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A NOVEL FORM OF AERIAL VESSEL.

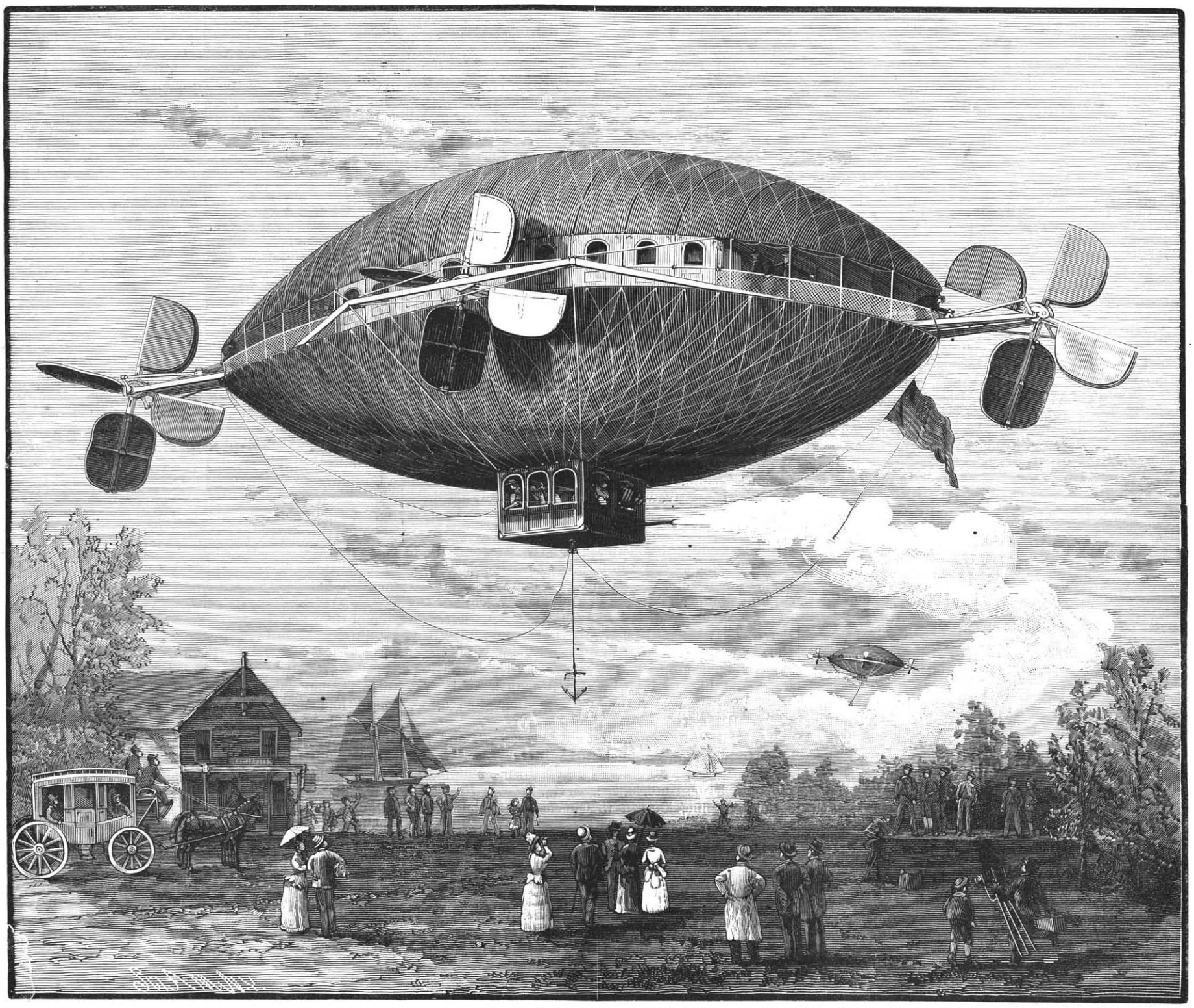
The accompanying engraving illustrates an aerial vessel and propelling wheel, the invention of Mr. Moses S. Cole, of Greytown, Nicaragua, Central America, containing many novel features in the form, construction, and general arrangement of the parts. It is claimed that this vessel can be raised, lowered, steered, and propelled in any direction at the will of the pilot.

The vessel is provided with a central compartment having suitable rooms for the accommodation of passengers and crew. On the top of the ceiling is secured an inflated balloon of semi-spheroidal form, while to the floor is attached a similar balloon. Downwardly through the floor extends a hollow shaft in which is placed the motive power for operating the driving wheels, and which forms at its lower end the pilot house. The main driving shaft is placed transversely across the floor, and is formed with a crank at its center, to which the motor is coupled. On each end of the shaft, and outside the inclosing wall of the compartment, is secured a wheel having several wings, which open and close automatically, according to circumstances; these wheels serve to raise or lower the vessel. Wheels similar in construction are placed at the ends of the vessel, each being mounted on a frame pivoted to the floor, and provided on its inner end with a device for swinging it from its central position in line with the axis of the vessel to one side. The wheels are each mounted on a shaft having crank arms, which receive a rotary motion from the main shaft by suitable connections. The end wheels steer the vessel in any direction, and propel it in a horizontal plane. The ends of the vessel are provided with valves, which permit of ventilating the compartment when the vessel is in motion and all the doors and windows in the wall are closed.

The wings of the propelling wheels are so constructed as to open through a certain part of the revolution and close through the remainder. This important feature is accomplished through the medium of cams, which, in connection with the rotating spokes or arms, operate sliding bars which open the wings and lock them in that position during a certain part of a revolution. The wings are open only through one-quarter of the entire revolution, and are completely closed through one-half, the remaining quarter being necessary for the opening of the wings and the closing, which latter is due to the resistance of the air. The wings consist of frames covered with canvas or other suitable material, and hinged to the arms; the two parts of each wing can thus be opened so as to lie in the same plane, or closed so as to rest parallel with each other.

The rotation of the side wheels causes the vessel to ascend, aided by the balloons. A forward or backward motion is obtained by the rotation of the end wheels when placed in an axial position, but the vessel can be forced to execute any evolution desired by swinging one or both of these wheels sidewise. To cause the vessel to descend, the motion of the side wheels is reversed.

The connections, through the medium of which motion is communicated from the motor in the shaft to the four sets of wheels, are well designed so as to insure the necessary strength combined with little weight. The arrangement of the parts for opening the wings is simple, effective, and not liable to get out of order. The machinery, taken as a whole, may be made strong and effective without undue weight.



COLE'S NOVEL FORM OF AERIAL VESSEL.

Petroleum in Amsterdam.

A huge iron reservoir is being built at a remote spot in the outer harbor of Amsterdam, for the storage of petroleum. It will be nearly 33 feet in diameter and of the same depth, and is calculated to hold 7,900,000 liters of oil, or nearly 1,740,000 gallons. The petroleum will be brought direct from Russia in vessels specially constructed, and it will be pumped out at Amsterdam into the tank, thus saving the expense of filling and emptying casks and diminishing the risk of accidents.

UNTIL 1776, cotton spinning was performed by the hand-spinning wheel.

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NEW YORK, SATURDAY, JANUARY 1, 1887.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 574.

For the Week Ending January 1, 1887.

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HIRING SHIPS TO CARRY THE FLAG.

Many naval officers and shipping merchants have recently expressed themselves in favor of subsidizing a fleet of American-built steamers, which in times of peace should carry the mails, and when war threatens be used as commerce destroyers, transports, and the like. According to the proposition, the ships should be built after plans prepared by the Navy Department, these plans to anticipate the easy transformation of the ships into swift-footed cruisers, capable of carrying a battery of one or more guns. It is, of course, at once apparent that ships built to carry passengers and freight could not possess all the essential requirements even of light-armored cruisers, for they would be top-heavy for large guns, and the placing of the engines below the water line would interfere with cargo carrying; but there is reason to believe that they could be so constructed as to become valuable aids as auxiliaries to a fleet of regularly constructed fighting ships.

The English transatlantic liners are regarded as a valuable addition to the British navy, into the service of which they may at any time be called; and the French, imitating the English plan, have recently built some splendid vessels for their merchant service, with a careful eye to their use in time of war. These ships—La Bretagne, La Bourgogne, and La Gascogne—are now plying between this port and Havre, and others are being rapidly put together at the yards at Saint Nazaire and Saint Chamond. They are built in the strongest possible manner for such constructions, and are so swift of foot as to have already become formidable rivals to the English "greyhounds."

Without going into the question of the desirability of subsidies for ships, such a fleet as that proposed would, it must be said, be an important and a valuable acquisition. It is not, however, easy to see how, as the friends of the project allege, these ships would, to any appreciable extent, encourage or lead to the building of a sea-going merchant fleet.

It is not likely that the appearance of these ships on the ocean would lead to the building of others, unless the subsidy scheme were extended to reach them, and this would, of course, be simply hiring ships to carry the American flag. It is not sentiment that prevents the American merchant from carrying his own goods. It is because he finds he can have them carried by foreigners cheaper than he can carry them himself. That is all. English, Italian, and German crews are paid small wages, and are content to live upon cheap food. Add to this the fact that good freight steamers can be purchased abroad for much less than they cost, and the futility of trying to compete with the foreign freighter is immediately obvious. Again, admitting the excellence of native workmanship, it is not at all likely that our shipbuilders could, for some time to come at least, rival the English builders of iron and steel steamers, with their years of experience in such construction. The idea that we could build steamers capable of averaging twenty-one statute miles an hour—faster, be it said, by a mile an hour than the average speed of the swiftest of the noble fleet now plying across the Atlantic—certainly seems to be preposterous and unworthy the serious consideration of a practical people. If there is any evidence to be had to sustain such an assertion, we should like to know where it may be had. Yet those who propose the plan under discussion say we can and ought to do this.

Here is a list of the fastest steamers afloat, and the average speed of each in statute miles:

Cunard Line, New York to Queenstown.—Number of miles per hour: Umbria, 20; Servia, 18; Etruria, 19.

Cunard Line, Boston to Queenstown.—Gallia, 15; Cephalonia, 14; Scythia, 14.

Anchor Line, New York to Glasgow.—Furnessia, 18; Ethiopia, 14; Devonia, 12.

North German Lloyd, New York to Southampton.—Trave, 19; Saale, 18; Eider, 18.

Hamburg American Line, New York to Plymouth.—Hammonia, 19; Wieland, 19; Lessing, 19.

American Line, Philadelphia to Queenstown.—Indiana, 18.

Guion Line, New York to Queenstown.—Alaska, 18; Arizona, 17; Wisconsin, 18.

Inman Line, New York to Queenstown.—City of Berlin, 15; City of Chicago, 15; Baltic, 15.

National Line, New York to Queenstown.—America, 18.

White Star Line, New York to Queenstown.—Germanic, 17; Celtic, 15; Britannic, 17.

General Transatlantic Line to Havre.—La Champagne, 20; La Gascogne, 20; La Bourgogne, 20.

Red Star Line, New York to Antwerp.—Noordland, 14; Westernland, 15; Rhynland, 14.

This list was compiled by Superintendent of Foreign Mails Bell, and shows the average speed of the ocean steamers carrying the mails.

When ocean freighting is so brisk that an average of seven or eight per cent can be made on money invested in ships, after deducting losses, or when a European war shall drive the English freighters from the seas, American merchants will no doubt try their hand at the business, but it is not likely that they will do so until that time comes.

The Conservation of Force.

The subject taken by Mr. R. Howson, the president of the Cleveland Institution of Engineers, for his inaugural address at the meeting of the Institution on November 22 was "The Conservation of Force, and Some of Its Possibilities." The author explained that all the natural powers which were employed depended upon the development of potent or static energy into the energy of motion. When that motion had been utilized, the energy was lost, and could not be recovered except by a renewal of its source. The principle was traced in the case of falling water, the steam engine, in voltaic electricity, and in the dynamics of animal life, and it was shown that in every instance the force developed and used up represented so much waste of original power, which waste would have to be made good, otherwise the system would come to an end. The balance was invariable, so far as could be ascertained in our laboratories and workshops. Nevertheless, it was contended that outside our terrestrial sphere the conditions were different, and therefore the results would be different. In one case it was pointed out that we actually know this to be true, viz., that the principle of gravitation, which brings everything to a standstill here, is, in the planetary system, one of the components of two forces which are the cause of unceasing orbital motion. After referring to permanent magnetism as in some respects falling into the same category as magnetism, the president entered into some speculations as to other cosmic possibilities which might be true, although, owing to our environment, these possibilities could not be realized here. Among those was the question of the radiation of the sun, whether that was really in process of decay or not. The doctrine of the dissipation of energy leads to the appalling result that the universe must ultimately come to one dead level of coldness, darkness, and desolation. The author contended that this doctrine might not after all be true, but that there was a law of compensation coexistent with the process of radiation.

The Masses and Distances of Binary Stars.

In a paper recently read before the Liverpool Astronomical Society, Mr. J. E. Gore, F.R.A.S., said:

When the parallax of a binary was known, and the elements of its orbit satisfactorily computed, it was easy to find some of the masses of the component stars in terms of the sun's mass, and the real dimensions of the orbit. The parallax of a few of them had been ascertained. First, there was the famous binary star α Centauri, which, as far as was known, was also the nearest star to the earth. From its orbit, computed by Dr. Hind in 1877, combined with a parallax of 0·928″, he found the mass of the system = 1·79 times the sun's mass, and the semi-axis major 23·49 times the earth's mean distance from the sun. Assuming the latest elements found by Dr. Elkin (a = 17·50″, and period = 77·42 years), and his parallax of 0·758, he found the sum of their masses = 1·759, and the semi-axis major = 21·13 times the sun's mean distance. Second, η Cassiopiæ. Dr. Duner found for this binary a period of 176·37 years with semi-axis major = 10·68″. Combining these elements with ● Σ parallax of 0·154″, Mr. Gore found the mass of the system = 10·722 times the sun's mass, and the mean distance = 69·35. The magnitude of the components was about 4 to 7·6; so they had a star of the 4th mag. with a mass about six times as great as that of α Centauri. The calculations of the elements of the well-known companion to Sirius were still more interesting, and there was no doubt that it was in rapid orbital motion round its primary, probably with a period of about 49 years. He had found the mass of this system = 71·63 times the sun's mass. Assuming the attraction of the companion to be the cause of the observed irregularity in the proper motion of Sirius, Auwers found that its mass must be about one-half that of Sirius; thus, we have the mass of a 10th mag. star absolutely greater than that of the sun.

William Cross, Glasgow.

