.

100,247.—STOP MECHANISM FOR CARDING MACHINE.—C. W. Anderson, Grosvenor Dale, Conn.

100,248.—CHAMELEOTROPE.—Smith W. Anderson, New York city.

100,249.—STEAM TRAP.—John Ashworth, North Andover, Mass.

100,250.—FASTENING FOR NECKTIES.—John Bachelder, Norwich, Conn.

100,251.—WAGON.—J. H. Barr, Mansfield, Ohio.

100,252.—ROCK DRILL.—A. Batchly, Central City, Colorado.

100,253.—WASHING MACHINE.—W. A. Brown, Philadelphia, Pa.

100,254.—IRON BRIDGE.—Henry C. Brundage, Buffalo, N. Y.

100,255.—HYDRANT.—S. G. Cabell, Quincy, Ill., and A. Q. Ross, Cincinnati, Ohio. Antedated Feb. 16, 1870.

100,256.—SPRING BED BOTTOM.—J. B. Campbell, Cincinnati, Ohio.

100,257.—BED LOUNGE.—H. S. Carter, Chicago, Ill.

100,258.—TAG MACHINE.—C. H. Chapman (assignor to A. G. Snell), Shirley, Mass.

100,259.—COAL-HOISTING APPARATUS.—Lewis S. Chichester Brooklyn, N. Y. Antedated Feb. 19, 1870.

100,260.—LAMP BURNER.—Michael Henry Collins, Chelsea, Mass.

100,261.—SPOKE LATHE.—C. B. Conant and Hiram Thompson, Worcester, Mass.

00,262.—FOUNDATION FOR BUILDINGS. — A. F. Cooper, San Francisco, Cal.

100,263.—ROCKING HORSE.—Jesse A. Crandall, Brooklyn, N. Y.

100,264.—SAFETY HATCH FOR BUILDINGS.—G. N. Creamer, Trenton, N. J.

100,265.—SELF-ACTING HATCHWAY HOIST.—G. N. Creamer Trenton, N. J.

100,266.—GRAND PIANO.—G. H. Davis, Boston, Mass.

100,267.—VENTILATOR. — Edward Mortimer Deey, New York city.

100,268.—HYDROCARBON BURNER.—Adolphe De Landsee, Paris, France.

100,269.—COMPOSITION FOR ROOFING, PAVING, ETC.—E. J. De Smedt, New York city, assignor to New York Improved Anthracite Co., New York city.

100,270.—VAPOR BURNER.—Henry C. De Witt, Waukegan, Ill.

100,271.—UMBRELLA FRAME.—Harry E. Donor (assignor to himself and Robert E. Brett), New York city. Antedated February 17, 1870.

100,272.—RAILWAY CAR COUPLING.—J. W. H. Doubler (assignor to himself, J. M. Clendening, S. C. Hayes, and T. F. Rooney), Chicago, Ill. Antedated Feb. 16, 1870.

100,273.—BREAKER ROLLER.—Edwin Douden (assignor to himself and Charles Broome), Lykens, Pa.

100,274.—CARBURETER.—Cleaveland F. Dunderdale, New York city.

100,275.—SCHOOL DESK.—W. P. Erwin and T. A. Dugdale, Richmond, Ind.

100,276.—SCHOOL DESK AND SEAT.—W. P. Erwin and T. A. Dugdale, Richmond, Ind.

100,277.—CORN CULTIVATOR. —John C. Erwood, Vernon, Ind.

100,278.—CORSET.—D. H. Fanning, Worcester, Mass.

100,279.—OIL CAN.—J. L. Folsom, East Boston, Mass.

100,280.—VEGETABLE CUTTER.—Michael Gerhard, Newark, N. J.

100,281.—HOT AIR FURNACE.—B. Gommenginger, Rochester, N. Y.

100,282.—COMPRESSED AIR CYLINDER.—G. W. Warfield Goodwin, New Orleans, La.

100,283. — BREASTPLATE FOR THE BREAST COLLARS OF DOUBLE HARNESS.—C. Graham, New York city.

100,284.—VIOLIN.—Joseph Grandjon, Paris, France.

100,285.—WICK TUBE FOR LAMPS.—J. H. Gray, Boston, Mass. Antedated Feb. 21, 1870.

