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THE GREAT BIRMINGHAM GAS HOLDERS.—[See page 146.]

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NEW YORK, SATURDAY, SEPTEMBER 4, 1886.

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THE WATER SUPPLY OF NEW YORK CITY.

In the SCIENTIFIC AMERICAN SUPPLEMENT of the present week (No. 557), we print an exhaustive review of the plans for the future water supply of this city, from the pen of Mr. R. D. A. Parrott. The Quaker Bridge dam project is discussed very fully on the basis of ascertained facts. The conclusions reached are anything but favorable to the city's prospects.

The Quaker Bridge dam valley seems, from the configuration of the land, quite unfit for the purpose of a reservoir. It has a very slight slope, only twelve feet to the mile. When the dam is overflowing, comparatively little harm may be anticipated from it. But, unfortunately, the records of the past ten years prove that overflowing will be an abnormal state of things, and will only occur during four months of the year. For the remaining eight months, the storage *plus* the flow into the reservoir will be drawn upon. This will occasion fluctuations in the level; and when it is remembered that twelve feet fall of water will expose a riparian area a mile in width of mud, the malaria-generating capacities will be obvious. It is quite within the possibilities that nearly three thousand acres of bottom may be exposed.

This injurious feature does not only affect the country inhabitants, the city is also threatened. Eventually, by its increase of 800 inhabitants a week, the region near the dam will be populated, and its evil influences may spread south and east over future thickly settled streets of the city. The recent injury to contiguous property, due to the lowering of the waters of Lake Mahopac, shows what harm exposed lake or pond bottoms may do.

For eight months, all the water of the shed will be impounded by the dam, and delivered to New York. All the filth of this area is to be drawn into a great pond, and without any purification by aeration is to be husbanded until delivered more or less diluted to the aqueduct. If sanitary science teaches anything, it does affirm that pond water is the worst of natural water supplies, and that a river by aeration due to its flow purifies itself. In the proposed reservoir, we have an exaggerated pond, in which no aeration is possible, and one that by its emanations threatens injury to those near it, and by its water may affect a whole city.

Pumping, as executed in this city by private individuals, represents a great deal of work, or its equivalent, money. But New Yorkers are proverbially patient, and now seem resigned to await the completion of the new dam to secure a flow of water in the upper floors of their buildings. But Mr. Parrott points out that the bottom of the Quaker Bridge dam is only seventy feet above tide water, and that little or no amelioration is to be expected from it. In the dry goods district, from one hundred to one hundred and fifty millions of dollars' worth of property are uninsured, as the risks will not be taken. When the Croton was originally introduced in 1842, rates fell 40 cents on the hundred dollars. Referring to this district alone, is it not public policy to spread the awful risk of a conflagration among insurance companies all over the world, rather than to center it upon a group of representative merchants, now unwillingly their own insurers?

It appears, then, that little amelioration in pressure is to be looked for, and that the supply will not much exceed 250,000,000 gallons a day. At the rate of 100 gallons per head per day, this supply will soon be grown up to. The policy of limiting the supply of water is directed against factories and health. Mr. Parrott advocates a possible supply of 400 million gallons a day at a head of 300 feet. Among the features to be disapproved of in the new structure, he includes the submerging of the Croton dam after its past and possible years of usefulness.

The indictment from chemical and engineering standpoints reads like a sound one, and if unaccompanied by any suggestion for a remedy, would be disheartening. But the feature of the paper lies in a very pregnant suggestion, the utilization of the Catskill Mountains as a watershed. The idea cannot be clearly explained without the map that is printed with the paper. A dam on Esopus Creek, within fifteen miles of the Hudson River, is the starting point. This is 500 feet above tide level, and includes 240 square miles of a mountainous watershed. A tunnel eight miles long will bring in 110 more square miles of watershed, through the Schohaire Creek; another three miles of tunnel will bring in 50 square miles of the Batavia Kill shed; and, finally, a third tunnel, eight miles long, would increase the total area to 530 square miles of the purest watershed this side of the Adirondacks. All this is little over a hundred miles from the city, is on the west side of the Hudson, and could be made tributary to the new aqueduct at comparatively small expense, in proportion to its features of good.

Mr. Parrott calculates that the water will be six degrees cooler than Croton. By the tunnels different sides of mountains will be utilized, so that local thunder storms will all contribute to the supply.

This is the general result of the conclusions derived from the paper we have considered. The subject of expense is taken full cognizance of, but should be the last thing thought of. The health and safety of New York, and the encouragement of its manufacturing interests, rise paramount to any possible expenditure.

SCORING OF GRINDSTONES.

The following item is a recent one, but it is not a new fact:

"An improvement in the driving of grindstones and emery wheels is that by which the wheel is given a reciprocating lateral motion in addition to its rotation. Every one has noticed the advantage of moving a tool from side to side on a grindstone, so as to equalize the attrition on the different parts of the edge. It has now been found that by making the grindstone move laterally, and keeping the tool still, a more perfect result is attained, while the detached particles of steel have an opportunity to drop off the grindstone instead of being crushed into it, and the wear of the stone and the heating of the tool are both greatly diminished."

In file-making establishments the lateral movement of the grindstone is a necessity, else the file blanks would speedily cut the stone into annular channels. In some machine shops, also, provision is made for the same movement. But if this sideways movement is absolutely reciprocal, the stone will be scored as surely as though there was no movement sideways, only the scores will be curved instead of straight. For instance, suppose the shaft of the grindstone has end play enough on its journals to allow of a lateral motion of one inch, and a cam is fixed on the shaft with that amount of throw, a stationary guide on which the cam works to be secured to the frame. It is evident that, when the stone has made one revolution, its periphery will be, in relation to a fixed line on the frame, in exactly the same place as when it started; and, in consequence, if a scoring point was held against the face of the stone, it would make a cut one inch sideways out of a direct line, but meeting, to make a continuous ring, precisely as though the stone had no sideway motion.

In order to prevent this continuous and uniform action, the lateral movement, in relation to the revolution of the stone, must be continually changing. For this purpose, the driving belt should be on a pulley on a short countershaft, on which is also a gear wheel that meshes with another on the shaft of the grindstone. This countershaft is to be attached by boxes to the grindstone frame. The gear on the grindstone shaft should be wide enough on the face to allow the lateral movement of the stone without unmeshing the teeth of the gears. The cam is fixed to the grindstone shaft, and may have its throw either as a raised strip or as a score, to be guided by a holder fixed to the frame; but if the gears have even numbers of teeth—numbers divisible by each other—the uniform scoring cannot be avoided. So, one gear should have an odd tooth—"a hunting tooth," as it is sometimes called—which will insure perpetual change. Thus, if the two gears had respectively 40 teeth and 80 teeth, there would be uniformity of throw; but with 39 teeth and 80 teeth, or with 41 teeth and 80 teeth, uniformity would be impossible. Half an inch is enough of lateral movement to the stone, and the relative sizes of gears are immaterial, so long as their disproportion in number of teeth is observed.

PHOTOGRAPHIC NOTES.

A Miniature Paper Camera.—We have several times alluded to the fact that it was possible to obtain fair negatives by arranging a sensitive dry plate in one end of a suitable box, while in the center of the opposite end was a fine needle hole through a thin piece of metal attached to the outer surface of the box. Practically this idea has just been carried out in a small camera recently put upon the market, which, for its compactness, simplicity, and novelty, will be likely to lead a great many, young and old, into taking up photography as a pastime.

The camera bellows is nothing more than a heavy brown-black paper box made in two folds, the whole when fully extended measuring about three inches. The front portion of the paper bellows is pasted over the edges of a rigid sheet of straw board, cut to the size of the sensitive plate, thereby forming the camera front, and in the center of this is an aperture about a quarter of an inch diameter, covered by a film of ruby and green colored isinglass, pasted on the inner face of the front. A minute needle hole is punctured through the center of the thin isinglass which forms the lens. The aperture is closed on the outside by a gummed paper flap. Cemented to another straw board, forming the back of the camera, is the sensitive dry plate. The back portion of the paper bellows is then pasted over the back of the camera the same as the front. We then have a light-tight paper box, the front provided with a pin hole and the back with a sensitive plate.

When the folds of the paper bellows are pressed inward, making the front and back come together, the thickness of the package does not exceed half an inch, and measures 3¼ by 4¼. An angle of 100° is included in the picture, and the focus is 3 inches. It will be seen that its compactness makes it very handy to carry. Several cameras can thus be readily taken in one's pocket, since they occupy scarcely any more space than the sensitive dry plate itself.

In making an exposure, the bellows is extended, and the miniature box is set upon a post, chair, or any convenient support, the front being turned toward the object to be taken. The small wafer of paper covering the aperture is turned down and an exposure of from one to two minutes is given, according to the light. Upon its completion, the wafer cap is turned back over the aperture, and the box compressed into its original compact form. The plate may be thus packed away for future development. If it is to be developed at once, the box is removed to the dark room, and the back end carrying the sensitive plate is cut off with a knife. The plate is next easily separated from its paper backing and can be developed in the usual manner with potash and pyro.