With the death of this gentleman, which lately occurred in his 82d year, Glasgow loses a famous shawl manufacturer, and Scotland a man of letters, an artist, and a poet. For many years he was a pattern drawer in Paisley, his native town, and gained a wide reputation for his exquisite taste in designing. This artistic ability afterward enabled him, when established in Glasgow as a manufacturer of shawls, to achieve remarkable success in business. One proof of his exquisite work is the fact that at the great exhibition in 1851, the whole of his exhibits were purchased by the Empress Eugenie. In the world of letters, however, he was equally well known as a poet and a humorist, and many of his songs and poems will hold a permanent place in the literature of his country. He was also the author of a novel, "The Description," which went through many editions, and is still much sought after. The deceased gentleman's personal qualities endeared him to all who knew him, and his loss will be widely felt.

DIRECT STEAM PROPULSION.

To the Editor of the Scientific American:

In your last issue is a bold and novel scheme for propelling ocean steamers by the use of jets of live steam. While there is nothing like a direct experiment for determining the actual value of such a system, yet a knowledge of what is known and of what has been done is sufficient to deter capitalists from undertaking it. Jet propellers, in which the jet was water, have been tried by the British navy; but, as theory indicates, the efficiency was low. In these cases, the jet was produced by a turbine or centrifugal wheel, and the machinery and pipes occupied too much room. (See Seaton on "Marine Engineering," page 274.)

Mr. Ayres proposes to dispense with all machinery, and cause the steam jets to issue directly from the boilers. It will not be claimed that a steam jet will be any more efficient than a water jet, for the amount of pressure will vary directly as the mass of the fluid flowing out of the orifice. A brief discussion of the jet propeller is given in the writer's "Analytical Mechanics," page 344. It is there shown that the mechanical power developed per second will be:

$$Pu = \frac{W}{g}\left(\sqrt{u^2 + v^2} - u\right) u$$

When—

W = the weight of the water discharged,
v = the velocity of the jet due to the pressure,
u = the velocity of the vessel.

Let us apply this to the water jet for a vessel on which is developed 5,000 horse power, running 15 miles per hour, and determine the weight of the water forced through the pipes. According to practice, the velocity v should equal u, which, at 15 miles per hour, is about 22 feet per second. We have from the formula—

$$W = \frac{5{,}000 \times 550}{(\sqrt{22^2 + 22^2} - 22)\ 22} 32 =$$

$$\frac{5{,}000 \times 550 \times 32}{484\ (\sqrt{2} - 1)} = 440{,}000 \text{ lb., nearly.}$$

Or, say, 220 tons per second, or nearly 800,000 tons of water moved about 21 miles ($u\sqrt{2}$) per hour in reference to the orifice. If it requires this weight of water, how much steam would it require to produce the same effect? It is plain that it would require so much that all the space now occupied by the machinery will be required for the coal necessary to generate the steam. The quantity is so large we will not stop to figure it, but look at the problem of steam use directly. The formula for the efficiency is:

$$e = \frac{2u}{\sqrt{u^2 + v^2} + u}$$

the symbols being the same as before. If the steam in the boilers be 90 pounds absolute, and the jets about 30, or say 20, feet under water, the effective head for driving the steam will be about, say, 3 atmospheres; and if the coefficient of discharge be 0·60, the velocity of exit due to the head will be, with sufficient accuracy for this case:

$$v = 0{\cdot}60 \times 8\sqrt{34 \times \frac{62\frac{1}{2}}{0{\cdot}2}} = 480 \text{ ft. per second;}$$

and if the velocity of the steamer be 15 miles per hour, its velocity per second will be, as before stated, about 22 feet per second; hence substituting $u = 22$ and $v = 480$, we have for the efficiency:

$$e = \frac{2 \times 22}{\sqrt{22^2 + 480^2} + 22} = \frac{1}{11}$$

At 10 miles per hour, the theoretical efficiency would be about one-sixteenth.

This small efficiency will be fatal to the scheme. It is the efficiency of the jet only, and does not include the effect of condensation, the friction of the pipes, the coefficient of discharge, nor other losses. In the use of the steam jet, only the momentum of the steam flowing out will be utilized, and all the power of the heat will be wasted; whereas, in the steam engine, no value is attributed to the momentum of the steam, and everything to the heat utilized in the cylinder. We intended to consider the effect of condensation, but it seems unnecessary to do so beyond a mere notice of the fact that its effect will be still further prejudicial.

DE VOLSON WOOD.

The Anchor Brake.

The *Railroad Gazette* proposes the following: To have an anchor to drop from the rear end of train and engage with the ties. Provision for preventing the bending of the ties "under the strain brought upon them" might probably be devised as simply as for the axles; and by having a good long spring to ease the shock when the anchor came to a bearing, in addition to the relief which would come from the draw springs of the entire train without any expense at all, a train might easily be brought to a stop within 15 or 20 feet from an ordinary passenger speed, if something did not give way.

A Remarkable Boiler Explosion.

The explosion of the locomotive boiler at Jersey Shore, Pa., on the Beech Creek Railway, on tho afternoon of December 9, 1886, is another added to the long list of mysterious explosions, every one of the four men on the locomotive meeting instant death. The master mechanic of the road, Lamott Ames, is positive that the disaster was not from any defect in the boiler itself. The locomotive came new from the Schenectady shops three years ago, and had just been repaired at an expense of abont $2,200. The overhauling of the engine was done under Mr. Ames' personal supervision. This gentleman has had an experience of thirty years with locomotives, and previous to taking his present position, less than a year ago, was road foreman of engines for the Northern Central Railway, at Elmira.

The locomotive was one of the heaviest kind, known as a "consolidated" engine, having four drive wheels on a side, and weighing 106,000 pounds. The repairs were general, 120 of the 220 flues being replaced in the boiler, and between 150 and 180 stay bolts or rivets being renewed. Before leaving the shops, a test of 150 pounds to the square inch had been made with cold water. The Schenectady people wanted Mr. Ames to make the test 180 pounds, but he considered that more than was necessary, as the boiler would never be allowed to carry more than 125 pounds.

The engine was run out of the shop, as near as can be ascertained, about 2 P.M., with slight pressure. Philip Knight, the engineer, was instructed to take the locomotive to a stretch of track not much used, to oil the machinery, to set the pop valve in the dome at 125 pounds, to run the locomotive up and down the track a few times to see that it worked satisfactorily, and then return for Mr. Ames, to make the trial trip of 12 or 15 miles. Meantime Mr. Ames was occupied supervising the setting of a new stationary engine, and he did not see the explosion. The blower of the locomotive was turned on a long time, as learned from those who saw it.

About fifteen minutes prior to the explosion, the Fallbrook passenger train went by the new locomotive, and the engineer of the train remarked to the fireman that "Number four" had a high pressure, as indicated by the noise of blower. Joseph C. Fields, the machinist, sat on top of the cab, screwing down the pop valve and waiting for the signal from Engineer Knight, when the steam gauge should show a pressure of 125 pounds. The locomotive had been standing still for at leaet 25 minutes. John Stapleton, another machinist, was on the ground on the right side of the engine, under the cylinder, adjusting a cylinder cock. The only warning observed by any of the men was the bursting of the "branch pipe," at the point where it had been brazed. This was noticed by Stapleton, who called the attention of Engineer Knight to it. The next instant the explosion occurred. The enormous force which steam exerts at the high pressure that must have existed in this case is as well illustrated by this disaster, doubtless, as by any that has ever occurred. The boiler was of steel, and pronounced by all to be perfectly sonnd. The wagon top, dome, and side sheets remained together. The engine was facing east, and this piece of the boiler, weighing about a ton and a half, was blown at an angle of about thirty-five degrees from a perpendicular so far into the air that it looked like a mere speck in the sky. It was found a quarter of a mile away, over the ridge of a hill about 400 feet high, to the north. Near it, and within a circle of fifteen rods, were found the mangled bodies of Fields, the machinist. Allen Ramsay, the fireman, and James Warren, an engineer off duty, who had got on board the locomotive, on Knight's invitation, to ride to the Junction, to get his pay. The body of Knight was found a half mile from the others, in an opposite direction from the wreck. No part of the locomotive was near him. His silver watch was badly battered, and stopped at 14 minutes after 3. The switch keys in his pocket were bent out of useful shape.

Stapleton was protected by the cylinder, steam chest, and the strongest parts of the locomotive. He was blown twenty or thirty feet forward down the embankment, but was confined to his bed only a day or two. He was able to walk home. He had not been in the cab for some time, and did not know what the condition of affairs was there. Not a particle of the boiler remained in the frame, which was broken in many places. The forward axle was broken in two, and the other axles bent badly. The only useful portions of the engine remaining are the tires and wheel sets. The flues were scattered all over the neighborhood, one of them having been driven clear through a frame cottage twenty-five rods away. No piece of the cylinder part of the boiler has yet been found. Of the smokestack, only the saddle has been found. From the broken axle it is assumed that the first break in the boiler was in the cylinder part. Fragments of the bell have been picked up, and small splinters of the cab. The firebox fell within a few rods of the wreck. One of the cylinders was badly broken, the other enough to be useless. The rails beneath the wheels were bent in a dozen places, and a large excavation was made in the roadbed. A lady sitting at a window in a cottage twenty-five rods away was admiring the brilliant paint and bright polish of the locomotive when the explosion occurred. A puff of steam, a heavy concussion, and it was all over. Several persons were attracted by the explosion in time to see the heavy wagon top with its three human bodies sailing far into the air, distinguishable only as a moving black spot against the sky. Pieces of the locomotive have been found a mile away, and the explosion was distinctly heard at Williamsport, twelve miles away.

The only theory that Master Mechanic Ames can offer is that the cock in the tube connecting the steam gauge with the boiler was partially turned, shutting off half or two-thirds of the actual pressure. He believes the pressure must have been three to four hundred pounds to the square inch. The fact that two experienced engineers were in the cab helps to make the affair more mysterious, as it would seem that they would notice anything wrong there. The pathetic part of the accident was that Fields, Warren, and Ramsay had been husbands less than a year, and that Knight left a widow and five children unprovided for. The lesson to be drawn is visibly apparent: "In the use of steam, be wise and watchful." Of a score of explosions that have come under the observation of Mr. Ames, he says this is the most frightful in the force displayed he has ever seen.

MARK BACUITT.

Elmira, N. Y.

How to Prevent a Cold.

Under this title Dr. Brown-Sequard makes a contribution to the Societe de Biologie which will be read with interest. Everybody catches cold more or less often, and nobody wishes to do so; hence Brown-Sequard's "method" ought to be popular. Under the name of a "cold" are included a number of acute catarrhal inflammations affecting the nasal, pharyngeal, laryngeal, tracheal, or bronchial mucous membrane. In this country we even apply the term to acute affections of the middle ear, the eye, the stomach, intestines, or bladder. The cause of these so-called "colds" is the influence of cold, damp air upon sensitive portions of the body, producing thereby a disturbance of the vascular equilibrium. The result is a congestion which settles down, perhaps with the help of microbes, as the late Dr. Austin Flint believed, into an inflammation.

The most sensitive parts of the skin, according to Dr. Brown-Sequard, the catarrhal genetic areas, are the neck and the feet. In order to prevent "colds," therefore, one has only to harden these areas and destroy their sensitiveness. This is done by daily blowing a stream of cool air, by means of an elastic bag, upon the neck, and by immersing the feet in cool water. The air is at first only slightly cool, but is each day made colder, until the neck can stand an Arctic blast with impunity. The feet are immersed in water which is at first at a temperature of about 90° Fah., and this is gradually reduced to 38° Fah.

Dr. Brown-Sequard's method is only a more rigid and elaborate form of a very well-known practice, viz., that of daily bathing in cool water. It will, no doubt, be useful if the person is not aged or weak. Such methods, however, seem after a time to lose their efficacy.—*Medical Record.*

Air in Greenhouses.

The circulation of air is one of the most important provisions in all kinds of horticultural buildings. Nothing but that will fairly exclude damp, or in any damp weather counteract its effects. It is not enough to open every front window. It would be far better to open only one and let down a top light a little. In all cases there should be an outlet as well as an inlet, and for want of this many houses do not answer well for plants. A circulation of air causes a more rapid evaporation, and it is a common thing among good gardeners to open a lower window even in wet, cloudy weather. Let down one of the top lights a little, and light a fire. By this a free circulation is created and the house dried, although it were in the midst of rains and cloudy weather. It is too common a thing to see the top lights let down to give air to a house, and no other part opened. This is all wrong; for there should be a draught. On the other hand, we see all the front windows and no top lights down. Many persons build pits three or four feet high at the back and half the height in front, and no air but what can be obtained at the top. We would always provide air holes at the bottom, as without such there can be no draught, no free circulation. When pits are built without this provision, the best mode of giving air is to pull up one light to let in air at the foot of it, and push down the next to open at top, and so on alternately through the whole range of lights, however long the pit may be. It is the same in giving air to a hotbed, only that when the air is rarefied, as it is inside, tilting the light a little lets out the steam, and the cool air will get in somewhere; but sometimes when a frame is made too close and the glass is puttied at the joints, things fog off in spite of tilting, because there is no circulation.

SNOW MELTING AND UNDERGROUND CONDUITS.

How to dispose of the snow: This is one of the most serious problems connected with the comfort and convenience of a great city in this latitude. Many ways of disposing of the snow in the streets have been proposed, but, with a single exception, we believe the only method heretofore adopted to any extent, other than the slow and very costly method of allowing the sun to melt it, is the old way of carting it off. This we all know is exceedingly costly and inconvenient. The single exception, we understand, is found in London, and consists in digging at convenient points in the street suitable pits, connected with the sewer, placing steam coils therein, and carting the snow thereto. This, by shortening the length of the haul of the snow, undoubtedly lessens and expedites the task of its removal. This task, coming, as it usually does, suddenly and unexpectedly, is always great, and sometimes herculean.

Still, with the extensive steam supply plants existing in most cities, it would seem that nothing like a snow blockade of our streets ought any longer to be experienced; for, as we took occasion to say on the 23d of last January:

"The use of steam for removing snow is feasible; both in a practical and economical point of view.

"To melt a ton of snow when the latter is at a temperature of 20° F. will require an expenditure of 147·4 heat units × 2,000 = 294,800 heat units. Each pound of steam used will deliver 966·5 heat units while becoming condensed to water at 212° F.; therefore $\frac{294,800}{966·5} = 305$ would be the pounds of steam required to reduce a ton of snow to water at 32° F., exclusive of all waste.

"If an effective evaporation of 6 lb. of water per pound of coal could be secured, which is only about half what is now obtainable from well-constructed and housed boilers, we should have $\frac{305}{6} = 50\frac{5}{6}$ pounds, say 51 lb. of coal required to do the work.