100,286.—CONSTRUCTION OF BARRELS AND PACKAGES.—C. Green, Wilmington, Del.

100,287.—PARLOR HOT HOUSE.—Patrick Griffith, Brooklyn' N. Y.

100,288.—ADDING MACHINE.—John Groesbeck, Philadelphia, Pa.

100,289.—LANTERN.—Charles Hart, Wakefield, Mass.

100,290.—TOY.—H. J. Heald (assignor to himself and Henry Somers), Birmingham, Conn.

100,291.—FERROTYPE PLATE. — H. M. Hedden, Worcester, Mass.

100,292.—CHURN.—C. P. Holmes, Governeur, and A. L. Howell, Mohawk, N. Y.

100,293.—MANUFACTURE OF ARTIFICIAL FLOWERS.—Catherine E. Howard, San Gabriel, Cal.

100,294.—STEAM BLOWER AND EXHAUSTER.—John Howarth, Salem, Mass.

100,295.—CARRIAGE TOP.—M. T. Jackson, Montrose, Pa.

100,296.—CIGAR BOX.—Chauncey Jerome, New Haven, Conn., assignor, by mesne assignments, to S. B. Jerome, administrator of estate of Chauncey Jerome, deceased, and S. B. Jerome, assignor to E. A. Douglass, Philadelphia, Pa.

100,297.—PORTABLE BATH.—E. J. Knowlton, Ann Arbor, Mich.

100,298.—DOUBLE-SHOVEL PLOW.—G. W. Lawbaugh, Geneseo, Ill. Antedated Feb. 26, 1870.

100,299.—FOLDING CRATE. — Landy A. Lindsey, Jackson, Miss.

100,300.—FLOWER POT.—Mathias Ludlum, Williston, Vt.

100.301.—FLOOR FOR DRYING PEAT.—J. B. Lyons, Milton, Conn.

100,302.—PEAT MACHINE.—J. B. Lyons, Milton, Conn.

100,303.—SHAFT COUPLING.—H. F. Mann, Pittsburgh, Pa.

100,304.—MANUFACTURE OF POTTERY, ETC.—Philip Marquardt, Buffalo, N. Y.

100,305.—ICE-CREAM FREEZER.—B.G. Martin, Williamsburgh, N. Y. Antedated Feb. 14, 1870.

100,306.—FRUIT JAR.—J. L. Mason, New York city.

100,307.—LIQUID MEASURE.—Martin McDevitt, Hampton, Vt.

100,308.—PUDDLING FURNACE.—Samuel McLaughlin (assignor to himself and B. R. Caskey), Philadelphia, Pa.

100,309.—PURIFICATION OF COAL GAS.—Emerson McMillin, Ironton, Ohio.

100,310.—FENCE.—G. S. Mills, Johnson, Vt.

100,311.—MANURE HOOK.—S. B. Minnich, Landisville, Pa.

100,312.—SAW GUMMER.—Gilbert Munday, Montezuma, Ohio.

100,313.—REVERSIBLE LATCH.—W. T. Munger (assignor to P. & F. Corbin), New Britain, Conn.

100,314.—ROSE FOR DOOR KNOBS.—W. T. Munger (assignor to P. & F. Corbin), New Britain, Conn.

100,315.—RATCHET AND PAWL MECHANISM.—M. D. Myers, Frankfort, N. Y.

100,316.—CHILDREN'S HORSE AND SELF-PROPELLER.—J. H. Nolan, Waterville, N. Y. Antedated Feb. 11, 1870.

100,317.—SHUTTLE FOR LOOMS.—E. A. Paine, Grafton, Mass.

100,318.—APPARATUS FOR MAKING SOLID CORES.—S. J. Peet, New York city. Antedated Feb. 16, 1870.

100,319.—MACHINE FOR PRODUCING MOLDS.—S. J. Peet, New York city. Antedated Feb. 16, 1870.

100,320.—MACHINE FOR PRODUCING CORES.—S. J. Peet, New York city. Antedated Feb. 16, 1870.

100,321.—BOTTLE COCK.—L. A. Perrault, Natchez, Miss.

100,322.—BASE BURNING STOVE.—J. S. Perry and Andrew Dickey, Albany, N. Y.

100,323.—FILTER FOR CISTERNS.—B. B. Redfield, Lapeer, Mich.