The peculiar advantages are that with each plate is furnished its own camera, so that both are always ready for immediate use. No focusing or adjusting is required.

It is expected that the novice will take the plate after exposure to a professional photographer for development and the finishing up of prints. The low price at which the camera is sold complete, ready for use, puts it within the reach of everybody, and we expect it will be the means of educating many who will eventually take up the practice of the art with more expensive apparatus.

Reproduction of Drawings direct with Black Lines on a White Background.—M. Poitevin is said to have been the first to give the details of a practical process for the reproduction directly, without the intervention of a negative, of drawings, maps, positives, etc. Pellet next devised the process of making blue lines in a white ground. A French officer, Lieut.-Col. De Saint-Florent, has lately published in the *Bulletin de la Societe*, which we find translated in the *Photo. News*, an account of some improvements he has made in these processes, accompanied by several useful details.

The first method he speaks of is what is called the powder process, where the positive is reproduced by the use of inert powders.

The paper employed is sensitized on a bath of bichromate of potash.

If albumenized paper is used, it must be laid back down upon a saturated solution of bichromate of potash. If plain paper is employed, it should first be coated with a weak solution of gelatine and water, and when dry sensitized face downward upon a solution of 48 grains of bichromate to one ounce of water.

If the sheet is large, the solution may be applied with a badger brush.

The paper is next dried in the shade, and exposed in a printing frame behind the picture or drawing to be copied. The drawing should be specially prepared with Indian ink having mixed with it a little chrome yellow. The back of the sensitized albumen sheet is now placed in contact with the face of the drawing, and an exposure made to the sun in the usual way. For ordinary tracing linen or thin drawing paper, from three to six minutes will suffice; for an architectural design on thick paper, from twenty to twenty-five minutes.

In case engravings on thick paper are to be copied, the printed side should be laid in contact with the front or glossy side of the sensitized sheet, and an exposure of from ten to fifteen minutes given. It is well to use a special photometer, to determine accurately the right exposures. When taken from the frame, the print should be washed a few moments in ordinary water containing a few drops of ammonia, then dried in the air. If albumen paper is employed, its surface will present a curious condition. The under side of the albumen fiber, in contact with the paper, will be found to be slightly coagulated by the bichromate of potash where the light acted upon it. The reduction by light of the chromic salt has rendered the portions of the surface not protected by the lines of the drawing impervious to water.

In case the exposure has been too short, or ammoniacal albumen used in the preparation of the paper, or if too much water has been added to the ammonia bath, the albumen surface will not be totally impervious to water. It is necessary that these precautions be carefully observed.

The portions protected by the black lines will, even if the albumen is slightly coagulated by the bichromate, be quite permeable to water. In the water bath the albumen thus protected will swell up quite perceptibly.

The print is now dried between blotting pads, when it will be observed that the whites alone, that is, the parts corresponding to the blacks to be reproduced, will possess an adhesive property, and retain the black or any other inert color that may be applied, whether by means of a dabber of cotton or a pointed pencil of cuttlefish bone. The surface is then cleared with a new dabber till the print is as free as possible from the black

The sheet is next immersed briefly in a ten per cent solution of sulphuric acid and water, which transforms the chromic oxide into soluble sulphate, and, at the same time, coagulates the albumen of the black parts. After further washing in three or four changes of water, the ground becomes almost white.

One difficulty to be noted about this process is that it is very hard to obtain absolutely pure whites—the ground is likely to be more or less slightly tinted. On the other hand, the prints are very clear, the lines standing out bold and plain. The process is also very simple and quick, and is valuable in case one has but little time to spare.

The glaze of the albumen may be destroyed by placing the print for ten or fifteen minutes in a solution of caustic soda, followed by careful washing. If the exposure is too short, negatives will be obtained instead of positives.

Direct positives of landscapes strongly illuminated by the sun may be obtained in the camera with exposures varying from thirty to forty-five minutes.

The Freight Brake Tests at Burlington, Iowa.

The tests of freight train brakes, undertaken by the special committee on that subject of the Master Car Builders' Association, began at Burlington, Ia., July 13. They continued through three weeks, and are now completed. Of the five companies which brought their trains to engage in the contest, viz., the American, Eames, Rote, Westinghouse, and Widdifield & Button, the Rote has practically not entered into the contest at all. Preliminary trials on the ground convinced the managers of this company that changes would have to be made in the apparatus before it could accomplish what they had expected of it.

The Widdifield & Button representatives entered into the trial with 25-car trains, but the records made by them on the first 50-car train test in which they took part were not encouraging, and they undertook no others. This brake, like the others of the buffer class, as stated below, failed to hold evenly on the wheels during stops, and showed a lack of power on the grade.

The American Brake Company pluckily took its turns on the programme with 25 and 50-car trains, but every run, especially with long trains, showed that there were imperfections to be overcome before the brake would be satisfactorily adapted to all conditions of railway freight traffic. It must be added that these imperfections seemed to be common to all the independent brakes. With trains of 25 cars, and still more with those of 50 cars, the effort to hold the trains to a moderate speed on a down grade was a practical failure. In a run of this kind with the American brake, in an attempt to hold the train to a speed of 15 miles per hour, down the 55 ft. grade, there was a constant succession of shocks and lurches, much too severe for stock trains.

The buffer brakes clearly failed to exert sufficient braking power on the down grade. The indications are that the retarding force exerted by the locomotive with its driver and tender brakes was very considerable on level track, and that the comparative absence of this help on the grade greatly increased the distance of the stop. If our railways had no grades, or only slight ones, the task of producing a satisfactory buffer brake would be a much easier one than it now is. The American brake certainly made a very good showing in the first three stops of several of the service tests, in spite of the intermittent action of the brakes above referred to, and it is not impossible that the well-known ingenuity of its mechanical superintendent may make it successful.

It appears that the irrepressible "coupler question" is an important element in the brake problem. There seems to be no doubt that the shocks of which we have spoken are largely caused by the cumulative effect of the slack, as the cars are bunched during a stop. In the case of buffer brake systems, when the cars come up against each other as the brakes take effect from the front of the train toward the rear, the result is the releasing of the brakes on the forward portion of the train, which then forges ahead until another compression of the draw-bars again sets them. This alternate slacking and starting forward would sometimes occur a number of times in a single stop, giving a continuous succession of shocks. With continuous brakes there was usually but one bunching of cars, and consequently one shock, though sometimes there would be a second one, far more severe than the first. Tests made with trains so coupled as to reduce the slack to a minimum showed a large decrease of shocks, thus scoring a point for the hook couplers. It is not impossible that much of the imperfection in the working of the buffer brakes may disappear if slack can be eliminated from long and heavy freight trains. The extent to which draw-bars can be compressed also appears to be an item of some importance. There were indications that the trains whose draw-bars were capable of only slight compression did not show as severe shocks as did those which permitted more variation in the space between the cars.

The Westinghouse air brake and the Eames vacuum brake were the only continuous brake systems entered for the tests.

The Westinghouse surpassed all the other competitors in the completeness of the preparations, the perfection of its equipment, and the familiarity of its representatives with their duties. Those upon whom devolved the handling of the brakes had an invaluable practice in all that was required to bring out the full efficiency of the system in all the tests. While it is believed that no train of 50 cars, each loaded with 20 tons, had ever before been handled with this brake, it is in extended use on the freight equipment of many roads, and long and heavy trains are being handled with it every day down the grades of the great mountain and Pacific coast lines. Its representatives, when they began the tests, knew fairly well from actual experience what the system could be depended on to accomplish.

The Eames vacuum brake entered the contest handicapped in more than one respect. It had never been operated on a train of even 25 cars in regular service. Those who handled it had had but slight opportunity to learn those niceties of management by which the difference between a good stop and a bad one is caused. The cars which this company brought to the trials were in some respects inferior to those of the other competitors, especially as regards the draw-bar rigging.

Doubt as to the possibility of controlling loaded trains of 50 cars with continuous brakes need no longer exist. When, on the morning of July 24, the Westinghouse train of 50 cars, each with a 20 ton load, thundered along the course, and swept down the 55 ft. grade, making each stop smoothly, in short distances and practically without shock, the fact that such trains can be handled by continuous brakes in all the exigencies of service was shown for the first time, but it was shown conclusively. The same fact was demonstrated by the Eames vacuum train, which in similar circumstances made in these runs records which fully satisfy all those who are identified with it or interested in its success.

Yet it should be said that it is very doubtful whether the brakes on the rear third of a 50-car train, in either of the two systems, exert much effective retarding force. Although the gauges on the last car always indicated nearly as much air or vacuum pressure as those at the front end, and showed that the brakes were on in from 10 to 14 seconds, other facts lead to the belief that the stops were made before the rear brakes were effectively applied. It was certainly shown that 50-car trains could be well handled if the brakes were cut out of the last 20 cars.

The general facts established by the tests, as regards the systems taking part in them, may be summarized as follows:

1. Continuous brakes, operated by air, can be applied to and released from the wheels of trains of 50 cars with all the promptness required in the service.