"Now, as to the economy, we have for a ton of snow removed the cost of 51 pounds of coal or about one-fortieth of a ton, which, at $5 per ton, would be 12½ cents per ton."

We illustrate in this article a new method of utilizing steam for this purpose, proposed by S. D. Locke, of Hoosick Falls, N. Y., that is certainly very simple and economical, and seems to be entirely practical. It is the subject of two or more patents issued to him, to whom all communications should be addressed.

Mr. Locke's method is shown fully in our illustrations, and contemplates utilizing the steam plants existing in most cities to melt the snow, so avoiding all carting. Underneath the surface gutter he proposes to construct a sub-gutter, of cast iron or other suitable material, that connects directly with the sewer and that is covered with a grate, underneath which one or more steam pipes are carried in racks, as shown in Figs. 1 and 2. The snow, as it melts, falls through the grate and is conducted by the sub gutter into the sewer. Fig. 4 is a longitudinal section, showing how the condensed steam is allowed to escape from the steam pipes at the lowest levels, through float valves, into wells.

By this method there is nothing on the surface of the street to interfere with or in any degree impede its traffic, and the snow can as quickly be moved by horse scrapers and brooms into the gutters as the streets can now be swept.

The cost to lay this sub-gutter is figured to be from $3.50 to $4 per lineal foot. Assuming it to be $4, the entire cost per mile, on both sides of the street, will be $42,240.

To show the economy of Mr. Locke's plan, we submit an estimate of the comparative cost of cleaning one mile of Broadway by his method and by carting. In this estimate we will take the width of Broadway to be 44 feet, and, to keep on the safe side, will double our estimated cost of melting snow by steam, and will call it 25 cents a ton instead of 12½ cents.

It costs this city about 50 cents a load, or one cent a cubic foot, to cart the snow off the streets. If the snowfall during a season be only two feet, there will be on one mile of Broadway 464,640 cubic feet of snow; and we have these figures for the cost of its removal:

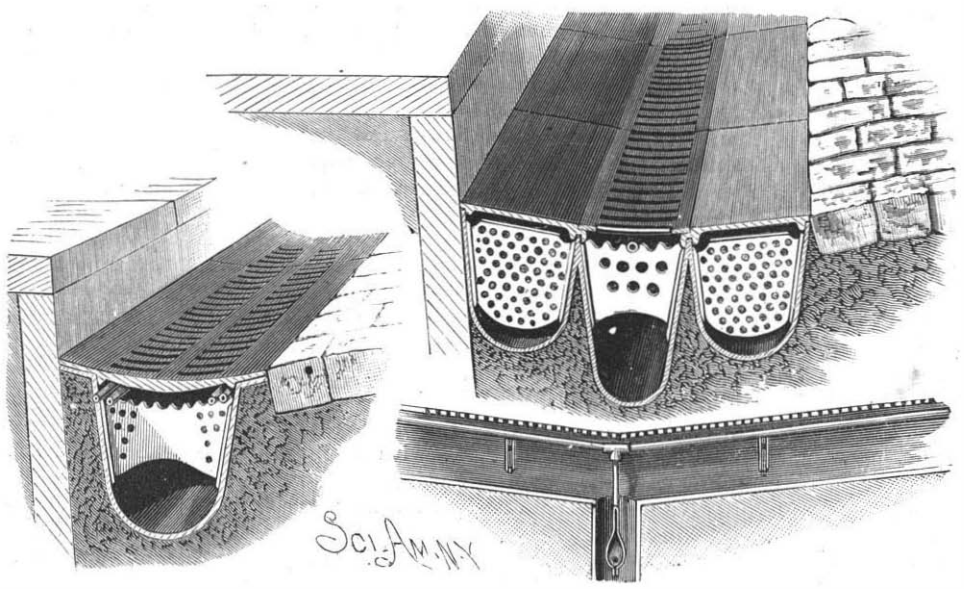
By carting 464,640 cubic feet at one cent a cubic foot = $4,646.40. By steam, assuming that a cubic foot weighs ten pounds, the 464,640 cubic feet will weigh 2,323·4 tons, which, at 25 cents a ton, costs $580.08. To this add 5 per cent interest on plant, $2,112, and we have $2,692.08.

If the snowfall be five feet, the figures are by carting $11,616, against only $3,564 by steam.

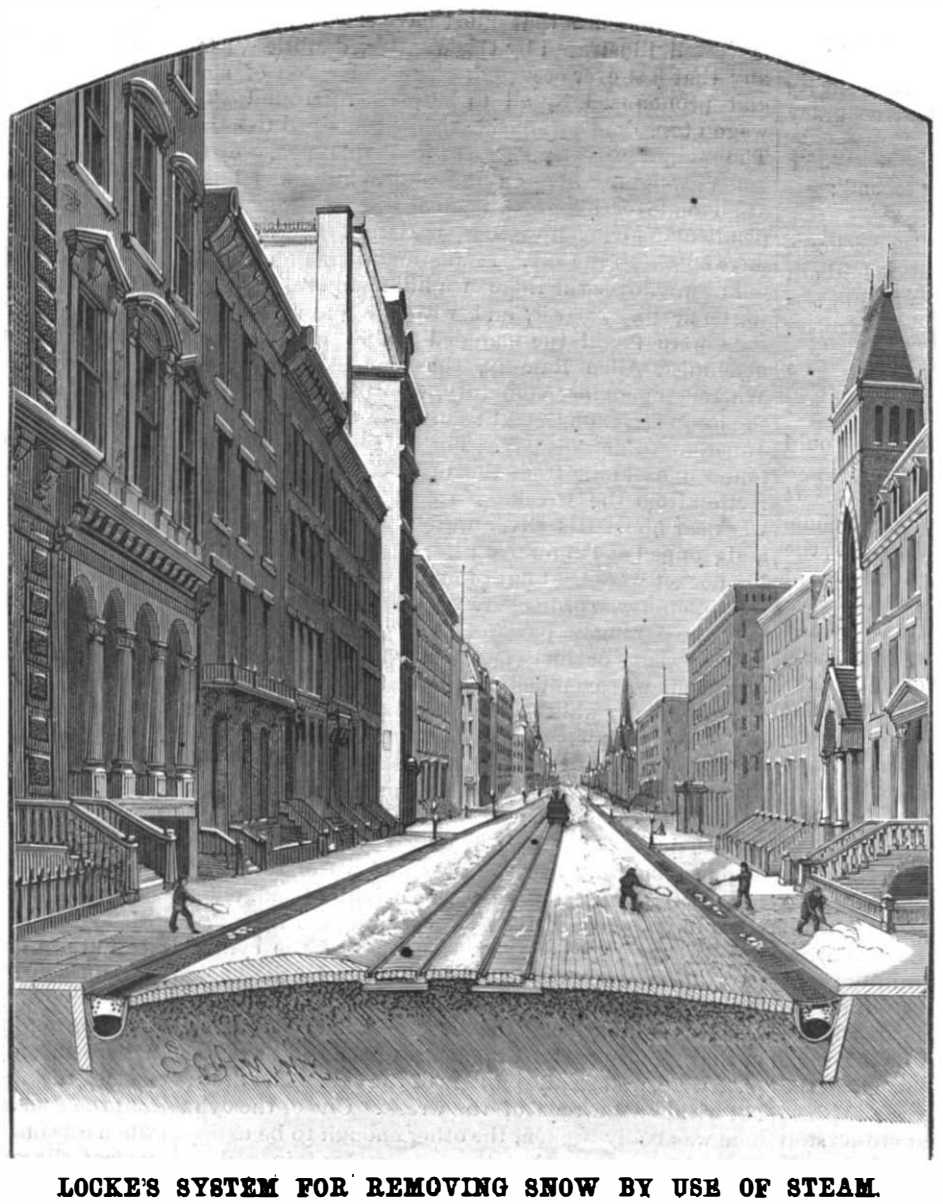
These figures are suggestive; and in addition to the undoubted economy of the steam method shown thereby, it must not be forgotten that it would be far more effective, and that with it no such thing as snow encumbered, much less snow blockaded, streets would ever occur.

Mr. Locke also proposes, by dividing his gutter into two or more longitudinal compartments, to utilize it as a conduit for electrical conductors. A modification for this purpose is shown in Fig. 3, wherein the lateral compartments are especially adapted to carry wires or cables. The cover, being laid in inclined close-fitting sections, prevents water from entering the electrical compartments. All of the sections of the cover, being held in place only by gravity, are easily removed, so enabling the whole contents of the conduits to be quickly exposed for the purpose of examination or repair, without disturbing in the least the pavement of the street.

Does not this plan offer to our telegraph and telephone companies a practical way of disposing their wires underground, in a position where they can be reached at any time, and that, too, without tearing up our streets? If so, a long suffering public, always being provoked to righteous wrath by the constant digging up and laying down of street pavements, will take courage and be glad.



LOCKE'S SYSTEM FOR REMOVING SNOW BY USE OF STEAM



LOCKE'S SYSTEM FOR REMOVING SNOW BY USE OF STEAM.

Indicating Furnace Temperature.

A method for determining the temperature of furnaces has been recently described by M. Wallerand, a Belgian mining engineer, in the *Belgique Industrielle*. The arrangement is applied in the first instance to a Siemens-Martin steel furnace; but the principle is capable of adaptation to other classes of furnaces. It depends upon the observation of a pendulum, beating seconds, hung against the furnace wall in a convenient place for the fireman. The pendulum is made of a simple rod, carrying at one end a ring by which it is suspended, and a weight capable of being adjusted up or down by a screw. In every case it is necessary to regulate the pendulum at the commencement by comparison with a watch or clock giving seconds. When the stoker wishes to ascertain the temperature of his furnace, he inserts an iron hook into the middle of the fireplace through a hole left for the purpose in the door. The iron is made from 8 mm. round rod, and is left in the fire for 22 seconds, or the same number of oscillations of the pendulum, when it must be quickly withdrawn. If the furnace is at a proper heat, the end of the hook will in this time have attained a welding temperature, as shown by the fact that sparkling drops of molten iron will be thrown off by vigorously swinging the bar through the air. If, on the contrary, the test rod comes out of the furnace merely red or yellow, and does not throw off drops, the furnace is not hot enough. It is evident that this procedure will not indicate the exact heat of the furnace in absolute measurement.

Preservation of the Dead.

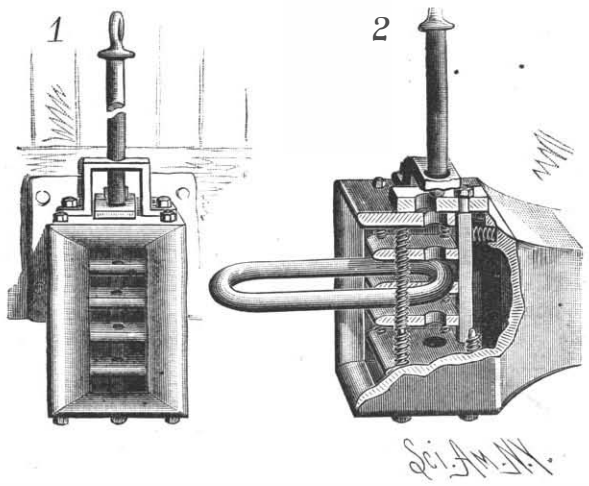
In speaking of the preservation of dead bodies, *Gaillard's Medical Monthly* says that Edward I., who died in 1307, was found not decayed 463 years subsequently. The flesh on the face was a little wasted, but not putrid. The body of Canute, who died in 1017, was found fresh in 1766. Those of William the Conqueror and his wife were perfect in 1522. In 1569 three Roman soldiers, in the dress of their country, fully equipped with arms, were dug out of a peat mass near Aberdeen. They were quite fresh and plump after a lapse of about 1,500 years. In 1717 the bodies of Lady Kilsyth and her infant were embalmed. In 1796 they were found as perfect as in the hour they were embalmed. Every feature and limb was full. The infant's features were as composed as if he had only been asleep for eighty years. His color was as fresh and his flesh as plump and full as in the perfect glow of health. The smile of infancy and innocency was on his lips. At a little distance it was difficult to distinguish whether Lady Kilsyth was alive or dead. The question is, What preservative was used, and how applied?

Sixty Whales Captured.

A large school of whales was lately captured at Cullivoe Yell, Shetland, after a very exciting chase. The whales first approached the Unitshores, and when observed a number of boats set out in pursuit. They succeeded, however, in gaining the water, but, after a six hour's chase, they were driven ashore and killed at Cullivoe. The school numbers over sixty, some of them measuring over twenty feet in length.

CAR COUPLING.

The front of the chamber of the drawhead is partially closed by a plate formed with an elongated opening for the passage of the link. Placed loosely upon rods within the chamber are division plates which are separated and held in position by coiled springs placed upon the rods, so that the plates have a yielding action, so as not to resist the entrance of the link. These plates support the link at various elevations, thereby adapting the coupler to cars of different heights. The plates are all correspondingly apertured,



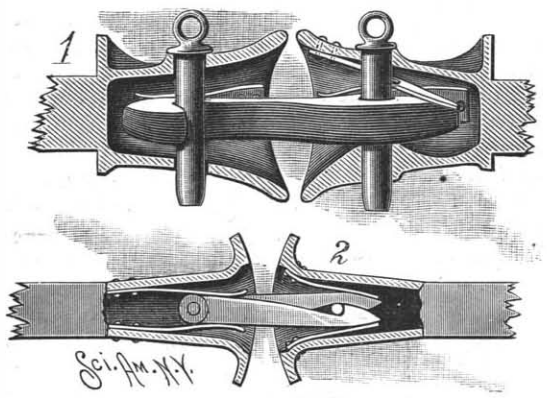
KALTENBECK'S CAR COUPLING.

to permit the coupling pin to drop into the drawhead and down through the link. The pin, when lifted out of the drawhead, is held in a raised position by a strap and sliding trip plate, the latter being forced forward under the pin by springs, which act against a bar bolted to the trip plate and passed through the drawhead, back of the division plates, as shown in Fig. 2. These springs are lodged in recesses made in the drawhead, and as they tend to constantly force the bar outward, the trip plate will be forced under the pin the instant the latter is raised, and the parts will be ready for coupling again. The entering link forces the trip plate back and allows the pin to drop and automatically couple the cars. The bar is held between guards formed in the back of the drawhead, which prevent the link entering too far; they also protect the bar from injury, so that there can be no failure in the proper action of the bar and trip plate at the time of coupling and uncoupling.