100,324.—ADJUSTABLE BEDSTEAD.—Wm. O. Reid, Vienna, N. C.

100,325.—PLOW.—Mark Rigell, Newton, Ala., assignor to himself, Robert D., Wm. D., and Robert F. Joy, Milford, Ga.

100,326.—PLOW.—Mark Rigell, Newton, Ala., assignor to himself, Robert D., Wm. D., and Robert F. Joy, Milford, Ga.

100,327.—DISINFECTING COMPOUND.—L. S. Robbins, New York city.

100,328—HORSESHOE.—David Roberge, Mooer's Forks, N.Y.

100,329.—HORSESHOE.—David Roberge, Mooer's Forks, N.Y.

100,330.—GRAPPLE.—Seymour Rogers, Pittsburgh, Pa.

100,331.—COAL SIFTER.—Brown Sears, Cold Spring, N. Y.

100,332.—REVERSIBLE HINGE.—A. P. Seymour, Hecla Works, N. Y.

100,333.—RAILROAD CAR HEATER.—Frederick Shaller, Hudson, N. Y.

100,334.—SCHOOL DESK.—James Smith, Richmond, Ind.

100,335.—BASE BURNING STOVE.—James Spear, Philadelphia, Pa.

100,336.—BROOM.—W. C. Spellman, Hartford, Conn.

100,337.—MACHINE FOR FEEDING ORES INTO SHAFT ROASTING-FURNACES.—Chas Stetefeldt, Austin, Nevada.

100,338.—CALENDAR.—J. T. Tannatt, Springfield, Mass.

100,339.—WOODEN PAVEMENT.—J. K. Thompson, Chicago, Ill.

100,340.—PEN.—E. P. Tiffany, Hartford, Conn.

100,341—CURTAIN FIXTURE.—Jas. Turnbull and Wm. Turnbull, Vancouver, Washington Territory.

100,342.—DEVICE FOR OILING CARRIAGE AXLES.—Jas. Vanderpool, Hackensack, N. J.

100,343.—BROOM.—Thomas Walter, Philadelphia, Pa.

100,344.—FEED-WATER FILTER.—G. Waters, Cincinnati, Ohio.

100,345.—CLOTHES PIN.—Wm. Wellington, Rockford, Ill.

100,346.— APPARATUS FOR TRANSMITTING MOTION TO SEWING MACHINES.—Wm. Wellington, Rockford, Ill.

100,347.—FERTILIZER FROM EXCREMENTS.—Friedrich Wicke, Bockenheim, Julius Bronner, Theodor Petersen, and J. G. Zehfuss, Frankfort-on-the-Main, Prussia.

100,348.—MACHINE FOR PARING FRUIT.—W. H. Williams (assignor to himself and C. H. Williams), Cantor, Ohio.

100,349.—PARLOR FOUNTAIN FOR DIFFUSING LIQUIDS.—Wm. Altic, Dayton, Ohio.

100,350.—HORSE POWER.—J. E. Atwood, Willimantic, Conn.

100,351.—BARN DOOR HANGER.—W. R. Axe, Rockton, Ill.

100,352.—METHOD OF PRESERVING THE AROMATIC PRINCIPLE OF HOPS.—Henry Bartholomay (assignor to Bartholomay & Frauenberger), Rochester, N. Y.

100,353.—MANUFACTURE OF DRY WHITE LEAD.—E. O. Bartlett, Birmingham, Pa.

100,354.—COVERING FOR STEAM BOILERS.—C. A. Baumann, New York city.

100,355.—FASTENING FOR CARRIAGE CURTAINS.—Frederick Baumgartner, Brooklyn, N. Y.

100,356.—VELOCIPEDE.—Joseph Beck, Morrisania, N. Y. Antedated Feb. 26, 1870.

100,357.—BRAKE FOR CARRIAGES AND WAGONS.—Joseph G. Bicknell, Cambridge, assignor to himself, C. S. Wilkins, Boston, Mass., and G. F. Jennings, New York city.

100,358.—COMPOUND FOR PREVENTING INCRUSTATION IN STEAM BOILERS.—Geo. Birks, Marine, Ill.

100,359.—COMBINED ENGINE BOILER AND SUPERHEATER.—F. B. Blanchard, Spuyten Duyvil, N. Y. Antedated Feb. 18, 1870.