2. Brakes operated by compression of the draw-bar may be used with a good degree of success upon trains not exceeding 25 cars, if handled intelligently. To be used on long trains, some device must be contrived by which the brakes will be steadily held to the wheels during the whole stop.

3. In running down grades, the buffer brakes do not show retarding power relatively proportioned to that which they exhibit on level track, or to that shown by the continuous brakes on down grades.

4. The comparatively gradual putting on of the full power of continuous brakes in what are called "service" stops is sufficient to meet all or nearly all the exigencies of service. The records show that these stops, or, at least, many of them, are made in just about the same distance as the corresponding "emergency" stops, while the injurious shocks which accompany the latter are avoided if the brakes are applied with a fair degree of skill.

5. The proper handling of long freight trains with either continuous or buffer brakes requires a coupling device which shall largely decrease the amount of slack caused by the use of the ordinary link and pin. This proposition is, perhaps, not absolutely established by the tests, but its truth is certainly indicated.—*Railway Master Mechanic.*

Mrs. Cleveland, in the Adirondacks, Starts the Machinery of the Minneapolis Exhibition.

The opening of the industrial exhibition at Minneapolis, Minn., Aug. 23, was made somewhat memorable by the fact that the machinery was set in motion by the President's wife from Upper Saranac Lake, in the Adirondacks. All the other arrangements for the purpose having been previously made, direct telegraphic communication was established between the exhibition building and the Minneapolis office of the Western Union Company, thence through Chicago, Cleveland, and New York city, with the country stopping place of the President's party, when, upon a given signal that the circuit was open the whole distance, Mrs. Cleveland pressed a button which set the wheels turning in the exhibition, over a thousand miles distant. The opening of the exhibition was a great success, the ceremonies being participated in by enthusiastic crowds.

BIRMINGHAM CORPORATION GAS HOLDERS.

These gas holders, the largest in the world, are made in three sections. The three sections telescope into each other, the lower one being the largest.

The upper section is 230 ft. in diameter. Its sides are 50 ft. high. The crown that covers it in rises 20 ft. in the center, giving a total height of 70 ft. for the section. The main part of its plates are of No. 9 iron, with 1⅛ in. laps, secured by five-sixteenth inch rivets. The crown is untrussed.

The stiffness of the crown of the Birmingham holders is secured, apart from the inherent strength of the ordinary plates as pressed upward by the gas, by the use of a sort of half box girder running around the upper curb. It is composed of two principal members. Around the upper sides of the section, and taking the place of the regular side sheets, a row of vertical steel plates, 14 in. wide, ⅝ in. thick, each about 27 ft. 9 in. long, are carried and secured to each other by butt joints, strapped and double riveted, the straps coming inside the holder. This constitutes one member. The first row of crown sheets are of similar steel, 3 ft. wide, and also butted and strapped, forming the second or horizontal member. A special obtuse angle iron, 6″ × 6″ × ¾″, is carried around the curb, and these two sets of plates are riveted to it, one set on top and one on the side. Then within the holder fifty-two bracket plates, of ⅛ in. iron, are riveted within the angle. This, it will be seen, represents a circle of a half box girder, 14″ × 36″ × ⅝″, with re-enforcing brackets.

All the butt joints here and throughout the holder are planed so as to fit accurately. The top sheets are arranged in circles with radial joints. The side plates are of No. 10 iron, except the lower two courses, which are ¼ in. in thickness. The arrangements adopted for the roller frames are of much interest.

In the drawing, one of the roller frames is shown in position, secured to the upper curb. It rests on the row of steel plates already described as constituting the horizontal member of the box girder. The double riveting of the butt joint, and the double line of riveting attaching the plates to the angle iron, are also shown. The general construction and bracing needs little description. Three rollers are carried by each frame. One is the radial roller in use in England and America universally. The other two are the French tangential rollers. For guide rail, an H-beam or joist iron is used. The tangential rollers work on the flat surfaces; the radial roller works in one of the channels.

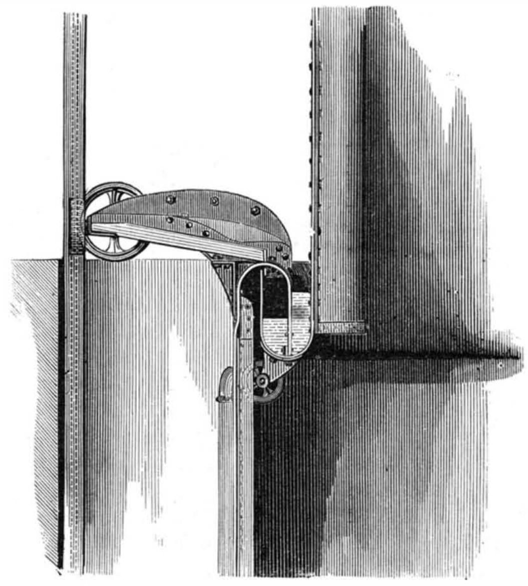
Screws are provided for adjusting the rollers accurately to their work. The radial roller is 2 ft. in diameter; the others, 18 in. There are twenty-six such carriages, or roller frames, on the top curb of each holder.

It is calculated that by this combination of rollers the pressure due to wind from any given direction is supported by and divided among three-quarters of the guide rails and columns—a very superior distribution of strength. At the bottom of the section a cup is formed by bending a seven-sixteenth inch sheet into a U-shape. This is known as Piggot's form, being due to Mr. George Piggot, who introduced it in 1862.

An illustration of the cup of the upper section is given, showing the bottom rollers within the section. The cups are 12 in. wide by 18 in. deep. In this cut is also shown the top of the next or intermediate section as it enters the cup. The bottom rollers of the upper section work in a channel bar secured to the inside of the next lower section, and outside of this section a plate of iron bent into semicircular form is secured that extends up and down the entire height. Each of the sections has fifty-two such "booms" or stiffeners. The ends of two of them are shown in the cut. Those for the upper section are within it; for the other sections they are on the outside. As bent, they are 11 in. wide by 13 deep for the upper section, and 18 in. wide by 4 in. and by 5 in. deep for the intermediate and lower sections respectively. The vertical booms of the two lower sections are re-enforced on the interior of the holder by channel bars, which are riveted by means of angle irons to the interior side walls, and within their grooves the bottom guide rollers travel. The vertical booms of the upper section coming within the interior have no such re-enforcement.

Smaller carriages or roller frames with radial and tangential rollers are attached to the upper curb of each section. Thus there is a total of seventy-eight carriages in each holder. For upper and lower sheets ¼ inch plates were used on both lower and intermediate sections. The rest of the sheets are No. 10 gauge. The bottom curb is an incomplete or three-sided box girder, with two 9 inch horizontal plates connected by a 24 inch channel bar, all nine-sixteenths inch in thickness. The bottom guide rollers work within this space. All the rollers turn on steel pins.

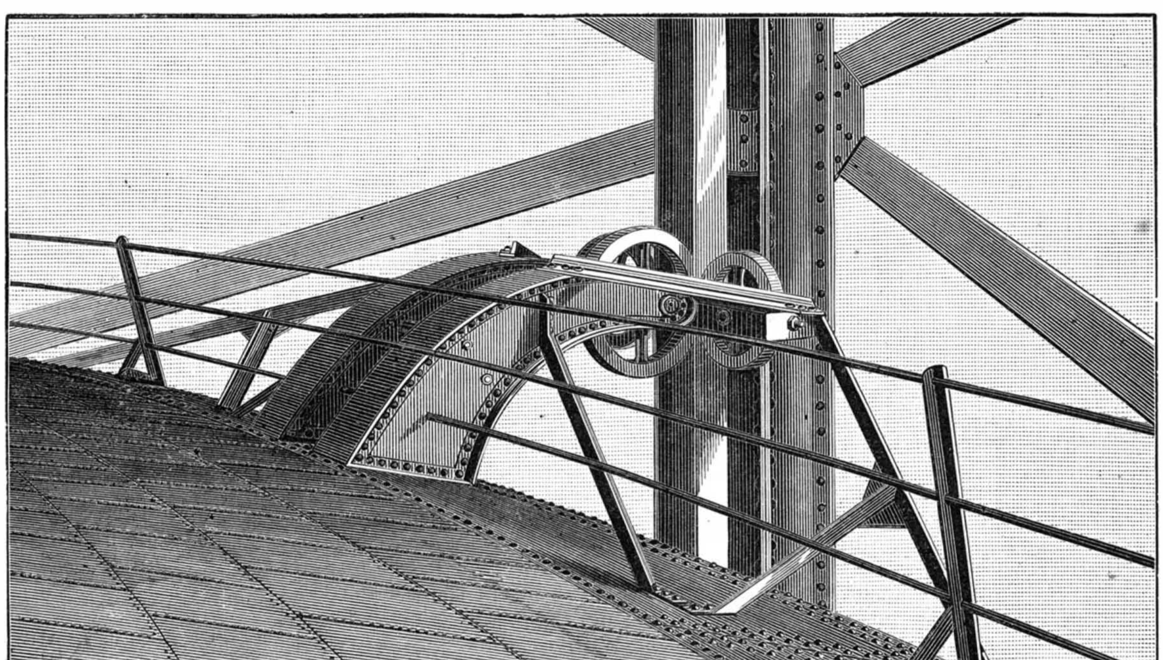
The frame is next to be spoken of. In this we recognize an integral structure, not a mere collection of columns held together by girders from top to top.