This invention has been patented by Mr. W. H. Kaltenbeck, of Roxbury, N. Y.

CAR COUPLING.

In this coupling the two drawheads are formed respectively with rounded faces and cavities. Upon a



SEABURY'S CAR COUPLING.

vertical pin in one drawhead are placed two connecting hooks, Fig. 2, whose hooked heads overlap each other to grasp the coupling pin of the opposite drawhead. The points of the hooks are oppositely beveled, so that when the cars are brought together for coupling, the pin will strike between the two bevels and force the hooks apart to permit the entrance of the pin between, and thus automatically effect the coupling of the cars. In each drawhead are arranged springs which hold the hooks in firm engagement with the coupling pin. To couple the cars, it is only necessary to place the pin in the drawhead and bring the cars together, when the hooks will enter the drawhead and engage with the pin. Uncoupling is effected by merely lifting out the pin. Fig. 1 shows plainly the construction when only one hook is used.

This invention has been patented by Mr. Charles E. Seabury, of Stony Brook, N. Y.

IT may not be known to some what causes the different colors in bricks. The red color of bricks is due to the iron contained in the clay. In the process of burning, the iron compounds are changed from the ferrous to the ferric condition and rendered anhydrous, thus developing the color. Certain clays—like those in the vicinity of Milwaukee, for instance—contain little or no iron, and the bricks made from them are light or cream colored.

CONVERTIBLE WIRE BASKET.

This wire basket may be used for a vast variety of purposes, some of which are illustrated in the accompanying engraving. The main ring or circle of wire is of any suitable diameter, braced by two or more cross bars, which form a bottom to the basket to stand a flower pot, etc., on. The side or main loops may be shaped as shown in the cut, and are hinged on the base ring separately, by having both of their ends bent around it, and clinched into an eye. These loops are arranged to overlap one another, so that one cannot be moved without moving all, thus always insuring the perfect circular form or curvature of the sides of the basket, no matter into what form it may be converted. The small base loops, consisting of two rows, one normally below and the other above the ring, are hinged and arranged on the ring in precisely the same manner. The side loops, moving on their hinged ends, may all be pressed upward, inward, outward, or downward, so as to be altered from a globe shape to a bell form, with all the intermediate forms and shapes.

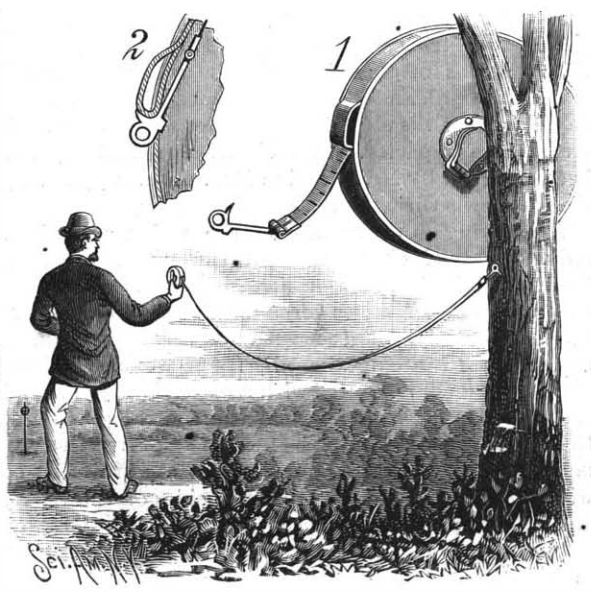
The basket is strong and durable, being made of the best spring steel wire heavily plated, and is decidedly ornamental in all the various forms it may be made to assume. It is so simple in construction that it will be instantly understood, while it may be readily changed by any one from one form to another, according to the use to be made of it. The engraving shows it as a card basket, frame to support a lamp shade and a vessel over a lamp chimney, cake and egg baskets, hanging flower basket (in which case the supporting cords are attached to the ring), flower pot, and flatiron holder. It is evident that this list comprises but a very few of the many good uses the basket may be put to.

GREENWOOD'S CONVERTIBLE WIRE BASKET.

This invention has been patented by Mr. A. S. Greenwood; further particulars can be had from the Cassgreen Mfg. Co., of Cleveland, O., and Toronto, Canada.

TAPE MEASURE.

When the common tape line is used by one person, it must be fastened at the end before it can be unrolled and employed in making measurements. In the tape measure herewith illustrated, which is the invention of Mr. Jerome Fountain, of La Grande, Oregon, a simple and efficient fastener is permanently connected with the end of the line, for holding it while making measurements. The casing is of the usual form and construction. To the outer end of the line is secured a metallic clip, to which is connected a hook, shaped as shown in Figs. 1 and 2. The head of the hook is provided with a sharp point, and in it is formed an eye. The point is preferably arranged one inch from the end of the line, and is inserted in any suitable fixed object, when the line may be unrolled and used in the usual way. The eye serves to receive an awl or blade of a knife, when it is impracticable to employ the hook. The metal band forming the edges of the casing is bowed outward and then bent under or returned upon itself at one side of the opening (Fig. 2) to form a rounded support for the hook when the line is wound up; and upon the opposite side of the opening there is a beveled lip under which a small lug formed on the back of the hook rests when the line is coiled within the casing. The engagement of the lug with the lip is insured by the spring of the looped end of the band forming the edges of the casing. It is evident that the rounded support may be formed separately and attached by rivets to the casing when the latter is made of non-metallic material; the hook may also be varied in form and otherwise attached to the line.

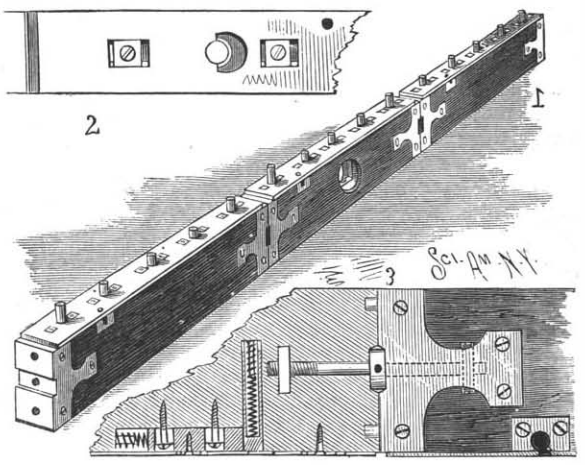


FOUNTAIN'S TAPE MEASURE.

OUTLINING TOOL.

This device is designed particularly for carpenters' use in the work of dressing doors and similar pieces of stuff to their frames, whereby a perfect fit may be obtained without the necessity of frequently setting the door up in the frame to test it as the work proceeds. The tool is made in several sections, each complete in itself, adapted to be connected together end to end, by a suitably arranged right and left hand screw, as shown in Fig. 3. Formed in one of the straight edges of each section are several chambers, in each of which is fitted a plunger, pressed outward by a coiled spring, Fig 3. Secured upon the edge of the section is a metal plate, Fig. 2, having formed in it as many openings as there are plungers. The plate may be moved longitudinally to hold the plungers within their chambers, or to release them, so that the springs will force them outward through the openings. The plate may be moved by a small bar inserted in a hole made in the plate, a recess being formed in the side of the section for the insertion of the bar.

In use, the plungers are all forced within their



MACKENZIE'S OUTLINING TOOL.

chambers and held by the plates. The edge of the tool is then placed upon the surface of the frame or other object whose outline it is desired to obtain. By means of the small bar, the plates are then moved to release the plungers, whose springs will force them into contact with the surface against which the tool is held. The plates are then moved back as far as they will go, which will permit suitably arranged friction blocks to press upon the plungers and hold them firmly in the positions they occupy. The tool is then removed from contact with the surface, the exact outline of which will be given by the outer ends of the plungers. This outline can be easily transcribed to a door, panel, frame, or other object, which can be easily dressed to match.

This invention has been patented by Mr. Robert A. MacKenzie, of 170 East 51st Street, New York city.

IN Pesth, Hungary, dynamite has been successfully used for driving piles. An iron plate 15 inches in diameter and 3¾ inches thick is placed in a perfectly horizontal position on the pile to be driven. A dynamite cartridge, in the form of a disk, containing 17½ ounces of dynamite, is placed on the iron plate and exploded by electricity.

A Remarkable Drainage Enterprise.

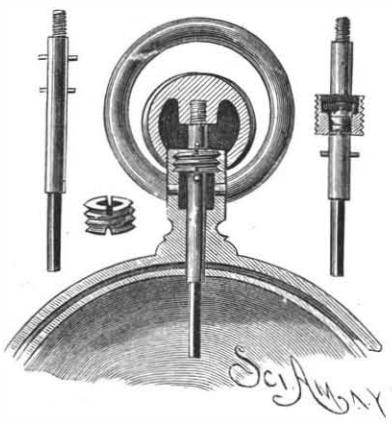
The Russian Government is engaged in one of the most extensive drainage enterprises ever undertaken in any portion of the world. The location is what is known as the Pinsk Marshes, in the southwest of Russia, near the borders of Galicia. This region is so extensive as to secure special designation in the ordinary map of Europe, and, in point of area, is very much larger than Ireland. The marshes have become famous in Russian history as a refuge of all manner of romantic characters, and have remained an irreclaimable wilderness up to within the last two or three years.

In 1870 the Russian Government first took in hand seriously the abolition of this wild expanse, owing to its being perpetually more or less submerged and covered with a jungle growth of forest, preventing not only communication between the Russian districts on either side, but also between Russia and Austro-Germany. A large staff of engineering officers and several thousand troops were draughted into the region, and these have been engaged upon the undertaking since. Up to the present time, about 4,000,000 acres have been reclaimed by means of the construction of several thousand miles of ditches and canals, so broad as to be navigable for barges of several hundred tons burden. Just now the engineers are drawing up the programme for next year, which comprises the drainage of 350,000 acres by means of the construction of 120 miles more of ditches and canals.

Of the 4,000,000 acres already reclaimed, 600,000 acres consisted of sheer bog, which has been converted into good meadow land; 900,000 acres of "forest tangle," which have been prepared for timber purposes by cutting down the underwood and thinning the trees; 600,000 acres of good forest land—forest oases in the middle of marshes—hitherto inaccessible, but which have been connected more or less by navigable canals, and thereby with the distant markets; and finally, 2,000,000 acres have been thrown open to cultivation, 120,000 acres of which have already been actually occupied. Besides making the canals and ditches, the engineers have built 179 bridges, bored 577 wells from 20 ft. to 80 ft. deep, and have made a survey of 20,000 square miles of country hitherto unmapped. When the task is finished, Russia will have effaced from the map of Europe one of the oldest and toughest bits of savage nature on the Continent. From an engineering, geological, and scientific point of view generally, the work is one of special interest.

PENDANT STEM FOR WATCHES.

The stems of self-winding and hunting-case watches are usually held in place in the pendant by a screw entering a circumferential groove in the stem, or a grooved collar placed on the stem. Both the screw and collar are apt to become worn, and the screw being small is weak and liable to be broken. In the construction shown by the three left-hand views of the annexed engraving, the pendant is internally threaded to receive a collar, into which fits the stem, which passes through the pendant to the winding and setting mechanism. The collar is provided with notches in its outer and inner surface, to receive pins passing through and projecting from the stem. The stem may be freely turned to wind or set the watch, as the pins are normally out of contact with the collar. The collar is carried to its place by bringing the upper pin into engagement with its notch, and may be removed by bringing the lower pin into contact with its own notch. In both cases the



SCHIMMEL'S PENDANT STEM FOR WATCHES.

stem and collar will turn together to screw or unscrew the collar.

In the construction shown in the right-hand view, the stem is formed with an enlarged part, beveled upon each side, and encircling which is a split steel ring which enters a recess formed in the threaded collar. Normally, the enlarged part of the stem is below the ring, so that the stem may be used for winding the watch. When the enlarged part has been pulled through the ring and rests above it, the device is arranged for setting the watch. It will be seen that this construction, while being strong and durable, prevents the entrance of dust or moisture to the interior of the watch.

This invention has been patented by Mr. F. W. Schimmel, of Murray, Idaho.

FLEXIBLE SCRAPER.

To the end of the handle is secured a concave board, having its opposite edges curved. To the back of the board are secured metallic sockets for receiving braces, which are held in sockets secured to the handle. This construction insures both strength and lightness. To the concave face of the board is attached an oblong sheet of rubber, whose edges project beyond the edges of the board, so that when the scraper is used only the rubber will be presented to the floor or surface being cleaned. By applying the scraper to the floor at the proper angle, the entire edge of the rubber sheet will be brought in contact with the floor, and as the scraper is moved forward its concave form will cause it to re-

KAELIN'S FLEXIBLE SCRAPER.

tain most of the water it gathers up, and to carry it forward.

This invention has been patented by Mr. Albert J. Kaelin, whose address is Germania House, Houston, Texas.

A New Submarine Boat.

The question of submarine warfare would appear to be advanced an important stage by a new submarine torpedo boat which was lately tried in the West India Docks, London. The great problem for solution in this class of boat is a simple and ready means of effecting submersion quickly and of again rising to the surface as frequently as may be desired. Many attempts have been made to compass this object by means of screws, inclined planes, water compartments alternately filled and emptied, and other contrivances. The present invention, however, involves none of these principles. The principle upon which the immersion and emersion of the new boat depend is simply that of displacement.

While lying on the surface, the boat has a given amount of displacement. To effect immersion, this displacement is reduced; and when it is desired to raise her to the surface again, the displacement is increased. A fair analogy is that of a telescope dropped into the water when extended for use, in which condition it will float for a given time. If dropped into the water closed up, it will straightway sink to the bottom. The idea of utilizing this principle originated with Mr. Andrew Campbell, and was worked out in practice by him in conjunction with Mr. Edward Wolesley and Mr. C. E. Lyon, and the vessel in which the joint ideas of these gentlemen have been embodied has been built by Messrs. Fletcher, Son & Fearnall, of Limehouse.

This boat is cigar-shaped, and pointed at both ends, being 60 ft. long and 8 ft. in diameter amidships, exclusive of a slightly raised central deck. Her displacement when fully immersed is about 50 tons. She is built of 3/8 in. Siemens-Martin steel and is driven by twin screws, the motive power being electricity, which is supplied from a storage battery to motors of 45 horse power. Electricity also supplies light, when submerged, by means of glow lamps. Air under pressure is stored on board, and there is accommodation for a three days' supply; the electrical batteries also have a similar storage capacity. The electrical machinery has been designed by Mr. Graydon Poore, and supplied by Messrs. Lewis Olrick & Co.