100,360.—SIFTING APPARATUS.—S. O. Blanding, Vineland, N. J.

100,361.—CULINARY BOILER.—G. W. Bliss, Brooklyn, N. Y.

100,362.—WATER-WHEEL CASE.—J. W. Bookwalter, Springfield, Ohio.

100,363.—WOOD PAVEMENT.—L. H. Boole, New York city.

100,364.—SNAP-HOOK AND BUCKLE.—J. C. Brady and J. H. Brady, Corsica Borough, Pa.

100,365.—MANUFACTURE OF MADDER DYES.—Thos. Bristow (assignor to Amasa Sprague), Cranston, R. I.

100,366.—TYPE-DISTRIBUTING MACHINE.—Orren L. Brown, Boston, Mass.

100,367.—ROTARY PAPER-CUTTING MACHINE.—Richard Vose, Philadelphia, Pa., administrator of Wm. Bullock, deceased. Antedated Feb. 23, 1870.

100,368.—MACHINE FOR PLANING AND SQUARING THE ENDS OF SEGMENTAL STEREOTYPE PLATES.—Richard Vose, Philadelphia, Pa., administrator of Wm. Bullock, deceased. Antedated Feb. 28, 1870.

100,369.—STOVE PIPE DAMPER AND VENTILATOR.—A. R. Burdick, Racine, Wis.

100,370.—SPRING WAGON SEAT.—Peter Burress, Braidwood, Ill.

100,371.—FLUTING MACHINE.—S. G. Cabell, Washington, D. C.

100,372.—CHIMNEY COWL.—E. P. H. Capron, Springfield, Ohio.

100,373.—SLIDING DOOR.—Jacob Capron, New York city.

100,374.—SHIELD FOR PITCHERS, ETC.—Franklin B. Carleton, Cambridge, Vt.

100,375.—CONFECTIONERY.—Lewson E. Chase, Watertown assignor to Chase & Co., Boston, Mass.

100,376.—MILK CAN.—John Cochran, Purdy's Station, N. Y.

100,377.—CARPET.—John Cochrane, Jun., Malden, Mass.

100,378.—MACHINE FOR SAWING MARBLE.—R. S. Craig and A. H. Woodward, Dover, N. Y.

100,379.—GRAIN SEPARATOR.—Evan Davis, Almond, N. Y.

100,380.—SEASONING AND PRESERVING WOOD.—J. C. Day, Hackettstown, N. J.

100,381.—HORSE COLLAR.—Arsene Ducastel, New York city

100,382.—BARLEY FORK.—Frederick Dunn, Pulaski, N. Y.

109,383.—GANG PLOW.—George R. Duval, Salem, Oregon.

100,384.—HARNESS RING.—Horace N. Eames, Newport, N. Y.

100,385.—SPRING BED BOTTOM.—Benjamin F. Ells, Dayton, Ohio.

100,386.—CAMP BEDSTEAD.—Charles Joseph Everickx, Paris, France.

100,387.—MACHINE FOR DRESSING LEATHER.—Edward Fitzhenry, Boston, Mass.

100,388.—DOOR SPRING.—Benjamin G. Fitzhugh (assignor to Jacob Byerly), Frederick, Md.

100,389.—HYDRANT.—Alexander S. Fort, Cincinnati, Ohio.

100,390.—JACK FOR MOVING THE CROSS-HEADS OF LOCOMOTIVES.—John S. Funk, Marysville, Pa.

100,391.—PAPER-CUTTING MACHINE.—Henry A. Gage, Manchester, N. H.

100,392.—SICKLE BAR. — Charles O. Gardiner, Springfield, Ohio.

100,393.—OIL CAN.—John D. Gray, Cincinnati, Ohio.

100,394.—CLAMPED MOLD FOR MAKING LEAD JOINTS IN PIPE CONNECTIONS.—Edward Gwyn, Tiffin, Ohio.

100,395.—DEVICE FOR REVERSING MOTION.—Charles F. Hadley, Chicopee, Mass., assignor to Ames Manufacturing Company.

100,396.—FRUIT JAR.—Joel Haines, West Middleburg, Ohio.

100,397.—COMBINED SPIDER, SKILLET, AND GRIDIRON.—Thomas Foster Hamilton, Geneseo, Ill.