ROLLER FRAME AND GUIDE RAIL.

Each frame consists of twenty-six upright members. Each member is composed of three hollow beams, each made up of four flanged segments, that form, when united, a hollow cylinder. They are spaced at the base five feet apart from center to center, and come together at the top. The inner beam is vertical, and carries the H-beam against which the rollers work. The two outer beams slope inward and meet it at the top. This series of three beams, each 12 inches in diameter, is braced and tied by cast iron struts and cross bracing. Each set constitutes a vertical member of the frame.

These series or members are connected by 8 in. × 5 in. H-beams, placed horizontally and crossing each other. A system of cross latticework is carried from top to bottom around the outside of the frame. The bars composing it at the bottom courses are 9 in. by ⅝ in., diminishing to half that width at the top. A six by five inch H-beam is fastened in an accurately perpendicular position to the front column of each group, to act as guide rail for the rollers, as already described.



TELESCOPING CUP BETWEEN UPPER AND INTERMEDIATE SECTIONS.

As the two holders are close together, the frames are connected with each other, for mutual re-enforcement. There are no wind ties at the top of the frame. A protective hand rail runs around the curb of the upper section.

Each of the Birmingham holders is 236 feet in diameter and 150 feet high, with a capacity of 6,500,000 cubic feet. The height to the center of the crown is 177 feet. The inlet pipe is 36 inches in diameter.

The pressure produced by these gigantic structures is 8·3 inches. As iron is of about seven times the specific gravity of water, if all the iron in one holder, exclusive of the frame, were melted into a disk of the diameter of the outer section, it would be about one inch in thickness (more exactly 1·15 inch), and would weigh about 1,000 tons. Including the guide frames, 3,250 tons of iron were used in both the structures. Each one holds about one hundred tons of gas, that exerts about the same lifting power, in virtue of its buoyancy.

Comparing one of these holders with the Great Eastern, it will be found to have about double the capacity of the including parallelopipedon of the great vessel. The holding capacity, if calculated in cubic feet of water, is about four times the displacement of the vessel, or 100,000 tons. Including a water surface 236 feet in diameter, and a clear height of over 150 feet, it will be seen that a large vessel could be comfortably docked within it.

Influence of Light on Colors.

Dr. John Percy says:

"I have drawings made by myself about fifty-seven years ago, in which the gray was made of indigo and Indian red. They have been kept in the dark ever since, and, so far as I can observe, no change has taken place. On the other hand, I have seen hundreds of drawings in which the grays used were the same, but from which the indigo has wholly disappeared in consequence of long continued exposure to solar light. It would not be difficult to make a large exhibition of faded drawings of such men, for example, as Francis Nicholson, Copley Fielding, and De Wint. This subject of the durability of pigments with reference to water color drawing has engaged my special attention for more than twenty years, and some day, perhaps, I may communicate the results even at the risk of exciting the ire of some persons. Certain colors resist light, and others do not. My collection contains about 1,600 drawings, almost wholly of the early English school, and the work of about 700 different artists, so that I can speak with some experience on the subject. Facts as to the durability or non-durability of water color drawings are abundant and amply sufficient to settle the question. But in order to explain the chemical changes induced by light, long and very accurate investigation will be required by men thoroughly competent for the work.

"I will mention one curious circumstance, not so generally known, I think, as it deserves. It is imagined by some persons that in a hard, solid, compact substance, such as glass, chemical change under ordinary atmospheric conditions cannot occur. Now, you have probably noticed, many years ago, the pink color of many windows in London. That color was actually developed by the action of light upon the glass. Faraday, if I mistake not, first pointed out that where the glass had been protected from light by putty, it remained colorless as at first. Oxide of manganese is used in the manufacture of window and some other kinds of glass to counteract the color which would be produced by the ferrous oxide, which is always accidentally present in small proportion in the materials from which the glass is made.

"Is it not strange that the pink color should result from the action of the light on the manganese compound in the glass? The manganese passes in consequence to a higher degree of oxidation, in which state it is pink or purple. If you take, as I have done, a piece of the window glass colored pink, and heat it gently, it loses its color and becomes quite colorless, as it was at first. Thus we see that even in such a substance as glass, chemical intermolecular movement may occur. If this be so, then we may expect a similar result in resins, of which varnishes are made."

HOW TO TIN CLOTH.—A mixture of finely pulverized metallic zinc and albumen, of about the consistency of a thin paste, is spread with a brush upon linen or cotton cloth, and by means of hot steam coagulated. The cloth is now immersed in a bath of stannic chloride, well washed, and dried. Running the cloth through a roller press, the tin film is said to take metallic luster. Designs cut in stout paper, letters, numbers, etc., when laid between cloth and roller, are impressed upon it. It can also be cut in strips, corners, etc.

How Bohemian Glass is Colored.

The ornamentation of the glass is done partly in connection with the exposure in the furnace and partly in the finishing shops, where the work is completed by cutting, polishing, tarnishing, etching, painting, and mounting in metal. The glasshouses have at their command a very complete color scale for transparent, opaque, and clouded glasses. But it must not be supposed that a crucible is placed in the furnace for each color, from which glass colored for each ornament is to be made. The colors are worked out by means of what are called pastes, which are kept on hand in sticks or cakes. From pieces of these pastes, previously warmed till they are soft, suitable quantities are cut off, laid upon the foundation of white or colored glass, and then spread out by drawing or blowing. By this means only is an economical use of such costly materials as gold and silver compositions possible. Some of the glasses thus treated—gold, copper, and silver glasses—remain still little, or not at all, colored after the melting, shaping, and quick cooling, and do not take on their bright hues until they are reheated. This is the case with the new yellow silver glass, which continues uncolored after the intermelting of the silver salt until it is exposed in the furnace again. Very fine effects are produced by blending or overrunning of paste colors, provided proper attention is given to the laws of harmony. A blue glass cup is, for example, overlaid with silver glass at its upper edge, and this is drawn down in gradually thinner tones till it fades away at the foot of the vase. Gold and copper ruby colors are thus combined with green glasses, etc. Another brilliant effect is produced when a still hot bulb of glass is rolled in finely pulverized aventurine glass, and after this is melted, and previous to the shaping of the vessel, is overlaid with a coating of either colored or colorless glass.—*Popular Science Monthly.*

Wanted, a Gas Meter.

The following inquiry has been addressed to the editor of this paper, which question we refer to our mechanical and inventive readers for an answer:

"Can any of your mechanical correspondents refer us to a self-acting meter for the registry of gas, as manufactured?

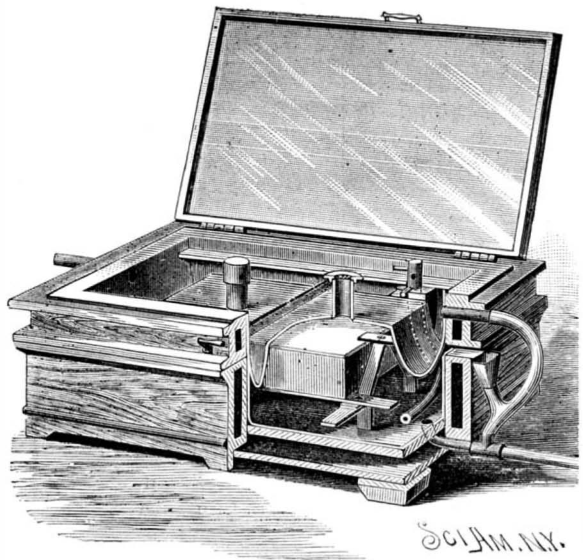
"They are needed to be used in connection with exhaust fans, and the gas will have a temperature of between 400° and 500°. They should be able to run at least 30 days, and 90 days would be preferable.

"The gas, an oxyhydrocarbon one, available at will for heating, power, and illuminating purposes, will be largely used in manufactories and other works, and it is for the determination of the gross amount of royalty to be paid that they are required."

The difficulty involved in supplying this want lies in the high temperature of the gas. Ordinary gas meters, if of the wet type, would be quite unavailable, on account of the presence of water and consequent generation of steam. Dry meters would have their diaphragms dried, their oiling destroyed, and their flexibility interfered with. A positive-acting meter, such as used for water, would, if of sufficient capacity, and if the lubrication was not interfered with by the heat, be very expensive. Something of the anemometer type seems to be indicated, as the doctors say. We leave the problem to our readers.

A MILK COOLER THAT EXCLUDES THE AIR.