When lying on the surface of the water, a depth of only about ten inches of the central upper portion of the boat is visible above water line, and this is surmounted by a steel conning tower about 12 in. high and 15 in. diameter and pierced with four sightholes. Entrance and exit are obtained by means of a manhole on the deck, which is secured with a watertight joint, and there is room for six persons in the central portion of the boat. Displacement is increased or reduced by means of cylindrical chambers which are projected or withdrawn telescopically from the sides of the vessel, and by this simple means she can be made to rise or fall in the water, slowly or quickly, at the will of those in command.

This was amply demonstrated recently, when Lord Charles Beresford, with others, went down in her, Lord Charles expressing himself very strongly as to the value of this new vertical maneuvering power. The boat was many times submerged to the bottom of the dock, about 17 ft., and brought to the surface again on a perfectly even keel. She was also propelled a short distance, connection being made with the batteries by hand, but as the motors were coupled up with the current, nothing further was attempted. The area for a run, moreover, was too circumscribed, there being a number of vessels lying in the docks, which would have impeded progress.

The main application of the system would appear to lie in the direction of submarine warfare, although it is not intended that it shall subserve this purpose exclusively, as the inventors have designed arrangements for applying it to all classes of submarine operations in lieu of the diving bell. It is also to be observed that, although only applied to a 60 ft. boat, this size in no way indicates a limitation of the principle, which can be applied to any sized vessel. The present dimensions were only adopted because they correspond to those of a second-class torpedo boat. The invention appears to be one of much merit, and well worth the attention of the government, which it will doubtless receive.—*London Times.*

A Pocket Camera.

An English paper says Councilor W. J. Lancaster, of Colmore Row, London, has a very remarkable photographic apparatus, to be used for detective purposes or ordinary portrait photography. The apparatus is inclosed in a watch case, which opens in the ordinary manner by means of a spring. As the case opens, a miniature camera shoots out for a moment, shuts up again, and the thing is done. The sensitive plates to be used for the camera are miniature dry plates, and a store of these is to be carried by the operator in a specially prepared locket to hang on the watch chain. We understand that the miniature apparatus has been very eagerly welcomed by the detective police, and that the authorities at Scotland Yard have decided to make extensive use of it. A detective who wishes to secure the portrait of a suspected character will only have to get close to his subject, and pretend to pull out his watch and look at the time, and the features will be registered. We may mention that for the sake of experiment, accurate and "speaking" likenesses were taken of a large number of the persons who mixed in the crowd at the recent Socialists' meeting.

IMPROVED CULTIVATOR.

When grain is planted by the so-called "combined lister and drill," the listing forms a ditch or furrow several inches deep, in which the seed is deposited. The drawback to this listing is due to the fact that close to the edges of the furrow on each side, a row of weeds springs up, which, with ordinary cultivators, it is impossible to exterminate, and at the same time cultivate the soil at the bottom of the furrow. The object of the invention here shown, which has been patented by Mr. Daniel M. Bourne, of Cool, Kansas, is to provide a shovel that will cultivate the bottom of the furrow, and at the same time trim the edges of the furrow. The cultivator plow point, or shovel, is provided with a cutter extending obliquely upward and standing above the plow proper, so that while

BOURNE'S IMPROVED CULTIVATOR.

the point enters the furrow, the cutter trims the side of the furrow above the point. The point may be rounded or beveled to bring it to a sharp point, and the plow may be made with a shank or be bolted to a separate shank. The wing or cutter extends upward obliquely from the main shovel point, and is slightly twisted to clear itself of trash. Its upper end stands slightly in rear of the body of the shovel, so that the contact of the cutter with the side of the furrow will cause a slight down draught and make the shovel penetrate the soil, and tend to steady the cultivator. The shovel can be attached to either a riding or walking cultivator, and has nothing to do with any outside shovels, as the operator can use any kind he desires or can take them entirely off.

Correspondence.

A Remarkable Family of Snakes.

To the Editor of the Scientific American:

I have fifty-six copperhead snakes in a quart bottle, that were taken from the old snake by Mr. Douglas Bird last summer. Each of the fifty-six was inclosed in a sack by itself, and was attached to the snake bed by a string. They were alive when cut ont, one hour after the dam was killed, I have also the skin of the old snake, which measured 4½ feet.

The umbilicus is still to be seen attached to several of the snakes in the bottle. They are each 9 inches in length.

Mr. Bird is a man of truth. Now, if you have a true snake story of greater magnitude, I should like to have it. S. E. HAMPTON, M.D.

Milton, Ky., Dec. 6, 1886.

Destructive Effects of Nitro-Glycerine.

To the Editor of the Scientific American:

In your issue of Dec. 11 appears au article headed "Destruction by Nitro-Glycerine Explosions," copied from the New York *Times*. It is well enough for the daily press to print such absurdities, but the SCIENTIFIC AMERICAN should not lend its columns to the propagation of anything but the truth. It is hardly necessary to specify any particular part of the above article, as the whole thing is a tissue of falsehoods. A nitro-glycerine explosion cannot cause annihilation of human bodies, horses, magazines, etc., as therein stated. It is true that a man's body is often reduced to minute atoms, but the *debris* will cover the ground for a large space all about, and it is impossible to gather it together.

I have seen a number of explosions, and in the winter as well as the summer. That the snow or ground remained pure and spotless in any case, after such an explosion, is false.

I was on the ground within ten minutes after a nitro-glycerine explosion that happened in the woods near Aiken, this county, about four years ago. A shooter was driving along the road with a sleigh load of 60 quarts of the explosive. From some means or other, the stuff went off. There was a hole about three feet deep and four feet square blown in the frozen ground. The horses were hurled forward about twenty-five feet, and their hind quarters were driven forward into their bodies. Nothing remained of the sleigh but splinters, and those were very small. A part of the tongue, with one of the whiffletress, was still connected by the harness to the horses. Of the unfortunate driver, we picked up probably thirty ponnds of flesh and bone. Several trees were chopped down to secure small portions of his remains. His face was intact, bnt there was nothing left of his skull; but the ground for an area of several acres was covered with the blackened portions of the wreck, interspersed with darkened blood stains, that showed out clearly from the snow.

Angust 27, 1885, a nitro-glycerine factory was blown up, just beyond the city limits. Twenty-three hundred ponnds of the explosive were destroyed. The wreck was complete. A horse was killed, and his body was blown several yards, but it was not annihilated. Several heavy iron safes were turned over, but they were not removed from human vision. Where the factory had stood was a large hole in the ground, and a space of about twenty acres covered with kindling wood. There was a score or more of the heavy iron drums in which acid is transported, scattered about. None of them was annihilated. I can cite a dozen more cases if necessary. A. L. S.

Bradford, Pa., Dee. 11, 1886.

Gas for Ocean Steamers.

To the Editor of the Scientific American:

Should the supply of natural gas prove inexhaustible, there will be no limit to its uses or applications. Its special adaptation to the iron and glass industries is a recognized fact of industrial economics, and a wider range of service is contingent only on a reasonable expectation of its continued availability.

Among the more immediately promising opportunities for the utilization of this natural product, that of its application to the propulsion of ocean steamers appears as the most prominent. The space required for the storage of coal is useless space, so far as profit is concerned; and the expenditure of power in carrying the source of power is indeed very heavy.

The Oregon required storage for 3,800 tons of coal—3,000 for actual nse and 800 for contingent supply; fully, if not more than, half her actnal tonnage. Whatever plan or device tends to the cheapening of steam production, without increasing risk or danger, must attract the attention of practical men with a view to its timely adoption.

One invention prepares the way for another, and the larger use of most substances and appliances means the increased production thereof at reasonable cost. The compression of gases is a recent accomplishment of science which carries with it the possibility of a constantly increasing use; and one of the most easily applied and practical uses of the process is the compression of natural gas in appropriately made cylinders, under such pressure as will insure safety and yet render the cylinders easily handled.

Then with suitable appliances to control the flow of the compressed fuel, these cylinders could be stored in proper chambers on the vessel, and, under the charge of the engineer, this newer heat producer could show its marvelous use and power in driving the steamships across the ocean, and that, too, with a maximum of cleanliness and comfort to the passengers, besides insuring a very greatly increased profit on account of the much larger quantities of freight carried, the coal bunkers being utilized for freight space.

If the natural gas has done as much for certain branches of industry as is claimed that it has, it does not seem unreasonable to argue, by analogy at least, that there is a future for it as a compressed fuel, premising, of course, that the cost of such compression be reduced to the smallest figure by improved and cheapened and reliable processes. W. L. KELLER.

Baltimore, Md.

How to Cast a Box on a Shaft.

To the Editor of the Scientific American:

To cast a box on a shaft or mandrel, warm the shaft (and box if practicable), take a piece of ordinary writing paper and cut to the length of the box and wide enough to just reach round, oil well, and wrap around shaft, and have lap come on side where the box will come apart; then wind the paper with a piece of common wrapping twine, in the form of a cone screw, say on a box 6 inches long about ten times, and fasten the ends by tucking them under another coil.

No. 2.—Proceed to put on cap, and pour as in other methods. When the box is made and the shaft taken out, you will find a good box, and the twine has made a spiral groove in the box, running from end to end, giving the oil a chance to pass through the box. In making a loose pulley, proceed as in casting a box. Always oil the paper. A. P. HYDE.

Oxford, Chenango Co., N. Y., Dec. 14, 1886.

Two New British War Ships.

The second of the new class of belted cruisers which has been built by the Palmer Shipbuilding and Iron Co., Jarrow, for the English Government, was successfully launched on the Tyne on Nov. 25, in the presence of a large concourse of spectators. As the vessel left the ways she was christened the Undaunted by Lady George Hamilton, amid the cheers of the onlookers. The constrnction of the Undaunted is similar to that of the Orlando, which was launched from this yard on August 23 last. The principal characteristics of this type of vessel are a high atiainment of speed with great defensive power.

The following is a general description of the vessel: Length, 300 ft.; breadth, extreme, 56 ft.; depth, moulded, 37 ft.; normal draught, 21 ft.; displacement, 5,000 tons; indicated horse power, 8,500; estimated speed, 19 knots. The armor is compound, or steel-faced, and consists of a belt 200 ft. in length extending from 1 ft. 6 in. above the water line to 4 ft. below. This belt is 10 in. in thickness, and is backed with 6 in. of teak, secnred in steel plating 1 in. in thickness. On a level with the top of the belt there is a protective deck formed of 2 in. of steel plating. Beyond the belt at both ends the deck is inclined downward to an angle of 30°, and is 3 in. in thickness. All openings in this deck are fitted with either armor shutters or shell proof gratings, and those necessarily open in action are also fitted with cofferdams.

By means of the armor belt amidships and the protective deck plating fore and aft, the whole of the vessel under this deck is rendered invulnerable to shot and shell, and forms an unsinkable raft in which are placed the engines, boilers, magazines, shell rooms, and steering gear. When in action, the movements of the machinery, the steering of the ship, and the firing of the guns are under complete control from the conning tower, a massive structure at the fore end of the vessel. The lookout men in this tower are protected by 12 in. of steel-faced armor, and all the communications to engine rooms, magazines, steering wheels, etc., pass through a tube of steel 8 in. thick. The stem, which forms a ram, is exceptionally strong, and is well supported by the framework of the vessel and the protective deck. The ram, sternpost, and propeller brackets are each of cast steel, manufactured by Messrs. Spencer & Sons, of Newburn. The hull is built of Siemens-Martin steel, and is divided into over 100 watertight compartments.

Sir C. M. Palmer, M.P., said the Undaunted belonged to a class which was a new departure, to meet the requirements of the empire. She would have a speed which would exceed that of almost any privateer that might be employed against the merchant shipping of the country, although they must not rest content with a speed of 18 or 19 knots while they had merchant ships performing 20 and 21 knots.

Her Majesty's belted cruiser Australia, built by Messrs. Robert Napier & Sons, Govan, for the British Government, was launched on Nov. 25. The Australia is one of five belted cruisers ordered in April, 1885. The building of two, the Australia and the Galatea, was intrusted to Messrs. Napier & Sons; two, the Orlando and the Undaunted, were ordered from Palmer's Shipbuildingand Iron Company (Limited), Jarrow-on Tyne; and the fifth was ordered from Earl's Shipbuilding Company, Hull. The Australia, like her sister ships, is 300 ft. long between perpendiculars and 56 ft. in extreme breadth. The draught of water under ordinary circumstances will be 19 ft., and at this draught the displacement will be 5,000 tons. This may at times be increased to 6,000 tons when a full supply of coal is shipped.

It is expected that the vessel will have a speed of 18 knots per hour. The engines which are to be fitted on board, and have been designed by Messrs. Napier, are of the triple expansion type, working twin screws, and will indicate 8,500 horse power, the working pressure being 130 lb. It may be interesting to mention that when tenders were asked for vessels of this class, compound engines of 7,500 horse power were specified; but Messrs. Napier proposed as an alternative scheme to fit triple expansion engines on board, and undertook to develop 8,500 horse power, and that without taking up any more room in the ship or increasing the collective weight of the machinery and coal.

The Admiralty accepted this proposal, and carried it out in the other ships of the class. The result will be to increase the speed by about a knot per hour, while less coal will be consumed. The boilers are of the double ended multitubular type, and have corrugated fiues. The armament will consist of two very long range 9¼ in. Armstrong guns, ten 6 in. guns of the same class, all mounted on central pivot Vavassenr mountings, eight 6 pounder and eight 3 pounder quick firing guns, also six torpedo impulse tubes. The two striking characteristics of the ship are her high rate of speed and length of gun, or range of fire. These qualities would generally enable her to overtake an enemy or to avoid one altogether if too heavy metal for her, or using her great speed she might keep the enemy within range of her big guns while she herself was beyond the enemy's fire. Every safeguard has been adopted to shield her from the enemy's fire and to prevent her from sinking. She is divided into about 130 compartments or cells. The engines and steering gear are all under the water line, and are protected from *debris* and from dropping fire by a 2 in. thick steel deck extending the whole length of the ship. The water line of the ship is protected by an armor belt 10 in. thick, steel-faced, strongly supported by teak and steel backing, and capable of resisting a shot or shell from 10 in. guns.

At a luncheon which followed, Mr. A. C. Kirk, the head of the firm of Messrs. R. Napier & Sons, said the ship that had just been launched was a formidable addition to the British Navy. It was a matter of congratulation, he thought, to the country that a private firm should be able, without any effort, to advance such a vessel to its present stage of completion, including the testing of 132 watertight compartments and the testing of 500 tons of armor plate, within a period of about 20 months. Had it been necessary, it could have been done in even less time. The Admiralty, in preparing this design, had succeeded in combining the conflicting qualities of a war ship in a rare degree—namely, offensive and defensive power, a large range of action, with a high rate of speed. The Australia was the fifty-first war ship which had been built by the firm.