100,398.—CAST METAL LAMP.—T. F. Hammer, Branford, Conn.

100,399.—PLATE-PRINTING REGISTER. — Joseph L. Harley, Washington, D. C.

100,400.—MACHINE FOR MAKING CAR SPRINGS.—Albert Hebbard, Springfield, Mass.

100,401.—COMBINATION OF BILLIARD AND DINING TABLE.—Frederick E. Held, Chicago, Ill.

100,402.—PADLOCK.—Louis Hillebrand, Philadelphia, Pa.

100,403.—PADLOCK.—Louis Hillebrand, Philadelphia, Pa.

100,404.—STOVE FOR RAILROAD CARS.—M. T. Hitchcock (assignor to himself and J. W. Labaree), Springfield, Mass.

100,405.—FLUTING MACHINE.—Charles R. L. Holmes (assignor to George Hovey & Son), New York city.

100,406.—COAL STOVE.—Marcus L. Horton, Windsor, Vt.

100,407.—MACHINE FOR SEWING BOOKS.—Frederick Webster Howe, Providence, R. I., assignor to Henry G. Thompson, New York city, and Reune Martin, Orange, N. J.

100,408.—SPRING BED BOTTOM.—Tyler Howe (assignor to himself and Otis Howe), Cambridgeport, Mass.

100,409.—WASH BOILER. — T. G. Hughes, Elysian, Minn

100,410.—BROILER.—Abraham C. Hull (assignor to himself and J. C. Cameron), St. Louis, Mo.

100,411.—STEAM GENERATOR.—W. H. Ivens, Trenton, N. J.

100,412.—CHURN.—J. N. Jacobs, Crittenden, Ky.

100,413.—TIN-WORKERS' TONGS.—John Dawson James, Jun., Washington, D. C., assignor to himself, Adolf Bode, and Jacob D. C. Outwater, Newark, N. J.

100,414.—MACHINE FOR SEAMING METAL ROOFS.—John Dawson James, Jun., Washington, D. C., assignor to himself, Adolph Bode, and Jacob D. C. Outwater, Newark, N. J.

100,415.—AERIAL CAR. A.—P. Keith, Easton, Mass.

100,416.—SCHOOL DESK AND SEAT.—Wm. H. Kline, Eaton, Ohio.

100,417.—CURRY COMB.—Lucien Knapp, Woodhaven, N. Y.

100,418.—CISTERN FILTER. — Patrick Laughlin, Danville, Ky.

100,419.—RUDDER COLLAR.—Sewall Leach (assignor to himself, J. D. Leach, and Sabin Hutchings), Penobscot, Me. Antedated February 19, 1870.

100,420.—FUNNEL.—Wm. E. Ledmun, Bridgeville, Del.

100,421.—ASH SIFTER.—Francis X. Lipp, Baltimore, Md.

100,422.—CHIMNEY COWL.—Miles Lockhart, Douglas, Isle of Man.

100,423.—SMOOTHING IRON.—George W. C. Lovell, Clarksville, Tenn.

100,424.—KILN FOR ANNEALING GLASS.—Thomas Lowry, Pittsburgh, Pa.

100,425.—CLOTH-MEASURING APPARATUS.—Samuel B. Luckett, Corydon, Ind.

100,426.—DRIVEN-WELL STRAINER.—Charles E. Macomber and Corydon E. Whelpley, Minneapolis, Minn.

100,427.—BASE-BURNING STOVE.—Wm. Magill, Port Deposit, Md.

100,428.—COLLECTING WASTE SPIRITS FROM BREWERIES AND BARS.—Arthur Maginnis and William McCormick, Philadelphia Pa.

100,429.—VENTILATOR FOR WINDOWS.—Sebeus C. Maine, Boston, Mass.

100,430.—FOLDING IRONING TABLE.—James H. Mallory, La Porte, Ind.

100,431.—FENCE.—John McConnell, Tyro, Ohio.

100,432.—MANUFACTURE OF ILLUMINATING GAS FROM COAL AND OTHER MATERIALS.—George McKenzie, Glasgow, Scotland.

100,433.—COMPOUND FOR THE MANUFACTURE OF ILLUMINATING GAS.—George McKenzie, Glasgow, Scotland.