The illustration herewith shows a cooler designed to facilitate the changing of the milk and the raising of the cream without uncovering the pans to the outside air and dust. The lower part, or pan box, of the cooler



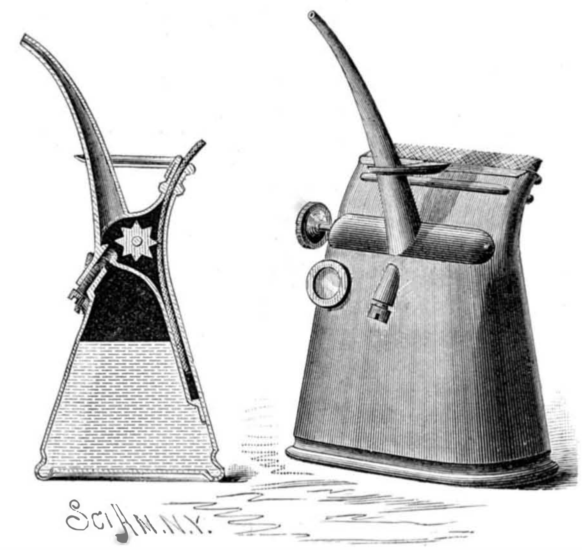
BRAMKAMP'S MILK COOLER.

is made with double bottom and side walls, providing air spaces, as will be readily understood from the engraving, where one corner of the cooler is shown with parts broken away. The cream pans, which are shallow, are supported with their tops about level with the top of the box, upon a metal framework, attached to the bottom and sides of a sheet metal lining. The box has an overflow pipe and a lower outlet pipe, through which the water used in cooling the milk may escape. The cover of the box has an interior water tight sheet metal lining, the central portion of which is raised, forming a pendent trough-shaped part, which enters the box around the milk or cream pans, and water-seals the pans against the entrance of air when the cooler is in use. In the lining, over each of the pans, is fitted a tube, through which the milk may be passed or strained into the pans. The water supply pipe is fitted at one end of the cover, and the overflow and discharge pipes at the opposite end. The water circulation may be regulated as desired, and the pans may be filled without lifting the cover.

This invention has been patented by Mr. John H. Bramkamp, of No. 825 Holiday Street, Denver, Col.

AN OIL CAN WITH WICK TUBE BESIDES A NOZZLE.

The accompanying figures represent an oil can hav-



MOAT'S OILER.

ing a body of oblong form, provided with spring sides, and terminating in a wick tube for receiving a broad wick for applying oil to the surface of saws, for the purpose of lubrication, and for oiling metallic surfaces to prevent rust. This oiler has also a nozzle or spout, with a regulating valve for controlling the amount of oil escaping through the nozzle or the wick. By the side of the wick tube is formed a chamber containing spur wheels placed on a spindle, extending longitudinally through the chamber and through the end of the can, the spur wheels engaging the wick, so that by turning the spindle the wick may be raised or lowered.

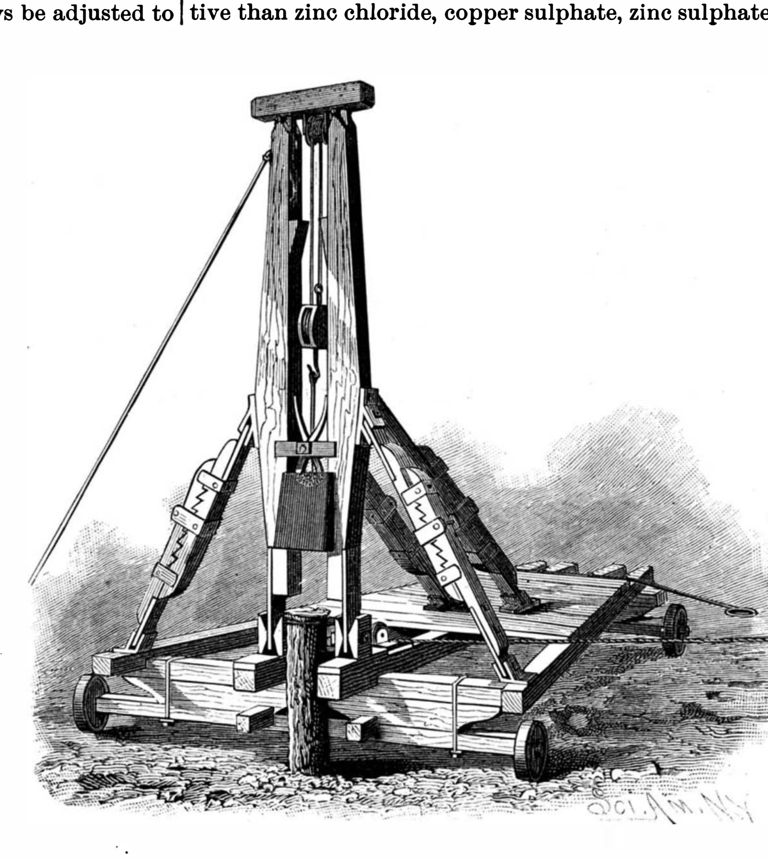
This invention has been patented by Mr. Elijah Moat, corner of Third and Flower Streets, Los Angeles, Cal.

A TRAVELING POST AND PILE DRIVER.

In this construction the derrick is so mounted upon the vehicle platform that it may always be adjusted to a perpendicular position, irrespective of the contour of the ground on which the vehicle stands, while the arrangement is such that the derrick may be folded down to rest in a horizontal position, and a tongue or bolt connected to either axle of the vehicle.

The rear axle of the vehicle is much longer than the forward axle, both axles having pole couplings, and both being connected to the platform framework by king bolts. The derrick proper consists of two timbers, to the lower ends of which are secured stout iron legs, which rest in sleeves secured to the upper faces of the rearwardly extending ends of the central timbers, in such way that the derrick timbers may be tilted, upon their connection with the vehicle platform, either to one side or the other, or folded backward, while they may be supported by braces in a vertical position. The braces are each formed in two sections, each section carrying blocks arranged so that their teeth will interlock, and there is a binding pin which holds the teeth in engagement, but which may be withdrawn in order that the length of the brace may be adjusted to suit the requirements of any particular case. Between the guide timbers is the weight to be used as a hammer, with the ordinary form of hoisting and tripping mechanism. A long pole is so connected, near the top, to one of the vertical timbers that it may be carried to the side, front, or rear of the derrick, to aid the operator in moving it, irrespective of his position.

This machine has been patented by Mr. Adam Towberman, of Sutherland, Iowa.



TOWBERMAN'S POST AND PILE DRIVER.

Thunder Storms.

From certain meteorological statistics recently published in Germany, we learn that thunder storms in that country have, during the last thirty years, been steadily increasing both in frequency and severity. The number of deaths per annum from lightning has increased in a far greater ratio than that of the increase of population. In the present state of our knowledge of the whole subject of atmospheric electricity, the cause of the phenomena of thunder storms is confessedly obscure. It is, however, very possible that some light would be thrown upon the question by a comparative study of the frequency and severity of storms during a lengthened period and over a wide geographical area.

The German *savants* incline to the opinion that the increase is to be attributed to the enormously increased production of smoke and steam which has taken place during the last three decades. But although we may admit this to be to some extent a probable *vera causa*, yet, when we consider the very local character of thunder storms, we should naturally expect to find that it would follow that the neighborhoods of large cities, and especially of manufacturing districts, would suffer the most severely. But the statistics referred to show distinctly that the very reverse is the case. The number of storms attended by fatal results from lightning is far larger in the agricultural districts than in the towns. Upon the other hand, we ought to take into consideration the protective action of lightning conductors, with which the prominent buildings in the towns of Germany are well provided.

Artesian Wells in Denver.

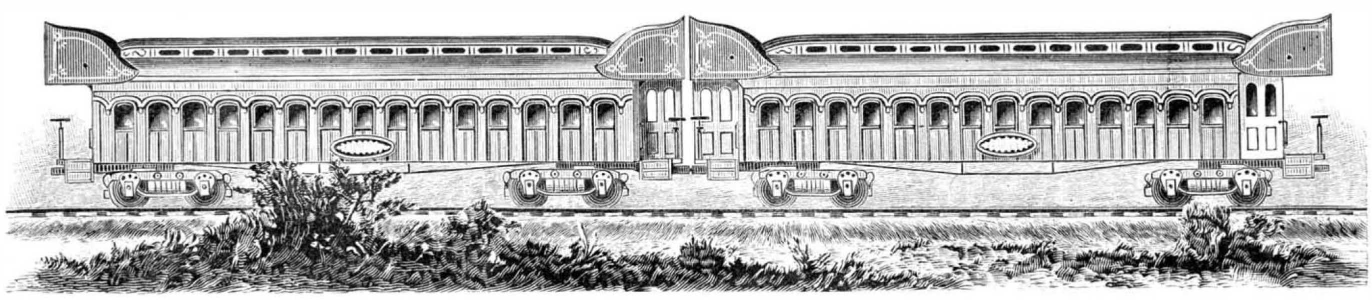
In 1883 the president of the Denver Water Company, one of the owners of landed estate in North Denver, on the highlands, just across Platte River, immediately opposite the business section of the city, conceiving his land to be underlaid at considerable depth with valuable coals, began boring them. At a depth of about 300 feet a stream of water was suddenly projected, with great force, from the bottom to a height thirty or forty feet above the surface, completely drenching his men and compelling a suspension of work. At first it was thought to be but temporary; but as it continued day after day without any perceptible decrease of force or volume, and as the theory of its projection from true artesian sources, so to speak, became more and more apparent, Mr. Zang, owner of a large brewery near by, concluded to test the matter for himself. In due time, apparently, the same deposit was encountered at a depth of 300 feet, and then followed a succession of like enterprises, all of which were successful. Many wells are now in operation, varying in depth from 250 to something over 700 feet, the deepest being that sunk by the county of Arapahoe, near its splendid court house, which is 910 feet deep, the whole producing about 3,000,000 gallons per day of 24 hours. The water is very pure and fine.