A Note on Watering Potted Plants.

In the operation of watering potted plants, persons not practically familiar with plant culture are apt to make serious mistakes. Cultivators find by experience that an excess of water at the roots is very injurious to almost all plants, and hence it is usual to direct that great caution be used in the application of water, especially in winter. The result is that frequently the opposite extreme is fallen into, to the great injury of the plants. From the moment that the soil becomes so far dried that the fibers of the roots cannot absorb moisture from it, the supply of the plant's food is cut off, and it begins to suffer. Some plants can bear this loss of water with more impunity than others; some again, and the heath family among the rest, are in this way soon destroyed. The object in watering should be to prevent this stage of dryness being reached, at least during the time a plant is growing, and at all times in the case of those of very rigid structure; at the same time, that excess which would sodden the soil and gorge the plants is also avoided. Within these limits the most inexperienced persons may follow sound directions for the application of water with safety. But whenever water is given to pot plants, enough should be employed to wet the soil thoroughly, and the difference between plants that require less or more water should be made by watering more or less freqnently, and not by giving greater or less quantities at one time.—*Farmer's (Irish) Gazette.*

THE LEIXOES BREAKWATER, PORTUGAL.

One of the most striking mechanical works is the great crane Titon, which is now at work in the port of Leixoes, Portugal, employed in placing the artificial stone blocks, 50 tons weight each, for the construction of the breakwater. "Nothing is more imposing," says a spectator, "than to see this extraordinary machine transferring itself along the rails, swinging in all directions, raising enormous blocks of stone, and sinking them slowly in the ocean to construct the walls of this remarkable mole."

The larger arm of the crane measures 46 meters from the axis of the machine, and the shorter 22¾ meters, making a total length of 68¾ meters. Its height from the center is 5½ meters, and at the extremities 0·81 of a meter. It has a counterweight consisting of solid masonry. It rests upon a circular tower, and turns upon 16 wheels of steel, in groups of 4. The vertical axis gives lateral movement to this enormous apparatus. The superior part rests upon 32 wheels, arranged in groups of 8, which run upon steel rails. Mounted upon the rear arm are two steam engines, of 50 horse power, which work the machinery of the crane. Its total weight is 450 tons, and the larger arm has sufficient strength, as we have said, to place and move blocks of 50 tons a distance of 27 meters, requiring for this operation, after the stone is fastened, 16 minutes 20 seconds from the time it is attached to the chains.

Our engraving represents the crane at work upon the mole. It was constructed by the Fives-Lille Co., France. Our engraving is from *La Ilustracion Espanola y Americana.*

ROLLING PLATFORMS AND ARMOR-CLAD BATTERIES.

The form of battery described in the following article is in accordance with the plans of Commander Mongin, in which he proposes the use of a platform rolling over an iron track. The project that he has studied admits of the putting in battery of a 6 inch

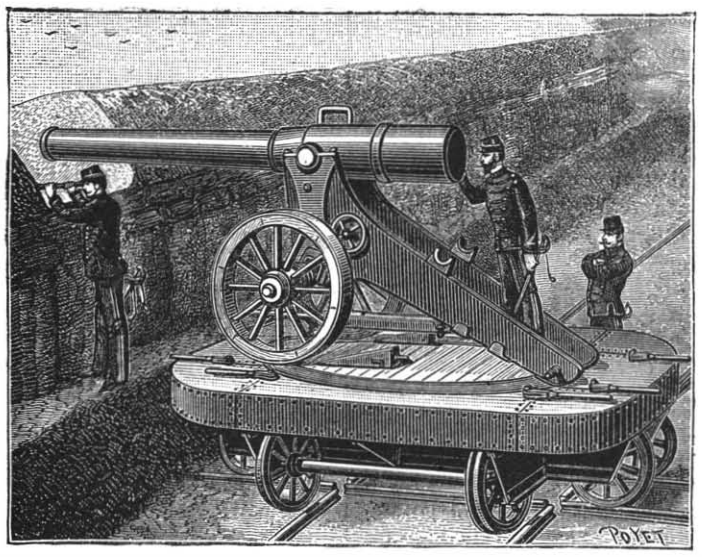


Fig. 1.—ROLLING PLATFORM.

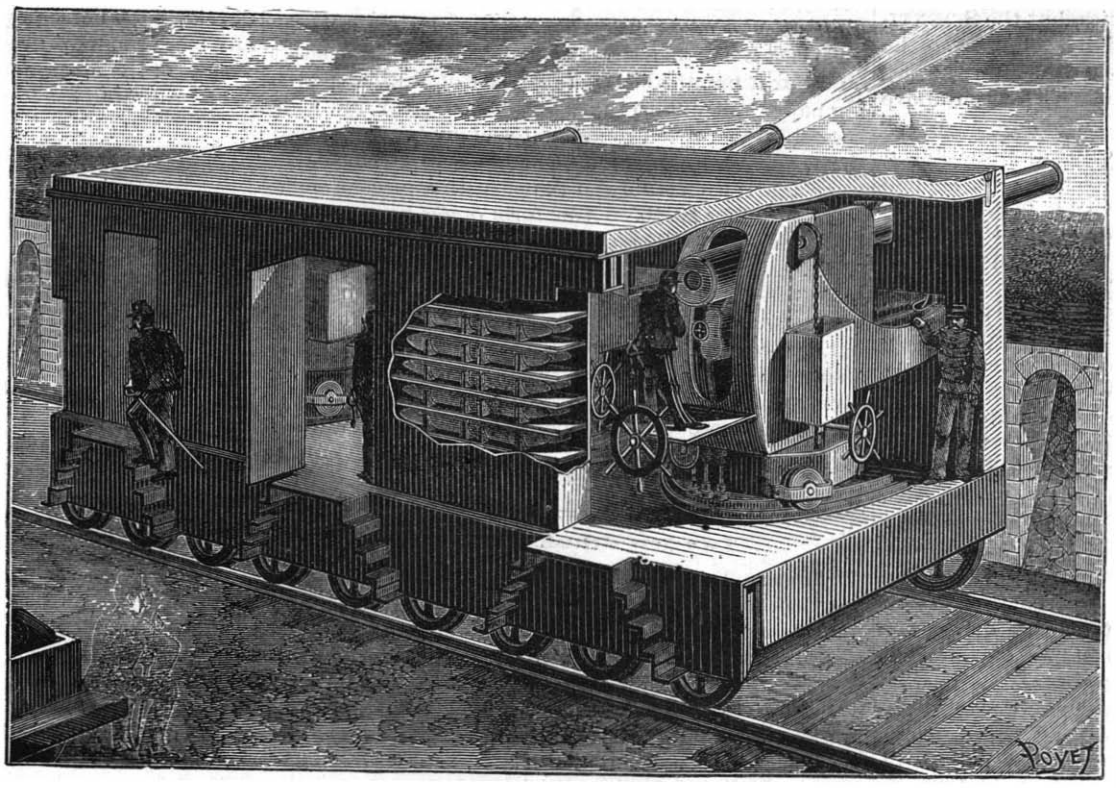


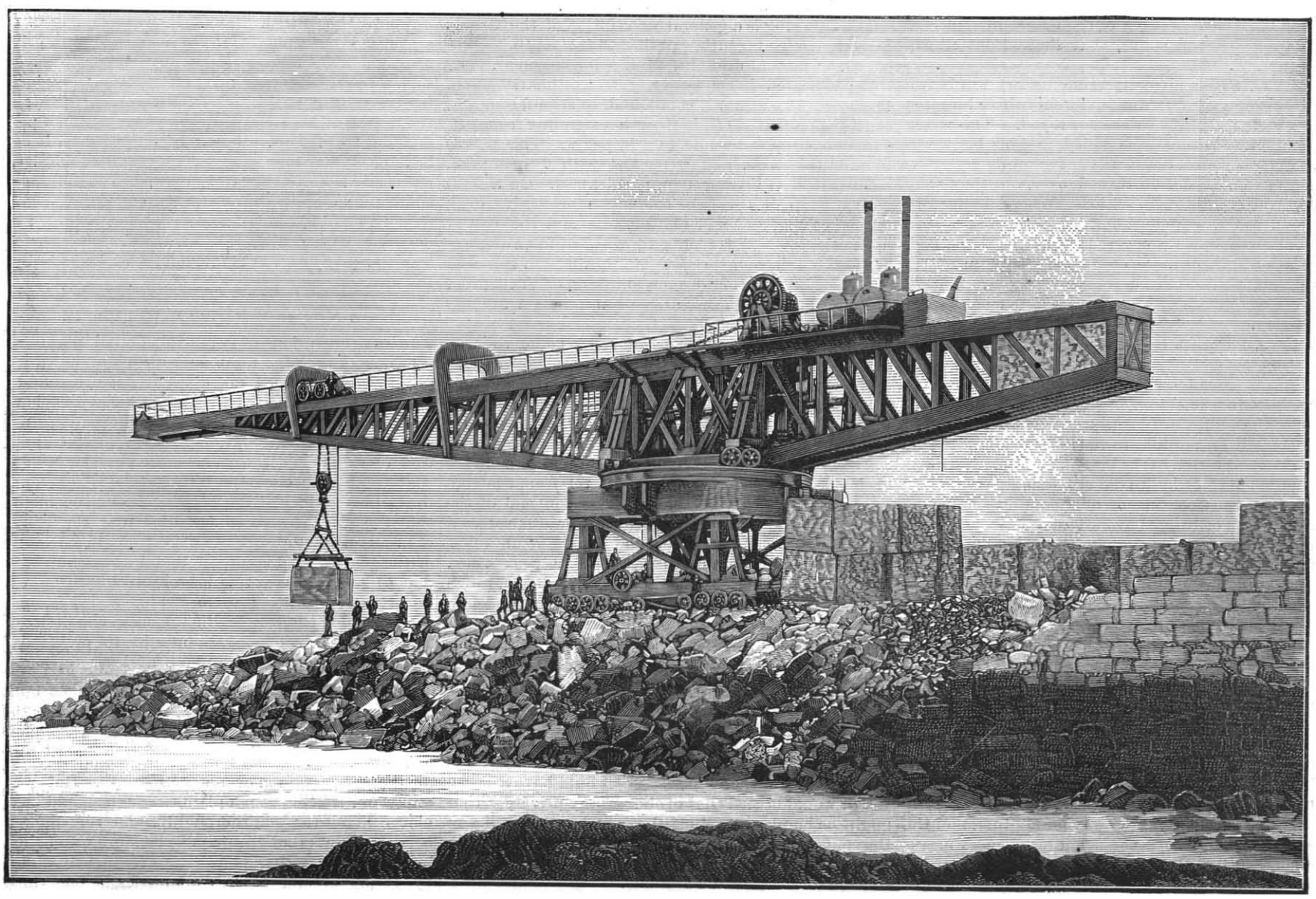
Fig. 2.—ROLLING ARMOR-CLAD BATTERY.

De Bange gun, mounted upon a siege carriage and provided with a hydraulic brake. The platform properly so called is, as he explains it, essentially formed of a frame composed of four iron plate and angle iron girders, which intersect each other in pairs at right angles, and the extremities of which are connected by a cover of iron plate (Fig. 1).

This frame is provided with a circular channel, likewise of plate and angle iron, whose center is the virtual pivot of the carriage. Externally to this channel, the platform is covered with striated iron plate, and internally with a wooden floor. In the channel there moves a cast steel ring, which is centered by a system of guide wheels, and rests upon the bottom of the channel through the intermedium of five rollers, two of which are under the wheels of the carriage, one under the butt end, and the two others at equal distances from the preceding. When the carriage is in battery, the two wheels and the butt bear upon the ring, thus permitting of quickly giving the piece every possible direction of aim in a horizontal position. The platform is supported by four pairs of wheels, the axles of two pairs of which are at right angles with those of the other two. Owing to a very simple mechanism, it is possible, at will, to make each of the wheels bear upon the rail that corresponds to it, or to raise it a few fractions of an inch above it.

From such an arrangement, it results, in the first place, that the direction of the platform can be changed on a crossing of two tracks at right angles, and consequently can be easily moved about at the bottom of a trench; and, second, that it possesses great stability at the moment of firing, although maneuvered on a system of ordinary railway tracks spaced five feet apart.

The positions for firing are marked upon the main track by a small crossing analogous to that for the change of direction. When the piece is to be fired, the entire eight



THE LEIXOES BREAKWATER, PORTUGAL.

wheels are put in action at the same time, thus preventing the whole from getting out of true, giving the affair a wide and solid base, and preventing the car from recoiling. As the car, carriage, and gun, as a whole, do not weigh any more than a heavily loaded railway car(40,000 lb.), it requires but a few men to rapidly move the system over an iron track of the ordinary type.

The organization proposed by Commander Mongin consists of an ordinary railway running parallel with the general direction of the forts of an intrenched camp, along the glacis and beneath the fire of the gorge facings. Starting from the points where it was not covered by the masonry of the fort, this track would follow a sort of siege trench with a nearly horizontal bottom. An investment of gabions and hurdles toward the interior would sustain a glacis having an easy slope and provided with an abatis. Here and there (at intervals of 15 or 20 yards, for example) the main track would be provided with a crossing to permit of putting a movable gun in battery upon it. Near by, there would be a small siege magazine, built under the glacis.

When necessary, the materials of the abatis would be separated at the right of these firing places, so as to allow the enemy's works to be seen plainly without those inside exposing themselves. Thus established in such positions, the artillery would enjoy all the advantages of the attacking batteries. Like the latter, it would show nothing but the guns themselves. Again, the enemy might not be able to recognize its location except by observing the cloud of smoke due to the firing. The gunners would not have to fear the bursting of shells on the talus of the parapets, and most of the enemy's projectiles, which did not directly touch the material, would pass beyond without producing a useful effect. When the besieger had succeeded in regulating his firing in an alarming manner, these movable pieces would be run 40 or 50 yards to the right or left, thus obliging the enemy to modify his aim at every instant.

If the form of the ground did not permit of excavating a long trench in a straight line without its being taken by a raking fire, it would be broken up into an embattlemented form, whose rectangular parts would be covered with high traverses of a symmetrically irregular shape.

Finally, it must not be lost sight of that the carriages employed permit of an indefinite field of fire in a horizontal direction, and that they might, should occasion require it, be turned about and strongly support the firing of the fort should the enemy attempt a *coup de main* on the gorge.