100,434.—GRAIN FAN.—James McPhail, Charles City, Iowa.

100,435.—MANUFACTURE OF HARD RUBBER.—John B. Newbrough, New York city.

100,436.—MANUFACTURE OF COMBINED CLOTH AND PAPER FABRIC.—James H. Newton, Holyoke, Mass.

100,437.—LUBRICATOR.—Thomas J. Nottingham, Cincinnati, Ohio.

100,438.—CLOTHES-LINE FASTENER.—Harrison Ogborn, Richmond, Ind. Antedated February 25, 1870.

100,439.—MEDICAL COMPOUND FROM GLOBE FLOWER.—John S. Pemberton, Atlanta, Ga.

100,440.—AUGER FOR BORING SQUARE HOLES.—Alfred T. Perrine, Louisville, Ky., assignor to himself and William C. Chase, Providence, R. I.

100,441.—GRAIN CLEANER.—Chauncey Perry and James E. Wheat, Rochester, N. Y. Antedated February 26, 1870.

100,442.—CIRCUIT-CLOSER FOR ELECTRO-MAGNETIC RAILROAD SIGNALS.—A. Warner Platt, New York city.

100,443.—STEAM GENERATOR.—Henry A. V. Post, Cincinnati, Ohio, assignor to himself, James H. Sheldon, and James T. Sterling.

100,444.—SPRING SEAT FOR WAGONS.—Wm. Pruett, Duquoin, Ill.

100,445.—COFFIN HANDLE.—James S. Ray, East Haddam, Conn.

100,446.—EXTENSION TABLE.—Wm. Reichenbach and Fretrich Roschdlantzky, Chicago, Ill.

100,447.—NAIL-CUTTING MACHINE. — Philemon Richards, Philadelphia, Pa.

100,448.—COVERING THE ENDS OF RUBBER HOSE.—John P. Rider and James R. Bird, Brooklyn, N. Y., assignors to "The New York Rubber Company."

100,449.—DEVICE FOR SECURING UNIFORM MOTION IN PUMP ENGINES.—Wm. H. Roberts, Mauch Chunk, Pa.

100,450.—LAMP SHADE.—Wm. Robinson, Spring Valley, N. Y Antedated February 23, 1870.

100,451.—STAY-BRACE FOR TRUNKS.—Jules Roch, Rochester N. Y.

100,452.—Ash Box and Sifter.—Hiram D. Rogers, Cincinnati, Ohio.
100,453.—Blind Hinge.—D. C. Sage, Middletown, Conn.
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REISSUES.

3,853.—Steam Generator.—W. P. Abendroth, John Griffith, G. W. Wundram, and T. H. Müller, New York city, assignees of T. H. Müller.—Patent No. 83,528, dated Oct. 27, 1868.
3,854.—Hay Rake and Loader.—Horace Baker, Cortland, assignor to R. K. Sanford, Volney, N. Y.—Patent No. 55,979, dated July 3, 1866; reissue 2,911, dated April 7, 1868.
3,855.—H̶t.—John P. Beatty, Norwalk, Conn. Patent No. 88,116, dated March 23, 1869; antedated February 2, 1869.
3,856.—Crimping Machine.—F. B. Cabell, Quincy, Ill., assignee of S. G. Cabell.—Patent No. 56,365, dated July 17, 1866.
3,857.—Use and Application of Fuel in Metallurgic and other Furnaces.—T. W. Clarke and W. S. Dexter, trustees, Boston, Mass., assignees of J. D. Whelpley and J. J. Storer. Patent No. 53,268, dated March 13, 1866.
3,858.—Device for Swaging Chain Links.—O. M. Draper, North Attleborough, Mass., assignee of Virgil Draper. Patent No. 50,200, dated Sept. 26, 1865.
3,859.—Electro-Magnetic Alarm for Railroad Switches.—Hall's Patent Electric Railway Switch and Drawbridge Signal Co., New Haven, Conn., assignees of Thos. S. Hall. Patent No. 62,414, dated Feb. 26, 1867.
3,860.—Breech-loading Fire-arm.—W. C. Hicks, Summit, N. J. Patent No. 16,797, dated March 10, 1857; reisque 1,952, dated May 9, 1865; reissue 3,798, dated Jan. 18, 1870.
3,861.—Fluting Machine.—Susan R. Knox, New York city, for herself, and assignee of W. D. Corrister. Patent No. 53,633, dated April 3, 1866.
3,862.—Reversible Latch.—Burton Mallory, New Haven, Conn.—Patent No. 38,400, dated May 5, 1863.
3,863.—Pencil.—Joseph Reckendorfer, New York city. Patent No. 36,854, dated Nov. 4, 1862.
3,864.—Compound for Treating Hides and Skins.—L. F. Robertson, Morrisania, N. Y. Patent No. 77,069, dated April 21, 1868; reissue 2,947, dated May 26, 1868.
3,865.—Machine for Milling the Knife Edges of Scale Beams.—T. J. Rockwood, St. Johnsbury, Vt. Patent No. 81,267, dated Aug. 11, 1868.
3,866.—Turbine Water Wheel.—B. Stetson, Uxbridge, and E. Townsend, Boston, Mass., assignees of B. Stetson. Patent No. 29,634, dated Aug. 14, 1860.
3,867.—Process of Treating Petroleum.—J. A. Tatro, Hartford, Conn. Patent No. 99,728, dated Feb. 8, 1870.
3,868.—Buckle.—The West Haven Buckle Company, West Haven, Conn., assignees of S. S. Hartshorn. Patent No. 29,270, dated July 24, 1860.