Stannous Chloride as a Disinfectant.

This is recommended by Dr. Abbot as being more active than zinc chloride, copper sulphate, zinc sulphate, or ferric sulphate, spores being killed after exposure to one per cent solution for two hours. It is cheap, tolerably safe, and will not corrode lead pipes. It is advised, when required to be kept, and to prevent formation of insoluble oxychloride, to mix it with an equal quantity of ammonium chloride.

AUTOMATIC GUARD AND PLATFORM DOORS FOR RAILWAY CARS.

The accompanying illustration shows a construction designed to prevent smoke, dust, cinders, etc., from passing down between cars in motion, and also to protect the steps and platform from rain and snow. Each guard is a little wider than the top of the car, the body portion of the guard being formed with an upwardly curved or flaring forward end, while the rear end is cut out and adapted to fit closely around the rounded top of the car, so that the wind cannot get under and



GILLHAM'S GUARD FOR RAILWAY CARS, TO KEEP SMOKE, DUST, ETC., FROM ENTERING THE DOORS.

raise the end. The guard also has downwardly projecting side flanges, with a slight curve upward at the meeting ends, to give the air an upward direction. There are doors, intended to be either sliding or flexible, to cover in and protect the spaces between the cars, to which may be attached fenders that will completely cover the car steps, these devices not only keeping out snow, wind, etc., but serving to prevent accidents from passengers falling off the platforms.

The guard is mounted in its operative position on the end of the car by a transverse rod, or by bolts which pass through the side flanges, making a pivotal bearing in which the inner ends of the guards toward the center of the coach will just overbalance the outer ends. When the train is in motion, the air passing under the raised forward end of the guard on the forward end of each coach will raise the rear end of the guard, and allow the free passage of smoke, dust, etc., through the space between the body of the guard and the top of the car, the pressure of the air at the same time forcing the inner end of the guard at the rear end of each car down tightly against the car roof, causing the smoke, dust, etc., to pass up over the guard.

This invention has been patented by Mr. R. J. Gillham, of Orlando, Orange County, Fla.

The Impossible.

Prominent among the many quaint devices and curiosities in which the writer's native city abounds were two large stone ornaments, serving as guards to seats of honor in one of the public buildings. One of these posts showed a picture of a party going out to a day's sport in a boat with flying pennants and all outward signs of merriment, while on the companion pillar appeared the same boat turned toward home, and the people on board looked dejected and sad. The representation bore the significant inscription: *To please everybody is impossible.*

Since then we have often recalled those marks, and have wondered how deep-rooted must have been the conviction which thus caused an attestation to be put up in lasting granite for the benefit of passers-by.

Indeed, it is impossible to please everybody, should you try ever so hard.

The truth of it is felt by the newspaper man, and especially by him of a trade paper.

If you make your paper large and of many pages, people assert that you are greedy and presumptuous; while if you cut down its size, they say that you have met with reverses, and will be compelled to close up soon.

If you print your journal in large type, the people say that you are at your wits' end, and don't know where to get reading matter while if you use small type, they say that there is so much in the paper, that they do not know whether to begin reading or not.

If you publish a great many suggestions and hints, you are called tedious; and if you look to chronicling affairs and happenings of the day, you are trifling and flippant.

If you give selections, your subscribers will complain that they are treated to second hand stuff; and should you confine yourself to original articles, they will be sure to say that there is the spice of variety lacking in your journal.

If you speak of anybody or anything, people will declare that you have been bribed to do it; and if you never give a complimentary notice, you will be voted a mulish, good-for-nothing blockhead.

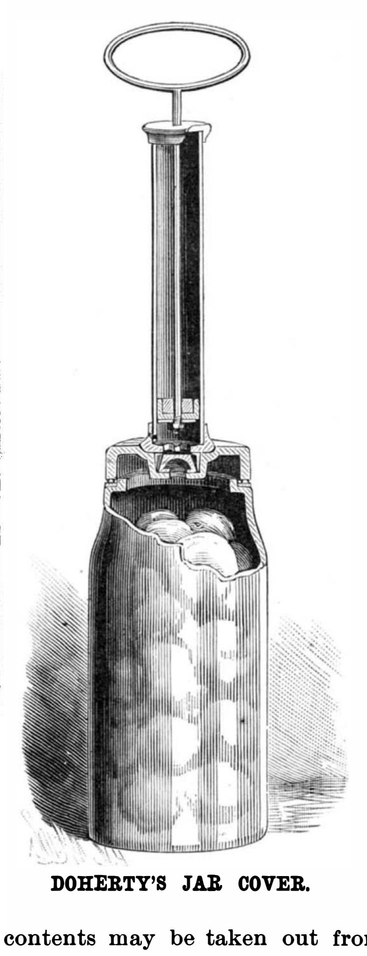
If you add to your paper, critics declare that you are playing at a game of bluffing; and if you keep going your easy way, you are denounced as stingy and uncommercial.

If you stick to your duties, people call you haughty and proud; and if you mingle with the crowd, the verdict will be that you do not attend to business properly.

In view of all this, *To please everybody is impossible.—American Lithographer.*

A FRUIT JAR COVER FITTED WITH AIR PUMP.

As the exclusion of air is a most important element in the preservation of canned goods, all methods of canning provide some means of attaining this object with more or less completeness. The illustration herewith shows a simple method of reaching the desired end, by making the jar cover in the form of a cap, to be held firmly in its position by the pressure of air on the outside, fourteen pounds to the square inch, the air within the jar having been previously exhausted by the air pump, shown in place for such sealing on a jar, partly broken away at the top, giving construction of cover. The outer rim of the cover fits upon a packing ring of the jar, no screwing on of the cover being necessary. The operation of the air pump will be readily understood from the illustration, a rubber cushion carried by it fitting in a recessed portion of the top of the cover. It is obvious that in this way a can may be very tightly sealed, and the cover is so made that the can may be opened as easily as the spring cover of a watch. It can also, with the air pump, be quickly sealed as effectually as at first, so that part of the contents may be taken out from time to time as desired.

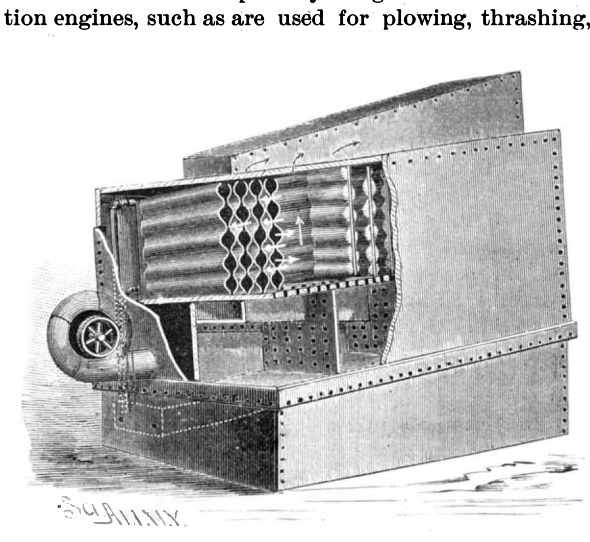


DOHERTY'S JAR COVER.

This invention has been patented by Mr. John Doherty (care of Holly Mfg. Co.), of Lockport, N. Y.

SURFACE CONDENSER.

This condenser is especially designed for steam traction engines, such as are used for plowing, thrashing,



BENSON'S SURFACE CONDENSER.

and other similar uses to which steam may be put where scarcity of water makes the saving of water by condensing the steam a consideration of great importance. It may also be used for the heating of houses. The condenser proper is composed of a number of thin parallel corrugated plates, which are so arranged that the hollows of one plate face those of the other, thus forming, practically, a vertical series of horizontal tubes. The ends of the plates are so connected as to form a continuous passage through which the steam flows. Alternate cells are designed for the passage of air, which is forced through by a blower, and serves to cool the plates, and thereby condense the steam. The steam cells open into a space at one side of the case, and at the other side they have nipples that open into pipes leading the condensed water down into a trap chamber in the base. A condenser constructed in this manner has a cooling surface of great area for the steam to come in contact with, is very light, weighing, it is claimed, only 50 lb. to the horse power of steam to be condensed, the plates being made of light sheet metal. It is further quite small and compact compared with the surface it contains. The air after condensing the steam is conducted to the ash pan, where it serves to support combustion.