Instead of continuing the track along the entire length of the attacked forts, merely 200 or 300 yard sections might be constructed to the right and left of the latter, and batteries of movable pieces be thus created that would advantageously replace the armed, annexed batteries of stationary guns.

There is no doubt that a gun which can be shifted as soon as the enemy's fire is regulated is capable of producing as great an effect as three guns occupying a stationary position, or, in other words, that such a gun will finally reduce three guns of the enemy to silence.

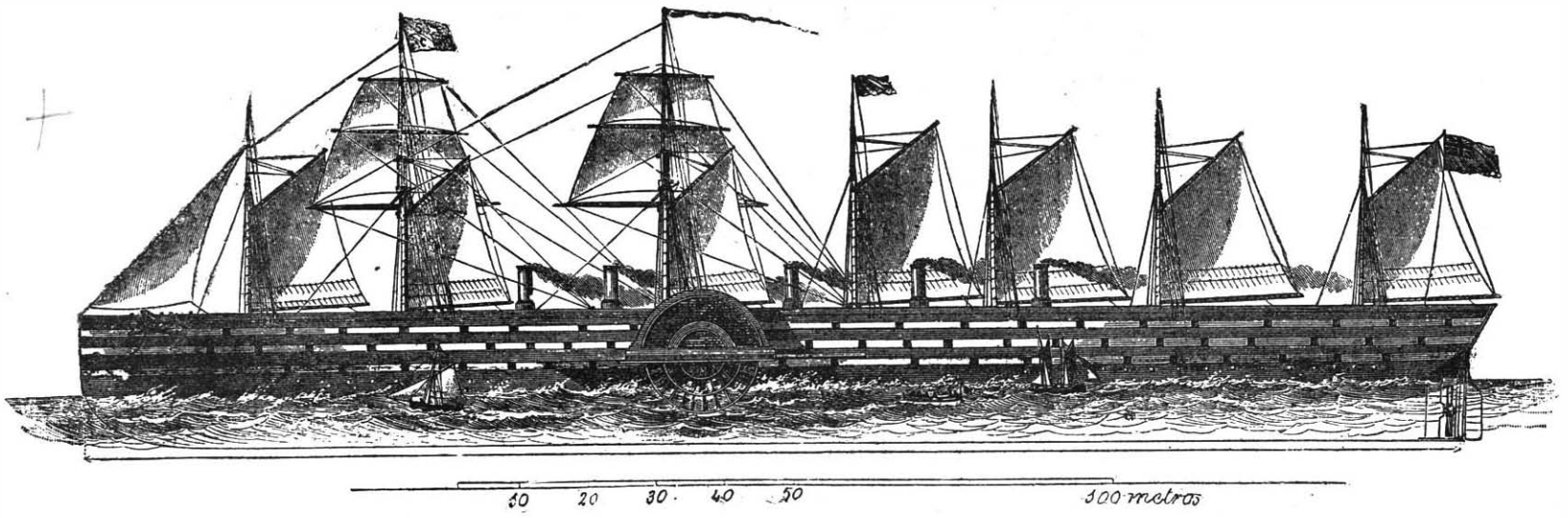
Moreover, it is possible to combine the two means of resistance to the fire of the enemy's artillery, that is to say, mobility in a horizontal position and armor plate protection. Hence the idea of armor-clad rolling batteries, which was carried out for the first time in France toward the end of the year 1870.

The first experiments on a rational use of armor-clad batteries, movable upon rails, were made in the siege of Paris. Since then the question has been the subject of serious study, especially on the part of Commander Mongin. This high officer now proposes rolling armor-clad batteries that may be said to be indestructible. He thinks that the adoption of a system of trains of guns thus protected would permit of greatly reducing the artillery *materiel* necessary for the armament of detached forts.

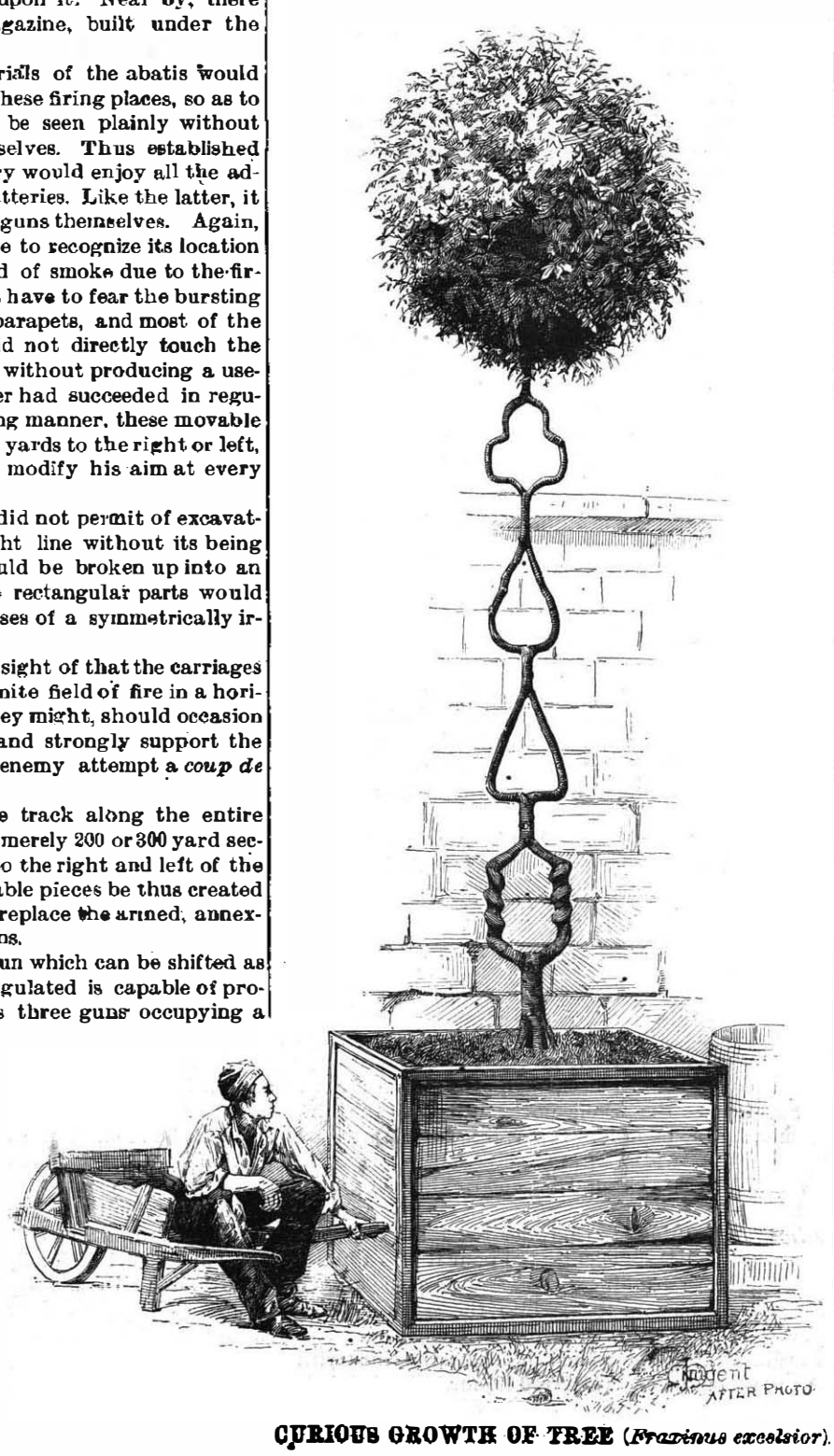
The battery of which he has formed a project may be considered, as a whole, as a hollow girder, iron clad on four of its sides, and externally capable of enduring heavy blows without being disturbed. This girder is fixed upon a strong flooring supported by nine suspended axles that permit of a side movement of the whole (Fig. 2). The axles are of steel, and are provided with iron wheels 3¼ ft. in diameter, having hard steel rims 2 in. thick. Their 8 in. journals are provided with cast steel grease boxes, connected with 25 ton suspension springs, affixed to the flooring of the battery. This flooring consists of two sole bars connected at their extremities, and between the axles, by ten small cross girders, which are themselves connected in pairs in the direction of the longitudinal axis of the flooring by ten struts. The whole, which is of plate and angle iron, is covered with a floor consisting of iron plates juxtaposed and carefully riveted to the sole bars, girders, and struts.

Two end panels and two intermediate stays divide the battery into three compartments, each containing one gun. The armor in front consists of two 16 in. thick plates of rolled iron connected all the way up by a mortise joint, and containing three embrasures at a minimum distance apart of 13 ft. from axis to axis, which are provided at the top and throughout their entire length with a rabbet 6 in. in depth. The prime cost of an armor-clad rolling battery amounts to but $80,000—a sum to which must be added the cost of three 6 in. guns.

These batteries may be advantageously employed during the course of the operation of defending the *enciente* of a place or the intervals between the forts of an intrenched camp. They are likewise of a nature to constitute the elements of a siege park of great power. It is even permitted us to foresee the coming of the day when they will make their debut upon our fields of battle.—*La Nature.*



THE STEAMSHIP GREAT EASTERN.



CURIOUS GROWTH OF TREE (*Fraxinus excelsior*).

CURIOUS GROWTH OF TREE (*Fraxinus excelsior*).

In this country the artificial training of shrubs and trees has not attained that degree of perfection that is observed in the countries of Europe. This is due probably to the fact that the gardens and parks abroad have been, many of them, kept in a most perfect state of cultivation for years, and even for centuries. Italy is especially noted for the beauty of form and design that has been imparted to the garden by the use of trimmed shrubs and hedges. This style of gardening has been extensively followed in nearly all the countries of Europe; and although there is no pretense at courting nature, this has, nevertheless, asserted itself, and age has added to this method a dignity which greatly heightens its original effect.

At Versailles, at Fontainebleau, at the Imperial Gardens in Austria, and in Germany, this same style is to be found. In England, also, we observe the same effect, not so much in the public gardens as in the private parks.

At Haddon Hall there are two quite celebrated box-wood trees, one representing a ship and the other a peacock of heroic size. At Chatsworth, near by, there are many curious shapes to be found. The tree shown in the accompanying cut is at present in the Jardin d'Acclimatation, in Paris. By examining the part nearest the ground, it will be observed that it originally consisted of five separate trees grafted together, which were successively divided and grown together again, producing the curious loops and forms observable in the illustration, which is a faithful delineation, taken directly from a photograph of the plant itself.

THE GREAT EASTERN.

This steamship, which for more than a third of a century has remained the largest ever constructed, was designed, about 1853, by the distinguished engineer Brunel, for the trade between England and Australia. It was calculated that a ship could be built having sufficient capacity to carry enough coal for the round trip in addition to a great many passengers and a paying cargo. She was built by J. Scott Russell at his works in Millwall, London, and was ready to be launched in November, 1857, but could not be moved until the following January. Even that early in her history her unlucky star assumed the ascendency, and in all her subsequent wanderings seemed ever present.

When launched, her cost was $3,831,520.

The Great Eastern is 692 ft. in extreme length, 83

ft. beam, and 27,000 tons actual capacity. She was built of iron, and double cased to about three feet above the water line. The motive power consisted of eight engines, four for the paddle wheels, which were 56 ft. in diameter, and four for the screw, 24 ft. in diameter. The cylinders of the paddle engines were 74 in. in diameter by 14 ft. stroke; and those of the screw were 84 in. in diameter and 4 ft. stroke. The heating surface of the boilers supplying the paddle engines was 44,000 sq. ft., while that of the screw engine boilers was still larger. The united nominal horse power was 4,000.

The first voyage to New York was made in 1860, and during the voyage she nearly averaged 336 miles per diem, or 14 miles per hour. Steam was carried at a pressure of from 15 to 24 pounds, and the total quantity of coal consumed was 2,877 tons. Since then her history has been strange and eventful, and the opinion we expressed in our issue of July 7, 1860, upon her visit to New York, has been most peculiarly borne out by the facts: "Although we cannot but regard the Great Eastern as a failure in *payability*, yet she is not so in a scientific sense. She is a grand experiment."

This ship, which, notwithstanding the many hard knocks she has received, seems to be in almost as good condition as when launched, now attracts attention because of the new use she is to be put to. For some time she has been exhibited at Liverpool, and has lately been taken as a "show ship" to Dublin. It is to be hoped that this venture will prove more remunerative than former ones; it certainly should, since the vessel is well worth a long journey to see, and a critical examination of her hull and machinery cannot fail to be both instructive and interesting. It is to be hoped that those in charge will brave the dangers of the Atlantic, and bring the leviathan once more to this country.

Simple Chemical Experiments.

The following are given in *The Chemist and Druggist*, by way of suggestions to druggists in the preparation of a variety of salable articles for the holiday season.

THE MAGNESIUM LIGHT.

Directions.—Take hold of the end of the ribbon by a pair of pliers, and introduce the other end into a flame, when it will at once take fire and burn brilliantly.

Material.—A piece of magnesium ribbon. To be packed by putting in an ordinary oval pill box laid in cotton wool, and wrapped in blue paper, labeled the above, and charged 6*d.* a box. The chemist that puts it up to judge for himself the quantity of wire.

INK AND WATER TRICK.

The following in a box, with bill of directions, may be profitably sold for 1*s.* or 1*s.* 6*d.*: 3 packets labeled respectively Nos. 1, 2, and 3. No. 1 contains about ʒ ss. fer. sulph. gran.; No. 2 about ʒ j. tannin; and No. 3 about ʒ ss. acid. oxalic. pulv.

Directions.—Take two decanters (preferably different shapes, so as to avoid suspicion of changing) and fill them both with water. Introdnce into one of them a *small* portion of No. 1 powder and the same of No. 2. This will form a black compound resembling ink. Into the other put another portion of No. 1 only, and shake till dissolved. This liquid will be clear like water. Now wrap up a pinch of No. 3 and the same of No. 2, each in a small piece of blotting paper (different colors, so as to prevent mistake), and conceal these in the palm of your hand. You are now ready for the trick. Step among the audience and explain that you have two bottles, one containing ink and the other water. This they may see for themselves. Now place the ink bottle at one end of the room, cover with a borrowed handkerchief, and, while doing so, contrive to slip in the blotting paper containing No. 3. Shake well, and let it stand covered. Go to the other end of the room and do the same with the "water" bottle, slipping in No. 2 packet. On removing the covers, chemical action will have taken place in the bottles, and the two liquids will appear to have changed places, the ink bottle containing water and the water one ink. It is well to practice this trick several times in private before showing to an audience.

GROWTH WITHOUT LIFE.