DESIGNS.

3,869.—Paper Collar Box.—Franklin Field, Troy, N. Y.
3,870.—Collar and Cuff Box.—Franklin Field, Troy, N. Y.
3,871.—Ink Bottle.—Alonzo French, Philadelphia, Pa.
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3,873.—Outside Door Latch.—W. Gorman (assignor to Russell & Erwin Manufacturing Company), New Britain, Conn.
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3,875.—Floor-cloth Pattern.—C. T. Meyer, Newark, N. J., assignor to E. C. Sampson, New York city.
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3,878.—Shade for Gas or Lamp Burners.—Benjamin Thackara (assignor to Miskey, Merrill & Thackara), Philadelphia, Pa. Antedated Oct. 1, 1869.
3,879.—Carpet Pattern.—J. T. Webster, New York city, assignor to Page, Wilder & Co., Hallowell, Me.
3,880.—Carpet Pattern.—J. T. Webster, New York city, assignor to Page, Wilder & Co., Hallowell Me.

EXTENSIONS.

Gearing for Feed Boilers of Planing Machine.—Chas. Burleigh, Fitchburg, Mass. Letters Patent No. 14,272, dated Feb. 12, 1856.
Machine for Folding Paper, etc.—John Thompson, of New York city, executor of Thomas Thompson, deceased. Letters Patent No. 14,260, dated Feb. 12, 1856.
Method of Bottling Fluids Under Gaseous Pressure.—Jane Quantin and H. A. Pintard, of Philadelphia, Pa., executors of the estate of Alphonse Quantin, deceased. Letters Patent No. 14,268, dated March 4, 1856; reissue No. 3,175, dated Oct. 27, 1868; reissue 3,272, dated January 19, 1869.

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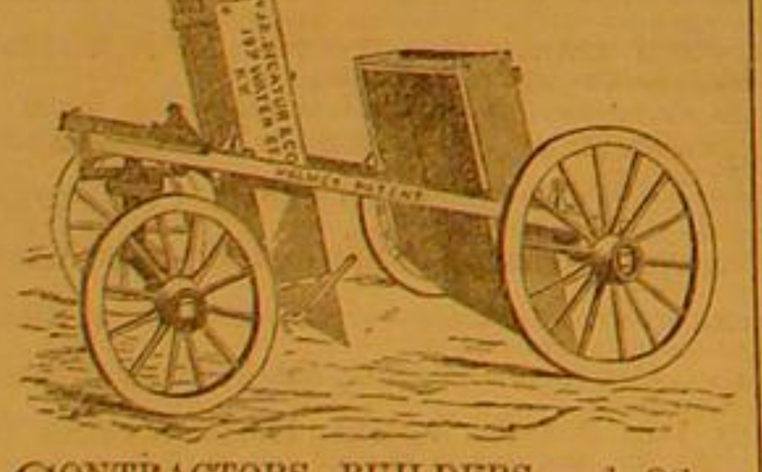

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