This invention has been patented by Mr. B. S. Benson, 52 East Monument St., Baltimore, Md.

Diffusion Applied to Cider Making.

La Revue Agricole de la Region du Nord has just published a memoir by Mr. C. Fossier on the diffusion process as applied to the manufacture of cider. After making known the principles upon which the extraction of juices by diffusion is based, the author says:

"I have established a cider manufactory at Ham, in which I make an exceedingly practical application of dialysis to the exhausting of fresh apples. I operate upon apples in the form of slices, as in the case of beets prepared for diffusion—a process employed in the manufacture of sugar for extracting beet juice, and which has pretty generally replaced hydraulic presses. My apples are placed in an exhausting apparatus, the elements of which are twelve open tuns, that are arranged in a line with each other in a horizontal plane. These tuns are provided with trunnions, so that they can be easily inverted for emptying them when the apples that they contain are exhausted.

"*Produce.*—By this mode of operating I obtain every bit of juice that the apple contains, in a maximum state of concentration—that is to say, without the addition of water, and at such a density as I may determine in advance. The loss in the residua is none, since from each 220 pounds of apples treated I get, practically and regularly, 212 pounds of pure juice, at a minimum. As this is all that the apple contains, there is, in this respect, no comparison to be established with the product obtained by other processes, all of which leave a certain amount of juice in the residua.

"*Manual Labor.*—With two men, I daily produce as many as 2,600 gallons of cider. I can do more, since these two men constitute my sole force. Outside of the manufacture, properly so called, it is their duty to do the carting of the apples and cider between the works and the railroad, and to do the storehouse work, and so forth. A small one horse power steam engine (Hermann-Lachapelle type) actuates the pump that furnishes me with the large amount of water required, and likewise actuates the apple cutter. The making of 2,600 gallons, and even more, of cider with two men is, I think, a considerable saving in the expense of manufacture.

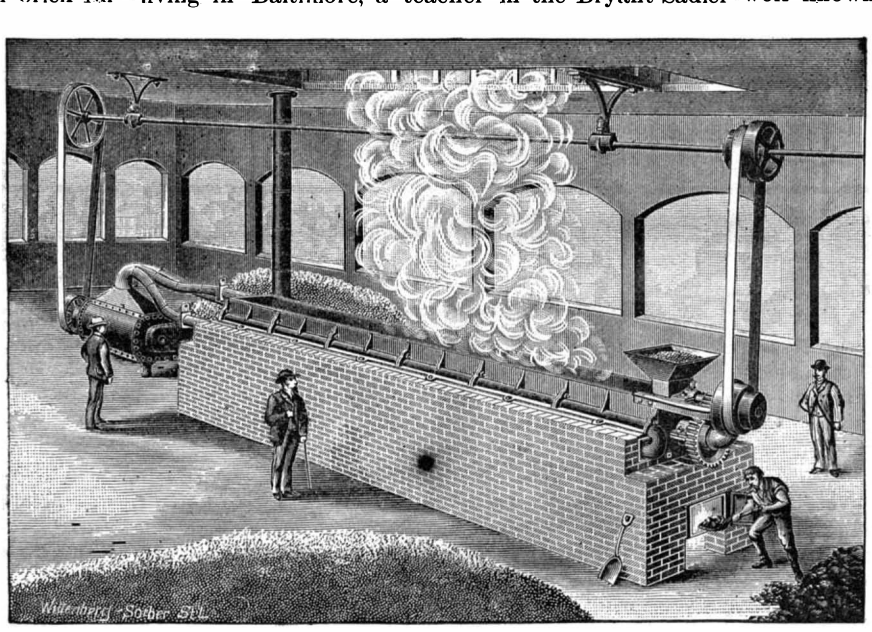
"*Quality of the Cider.*—After three years of practical and industrial experience, without counting the years that were passed in testing the efficiency of the process before putting it in practice, I can now assert, to my full knowledge, that none but the cider obtained by dialysis is perfect. Fermentation is easily set up, and proceeds rapidly. The deposits that it causes are dense, and of slight bulk. They speedily collect in a mass, and it is rare to find more than a quart of turbid cider at the bottom of the 110 or 120 gallon casks in which I have submitted it to fermentation. After fermentation, the cider is as limpid as it was when it came from the apparatus; an odor of the raw pomace has developed, or, rather, it is not concealed; the taste is truly vinous, and the beverage is a healthy one, which, even before fermentation, does not possess the laxative properties of the mash produced by the press or alembic. In a word, it is a beverage comparable with wine, taking into account, of course, the alcoholic richness, which has the same influence upon wine as upon my cider. It keeps perfectly in casks and bottles. It remains limpid in the latter, and, in case it has been put into them when somewhat new, it produces but a slight deposit, which is heavy, and easily masses, so that the cider remains limpid, as occurs with wine. Like wine, too, it can be carried to a distance without undergoing alteration. This is an important property for consideration, especially from the standpoint of consumption, which it is possible to extend to cities and countries devoid of apples, to the great benefit of districts that are privileged in this respect."—*Le Genie Civil.*

WORRELL'S "HERCULES" DRIER.

The accompanying engraving represents a new drier adapted for drying very wet substances, such as starch refuse, offal, brewers' grains, distillery feed, salt, tankage, sewage, clay, fertilizers, etc., at a low cost.

The direct effects of combustion in the furnace are utilized without any auxiliaries, such as steam boilers, heaters, stoves, or ovens. This is attained by using forced currents of cool as well as hot air, acting as moisture removers, and at all times under easy control of the operator.

The apparatus is supported upon a plain brick furnace, the fire box being at one end, and the drier proper consisting of a large iron open-topped trough with a circular bottom, having round hot air conduits at the sides, with numerous perforations connecting the latter with the interior of the trough. Inside of the trough, too low down to be seen in the view, and supported by the journals at each end, is a tubular rotary agitator, with numerous guarded perforations connecting its interior with the inside of the trough, and to it are secured iron or steel flights and agitators, the outside edge of which scrapes the circular bottom. The side flanges are bolted to two iron superheaters, also acting as a foundation for the machine, embedded in the furnace walls; at the front end these heaters are connected with the hot air ducts above by half bend pipes, only one of which is in sight. Motion is transmitted to the agitator by the cone pulley and two spur wheels.



WORRELL'S "HERCULES" DRIER.

The air discharged from the blower in the rear is divided into three currents by the pipes shown, in each of which is placed a cut-off gate for regulating the amount and force of the blast. The two outside pipes lead into the superheaters, while the center one passes into the hollow agitator. As the flames come in contact with the bottom of the trough and the parallel air ducts and the inner sides of the superheaters, the air entering the trough through these hot channels will be heated to a high degree, while that portion passing in through the agitator will be of a cool or nearly natural temperature.

The operation is simple. The wet stuff to be dried passes down from the hopper into the machine. Here it encounters the agitator, and is constantly commingled and agitated by the flights and scrapers, the inclination of these gradually moving it along the drier. It is quickly heated by the hot surface of the trough and hot air forced in through the perforations at the sides. The moisture is brought to the surface of the damp particles by the heat, where it is absorbed by the hot air and carried off in the form of vapor or steam. This action is continued until the material reaches the opposite end of the machine, where it is discharged in a thoroughly dry condition. Most of the air blast is admitted through the hot conduits; but should the product be in danger of scorching, its temperature is quickly reduced by more widely opening the gate in the middle pipe, thereby increasing the volume of *unheated* air entering through the agitator. This novel feature admits the use of an unusually high degree of heat. The scrapers remove any glutinous matter adhering to the hot metal surfaces, effectually prevent "balling," so fatal to many driers, and act as pulverizers when drying lumpy materials like tankage, etc. The perforations in the trough and agitator are ingeniously protected, so as not to become clogged or closed. When drying substances of a disagreeable nature, the trough is covered with a hood and exhausting device for removing the offensive fumes. The scrapers are moved out as their edges wear down, and their inclination can be changed so as to increase or shorten the speed of passing the material through the drier.

This machine is compact, durable, well proportioned, and easy to operate. The motion is slow, and only a moderate amount of power is required. Its consumption of fuel is low in proportion to its drying capacity. Application for letters patent has been filed, covering all the novel features in this drier. The inventor is Mr. S. E. Worrell, of Hannibal, Mo.

Poppy Alcohol.

The poppy planters of mid-Germany will be interested to learn that a botanist of Pondicherry has discovered what he considers will prove a new and economical source of alcohol or brandy. It appears that the pulp which covers the poppy seed contains saccharine matter, which, after due fermentation and distillation, produces a kind of brandy of an agreeable flavor. As this pulp has hitherto been thrown away, the discovery, it is said, affords poppy planters an opportunity of realizing more profit from their crops, without a very great expenditure of capital.

Explosion of a Coffin.