A small bottle containing about ʒ j. cupric chloride in crystals, and a 4 oz. bottle filled with *strong* solution of K_4FeCy_6. The two might be put in a cardboard case (such as is used for proprietary medicines) with bill of directions, and charged about 1*s.*

Directions.—Take a tumbler of water and put in a dessertspoonful of the solution. Mix by stirring, and then carefully drop in a crystal or two out of the small bottle and let the glass stand quite still for a few minutes, when a beautiful structure resembling brown seaweed will grow up and soon fill the glass. A tall, narrow jar is best to use, and the exact quantities can be best judged by practice.

TO CONVERT STEEL INTO COPPER.

Dip the bright blade of a steel knife (or a piece of bright steel) into the solution supplied. In a few minutes it will be fonnd to be coated with copper.

Contents of the Box.—ʒ j. bottle solution of copper sulphate acidulated.

AN INCREDIBLE FEAT.

To take a coin out of water without wetting the hand.

With the powder supplied well sprinkle the surface of the water in which the coin is placed, or the hand may be rubbed over with the powder. In either case the hand may be dipped into the water without becoming wet, and thus the coin may be removed. After performing the feat, a shake of the hand will dislodge the adhering powder.

Envelope contains, in packet form, ʒ ss. lycopodium powder.

THE MAGIC WHIRLPOOL.

Fill a small basin with hot water, and throw upon its surface a few fragments of the substance supplied. They will instantly acquire a rotary and progressive motion, which will continue for some minutes. Before the motion ceases drop on to the surface a little oil of turpentine. The floating particles will quickly dart away as if by magic, and will become almost stationary.

Box contains ʒ ij. camphor in small fragments.

THE DANCING FIRE BALL.

Directions.—Procure a stout and tolerably wide test-tube. Place in it a teaspoonful of the powder and heat over a spirit lamp. When it is liquefied and begins to boil, drop into it a piece of the charcoal about the size of a pea. It will immediately begin to glow, and will dance about on the surface of the liquid as if alive.

Contents of the Box.—(*a*) ½ oz. pill box (deep) containing powdered chlorate of potash; (*b*) piece of charcoal.

A LIQUID PRODUCED BY TWO SOLIDS.

Directions.—Rub together in a dry mortar equal portions of the powders provided, and in a few minutes a blue liquid will be formed.

Contents of the Box.—Half ounce carbonate of ammonia powdered, ½ ounce blue vitriol powdered, or, omitting "blue" in directions, ½ oz. sulphate of soda powdered, ½ oz. acetate of lead.

THE FIRE EATER.

Directions.—Cut off about an inch of the prepared string, wrap it in a piece of tow. Hold it in left hand; with right hand put more tow into the mouth, chew it, and appear to swallow it. Now take the handful in which is the string and put into the mouth, taking out at the same time, unobserved, the piece already chewed. Take a breath *through the nostrils* and breathe it out through the mouth. Repeat a few times and smoke will issue forth, and on opening wide the mouth it will be lighted up with a glow. When the mouth is shut and the tow pressed together, the fire goes out.

Contents of the Box.—(1) A piece of *thick* string about ¼ yard long, prepared by soaking in solution niter and drying; (2) tow. Can be sold for 3*d.*

TRANSFORMATION LIQUID.

Solution of caustic potass 1 oz., powdered nitrate of cobalt 1 drachm.

Directions.—Mix the nitrate of cobalt with the caustic potass, when decomposition of the salt and precipitation of blue oxide of cobalt will take place. Cork the bottle and the liquid will assume a blue color, from which it will pass to a lilac, afterward, to a peach tint, and finally to a light red.

THE MAGIC LIQUIDS.

Tincture of litmus and sulphate of indigo, of each ½ oz. in separate bottles. Label distinctly.

Directions.—Pour a little of each into separate wine-glasses. Mix these two blue fluids together, and to the great astonishment of everybody, the result will be a beautiful red.

ARBOR DIANÆ.

Being the materials for making a silver tree.

Directions.—Dissolve the crystals in the blue paper in a tablespoonful of water, and add the contents of the bottle to this solution and allow it to stand aside a little while, when it will form a silver tree in full growth.

Materials.—ʒ ss. of argent. nit. wrapped in blue paper and ʒ j. of hydrargyrum in a small flat bottle packed in a one dozen powder box in cotton wool. Label "Poison." To sell at 6*d.* or 1*s.*

HOAR FROST SHRUB.

Ingredients.—In chip box, benzoic acid.

Directions.—Place a sprig of rosemary, or any other garden herb, in a glass jar, so that when it is inverted the stem may be downward, and the sprig supported by the sides of the jar; put some of the crystals on a piece of hot iron, invert the jar over the iron, and leave the whole untouched until the sprig becomes, by the deposited vapor, like hoar frost.

MAGICAL TRANSMUTATIONS.

Ingredients.—(1) Ground logwood chips; (2) ground alum.

Directions.—Infuse the powder No. 1 in water, and when the liquor is sufficiently red pour it into a bottle. Then take three drinking-glasses and rinse one of them with strong vinegar; throw into the second a small quantity of powder No. 2, which will not be observed if the glass has been washed; and leave the third without any preparation. If the red liquor in the bottle be poured into the first glass, it will appear of a straw color; if into the second, it will pass gradually from a bluish gray to black, when stirred with a key or any piece of iron which has been previously dipped in strong vinegar. In the third glass, the liquor will assume a violet tint.

TO MELT IRON IN A MOMENT.

Ingredient.—Roll of sulphur.

Directions.—Heat a piece of iron (a poker will do) to white heat, then apply the roll of sulphur. The iron will immediately melt and run into drops. This experiment is best performed over a wash basin of water, allowing the melted iron to drop into the water.

CRYSTAL ROOM ORNAMENT, TO MAKE.

Ingredients.—Sulphate of alumina, sulphate of copper, sulphate of soda, sulphate of potass, sulphate of iron, sulphate of zinc, sulphate of magnesia, of each ½ oz. in separate chip boxes.

Directions.—Dissolve each of the salts in warm water in a separate tumbler. When dissolved, pour all together into an evaporating dish and mix well with a glass rod. Place the dish in a warm place where it cannot be affected by dust, and where it is not liable to be agitated. When evaporation has taken place, the whole will begin to shoot out into crystals. Their color and peculiar form of crystallization will distinguish each crystal separately, and the whole together will display a very curious and pleasing appearance. Preserve carefully from dust.

ARTIFICIAL CORAL FOR GROTTOES.

Ingredients.—Vermilion, 2 drachms; pale resin, 1 oz.

Direct these to be melted together. Have ready branches of twigs peeled and dried; paint them over with this mixture while hot. The blackthorn is the best branch for the purpose. Hold these over a gentle fire, turning them round till they are perfectly covered and smooth.

SILVER TREE.

Ingredients.—(1) Nitrate silver, 2 drachms; (2) quicksilver, 1 drachm.

Dissolve No. 1 in ¼ pint of filtered water, and set the glass vessel containing the solution on the chimney piece where it is not likely to be disturbed. Now pour in No. 2; in a short time the silver will be precipitated in the most beautiful arborescent form, resembling real vegetation.

TIN TREE.

Ingredients.—(1) Muriate tin, 3 drachms; (2) nitric acid, 10 drops; (3) piece of zinc attached to copper wire.

Directions.—Put No. 1 into a glass vessel with sufficient water to three parts fill, then add No. 2, shake well until dissolved. Now place No. 3 through a cork and insert in solution so that no part shall touch top, bottom, or side of glass vessel. Let the whole rest quietly for a short time. The tree will grow, and have a very lustrous appearance.

LEAD TREE.

Ingredients.—Sugar of lead, ¼ oz.; zinc fastened to a wire (copper or brass) twisted in the form of a spiral spring. From the center suspend a small porcelain doll with wire twisted round it.

Place the lead acetate in a bottle of water, shake well, then thrust zinc and appendages into it, and cork securely. In a few days the tree will begin to grow, and produce a most beautiful effect.

TO GIVE GHASTLY APPEARANCE TO COMPANY.

Ingredients.—Mixture in bottle; piece of tow.

Composition of Mixture.—Salt, inf. saffron, spt. vin. methyl.

Directions.—Dip a small piece of tow into the mixture, and ignite in a room of company, when the whole will have a very ghastly appearance. Extinguish all other lights in the room.

CRYSTAL ORNAMENT.

Ingredient.—Alum, 18 oz.

Directions.—Dissolve in 2 pints of soft water by boiling it gently in a close tinned vessel over a moderate fire, keeping it stirred with a wooden spatula until the solution is completed. When the liquor is *almost* cold, suspend a small basket, ears of corn, moss rose, hyacinth, or almost any vegetable specimen, by means of a small thread or twine from a lath or small stick placed horizontally across the aperture of a deep glass or earthenware jar, into which the solution is poured. The respective articles should remain in the solution twenty-four hours; when they are taken out, they are to be carefully suspended in the shade until quite dry. The whole process of crystallization is best conducted in a cool situation. When the objects to be crystallized are put into the solution while it is quite cold, the crystals are apt to be formed too large; on the other hand, should it be too hot, the crystals will be small in proportion. The best temperature is about 95° Fahr.

CHAMELEON PICTURES.

Put into small bottles, say 2 drachm, some bromide of copper, muriate of cobalt, and acetate of cobalt in solution. Label distinctly.

Directions.—Draw a scene on paper with bromide of copper. The trees stretching across the sky, and the snow-covered ground, may be changed to vernal beauty by heat. This is done by painting in the grass, foliage, etc., in muriate of cobalt, and the blues—of the sky and water—in acetate of cobalt. These tints will be invisible until held before the fire.

ENGINEERING INVENTIONS.

An alarm for railway trains has been patented by Messrs. George E. Carpenter and Albert F. Tucker, of Jersey City, N. J. Electrical connections areso made between each car of the train that the accidental separalion of any of the cars will be signaled to tbe engineer, and also to the caboose, when used on freight trains.

A railway tricycle has been patented by Mr. William Hayes, of Los Angeles, Cal. The invention consists of a trailing wheel free to swing within certain limits, and without flanges, with a seat placed at right angles to the main wheels, the object being to avoid friction of the flanges of the wheels on curves, as well as on straight tracks.

A rail joint has been patented by Messrs. Maris E. Lewis and Carlton A. Dodge, of Orange City, Iowa. Thefastening consists of a sectional fishplate, one section being apertured and having inclined recesses or notches, and the other having inclined projections and longitudinal slots with enlargements, a double-headed bolt with one head of greater diameter than the other, and a wedge, with other novel features.

A car coupling has been patented by Messrs. George C. McKitterick, Thomas R. Morgane, and John J. McKitterick, of Jackson, Ohio. The drawhead has a link chamber, and an upperlongitudinal slot and groove connected therewith, with other novel details, besides a coupling dog of novel construction, the coupling being also for use with cars having the ordinary pin and link coupling.

A car axle box has been patented by Mr. Stephen R. Stinard, of Pompton, N. J. The principle of the invention is giving a support to oiled waste or similar material quite closely to the axle journal, in such manner thatsettling or packing will not cause it to leave the journal, but rather to bear all the more closely, to insure constant lubrication without waste of the lubricant.

AGRICULTURAL INVENTIONS.

A combined pulverizer and plow has been patented by Mr. Daniel W. Evans, of Sims, Dakota Ter. Combined with the plow is a series of vertically adjustable colters, with a series of narrow plows extending between the colters, with pulverizing devices between the colters and main plow, and other novel features, to cut the furrow slices into strips, pulverize them, and then turn themunder.

A check row corn planter has been patented by Messrs. John F. Scott and Oliver W. Chesnut, of Templeton, Ind. It is so made that the seed-dropping mechanism and the markers will be operated by the revolution of the axle, while the mechanism can be readily thrown out of gear, and the markers readily adjusted, should the cross rows get out of line, so that the planting can be done in accurate check row.

A potato planter has been patented by Mr. Charliee C. Maves, of EastDavenport, Iowa. It is a machine in which the mechauism for gathering and depositing the potato seed is carried by an auxiliary frame whose position is easily controlled by means of a lever, and the machine is so constructed that the potatoes may be planted either in hillsordrills, and that the space between the hills may be varied, as also the distance between the seed when the potatoes are planted in drills.

MISCELLANEOUS INVENTIONS.

A sign has been patented by Mr. George H. Kitchen, of New York city. This invention relates to illuminated signs where opal glass is used to form the letters, and glass ball's eyes for ornamenting, and consists in the means of holding the ball's eyes in place in the body of the sign, and in the means of forming the letters with the glass.

A steam generator has been patented by Mr. William P. Crater, of Salamanca, N. Y. It consists of two water tanks placed one above another, connected bypipes and surrounding a fire grate, fire pot, and self-feeder, with a peculiar draught arrangement, being simple in construction and designed to generate steam rapidly without using much fuel.

An elevator and perambulator for invalids has been patented by Margaret Hammond, of Port Madison, Washington Territory. It consists of a main frame with wheels, elevating devices, frames or bars with wheels and clamps, and other novel features, whereby a patient can be raised from bed and carried to any part of the house on the arms of the machine, or, by applying the large wheels, can be conveyed a distance or over rough roads.

An article of jewelry has been patented by Mr. Jethro C. Cottle, of New York city. This invention covers an improvement in ornamental pins for neck scarfs, handkerchiefs, etc., embodied in the form of an insect or bird made of gold, silver, or other suitable metal, the feet or claws serving to attach the pin, which is acted on by a concealed spring, the wings serving as levers to overcome the tension of the spring, to separate the claws, to detach the article from clothing.

A gas burner attachment has been patented by Mr. Francis E. Mills, of Pittsburg, Pa. The invention consists in inclosing the broad thin sheet of flame of a burner, for one-third or more of its height, with anoblong or elongated cage, the twosides opposite the flat sides of the flame having small interstitial perforations, through which air is drawn in against the flame, the ends opposite the edges of the flame being closed.

A gate hinge has been patented by Mr. David J. Olinger, of Anson, Tex. The upper hinge may be of any suitable construction permitting the gate to rise slightly on being operated, but the base hinge is made with a dish-like attachment to the post, the inclines of which on either side have to be traveled by a section attached to the gate as the latter is opened or shut, there being also notches on either side of the post attachment which hold the gate in position when fully opened.

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One 40 H. P., 4' x 13', $275.
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Three 150 H. P., Corliss, 2" tubes, each $500.
Three 125 H. P., 2" submerged tubes, each, $575.
One 100 H. P., 2" tubes, $550.
One 60 H. P., 2¼" tubes, $400.
One 25 H. P., 2¼" tubes, $300.

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Three 100 H. P., 4" tubes, $500, $550, and $600.
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