Recently, there was an occurrence in the cemetery at this place, the like of which, perhaps, was never known before. In 1875, James A. Watson, of Clover, whose family then resided in Yorkville, lost a child, aged four years, by death. At that time Watson was living in Baltimore, a teacher in the Bryant-Sadler Commercial College, and he could not conveniently leave his business to attend the funeral, and in his absence only temporary burial was given the body, awaiting his return home to secure a permanent burial lot in the cemetery. This was not practicable until recently on the extension of the cemetery grounds, since which time he has bought a lot, and a few days ago, in company with J. E. Jeffreys and Dr. J. B. Allison, he went into the cemetery to remove the body to his lot. The burial case, a Fisk metallic, was raised from the grave, and a natural desire to look upon the face of the child which died and was buried in the father's absence prompted Mr. Watson to ask Mr. Jeffreys to remove the lid covering the glass panel over the face. The lid was unscrewed and removed, all three standing near, but, observing a film on the surface of the glass, Mr. Watson requested Dr. Allison to procure some material for cleaning it off.

The Doctor went to a residence near by for some cloth for this purpose, and while he was in the house an explosion of gas ensued, shattering the glass, which was a quarter of an inch thick, into numberless fragments, several striking Mr. Watson in the face, cutting it severely. One piece struck the bridge of the nose, cutting entirely through it. A few pieces of the glass also struck Mr. Jeffreys, but he was not seriously hurt. The casket had been out of the ground several minutes when the explosion occurred, which was the result of the expansion by the warmth of the sun of the gas formed in it. The report of the explosion was equal to that of a dynamite cartridge, and was noticed by persons on Main Street, more than a quarter of a mile distant.

The face of the child was in excellent preservation, as were also its burial clothes, and a wreath of flowers on the breast seemed to be nearly as fresh as when buried, twelve and a half years ago.—*Yorkville (S. C.) Enquirer.*

Clarifying Cider, Ale, Beer, and Similar Liquids.

In Bavaria, the country which is renowned for the best and purest malted liquors, the government supervision over the entire process of brewing is so strict that infringements of the law have become very scarce, as they are punished by very heavy fines.

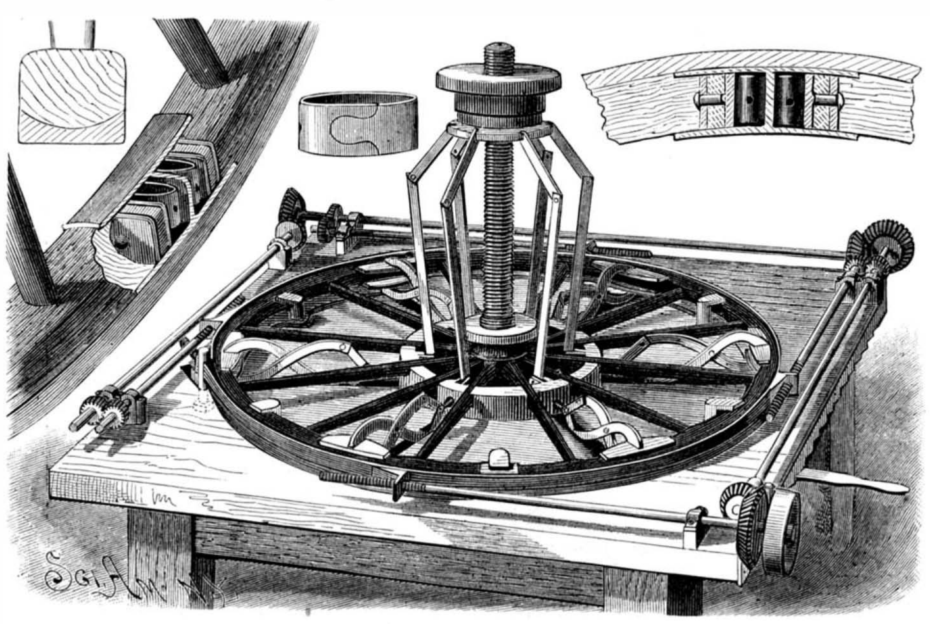
The only clarifying agents permitted to be used there are mechanical, that is, such as will not enter into solution or remain in the liquid under any circumstances. The principal ones are isinglass and fine wood shavings. Clarifying by means of isinglass is well known, and need not be described here. The second method is quite effective, and a brief description may be of use.

Any kind of moderately close fibered wood which is free from strongly tasting resinous matters may be used for this purpose, but the most suitable has been found to be beech wood and hazel wood. Either of these is cut into lengths of six to twelve inches, the bark carefully removed, and the wood reduced, by a machine, to shavings, which ought to be as thin as possible. These must be deprived of tannin by being soaked for several days in cold water, and afterward repeatedly boiled with water until the latter no longer acquires any color. Only a comparatively small portion of these purified shavings need be used for a cask of the liquid to be clarified—about ½ pound for 15 gallons. The *modus operandi* by which the clarifying is accomplished is, of course, a purely mechanical one, mostly due to currents established by capillary attraction into the fibers of the wood floating on top of the liquid, and the mechanical adherence of suspended impurities to the surface of the shavings, as a new portion of the turbid liquid is brought toward the surface.

When the casks are emptied, the shavings may be taken out, washed, and used over again. The wood shavings are a regular article of trade, and may be obtained through dealers in brewers' supplies.

METHOD OF SETTING WAGON TIRES WITHOUT HEATING.

The accompanying illustration shows a means of putting tires on wheels cold, so that steel may be used as well as iron, the tire not having, when this invention is used, to be expanded by heat and then suddenly cooled. The platform which supports the wheel and mechanism for setting the tire has a circular rest for the fellies, which also holds a draw band, that may be tightened or loosened by rods revolving in journal bearings, all of these rods being operated from the belt pulley, by cog gearing, to draw the band in upon the wheel with uniform pressure. By this means sufficient force can be exerted upon the outer rim of the wheel to cause the spokes to buckle horizontally, but the bend caused in the spokes is prevented from extending to the hub, and loosening them in their sockets, by a fulcrum wheel or flange, which extends around the hub, and at a short distance from it. In order to hold the wheel in this position until the tire can be adjusted, a system of duplex levers is provided, the outer links of which operate jaws which may be made to grasp the fellies at several different points, these links being controlled, through the upright jointed lever arms, by a plate on the screw-threaded king bolt. When the tire is put in place and the jaws loosened, the wheel springs back into its proper position.



ROHRER'S IMPROVED WHEEL AND METHOD OF SETTING TIRES.

In order that this method can be followed, it is necessary that parts, at least, of the felly shall be compressible and have an expansive force as well, to cause it to resume its position and hold the tire in place. To this end a joint is used for the meeting sections of the fellies, consisting of a shell which holds movable heads, and between these heads a powerful spring. This construction and the arrangement of parts is shown in detail in the small views, the felly being preferably made convex on its outer side, and the tire made concave on its inner surface, to fit snugly thereon.

Those desiring further particulars respecting this wheel and method of setting may address Messrs. Henry Rohrer & Co., of Stockton, Cal.

A VERY complete filling for open cracks in floors may be made by thoroughly soaking newspapers in paste made of one pound of flour, three quarts of water, and a tablespoonful of alum, thoroughly boiled and mixed. Make the final mixture about as thick as putty, and it will harden like papier mache. This paper may be used for moulds for various purposes.—*Cal. Architect.*

FRENCH NAVAL MANEUVERS OFF THE COAST OF CORSICA.

The second series of the naval evolutions recently ordered by the French government has just terminated off the coast of Corsica, the first having taken place in front of Toulon. The first part of the programme was as follows: The ironclad squadron anchored off the coast of Provence was ordered to double Cape Corsica, while a flotilla of torpedo boats, supported by an ironclad coaster and some cruisers, was to try to stop it, destroy it, or pursue it.

Admiral Lafont's squadron was re-enforced by the torpedo advice boat Couleuvrine, and the Brown division by three torpedo boats.

On June 2, toward 5 o'clock in the afternoon, Admiral Lafont set sail and left the cape to the southeast. Toward seven o'clock he spied the Du-Petit-Thouars and four torpedo boats watching his movements. The commander of the ironclad squadron, delighted at detaching Admiral Brown's best cruiser from the bulk of his forces, allowed himself to be watched and pursued up to the Gulf of St. Laurent, on the Corsican coast. Here (at 10 o'clock A.M. on June 3) Admiral Lafont put about, and ordered Commander Barrera, of the Amiral Duperre, to give a good chase to the Du-Petit-Thouars, which was standing to the east at about six miles from the Colbert. The pursuit began, and, from the very first hour, Commander Barrera found that he had no need to quicken his fires in order to catch up with his adversary, for he was gaining upon him half a knot in every fourteen. So he hastened to begin firing with his turret guns from a distance of 7,200 feet, and then, continuing the chase, he succeeded in holding the cruiser at 3,900 feet, came grandly up on the larboard, fired his port broadside, and left at the moment Admiral Brown, running from Cape Corsica with the Desaix and Arethuse and a group of torpedo boats, came to the aid of the Du-Petit-Thouars, which, according to agreement, was *hors de combat*.

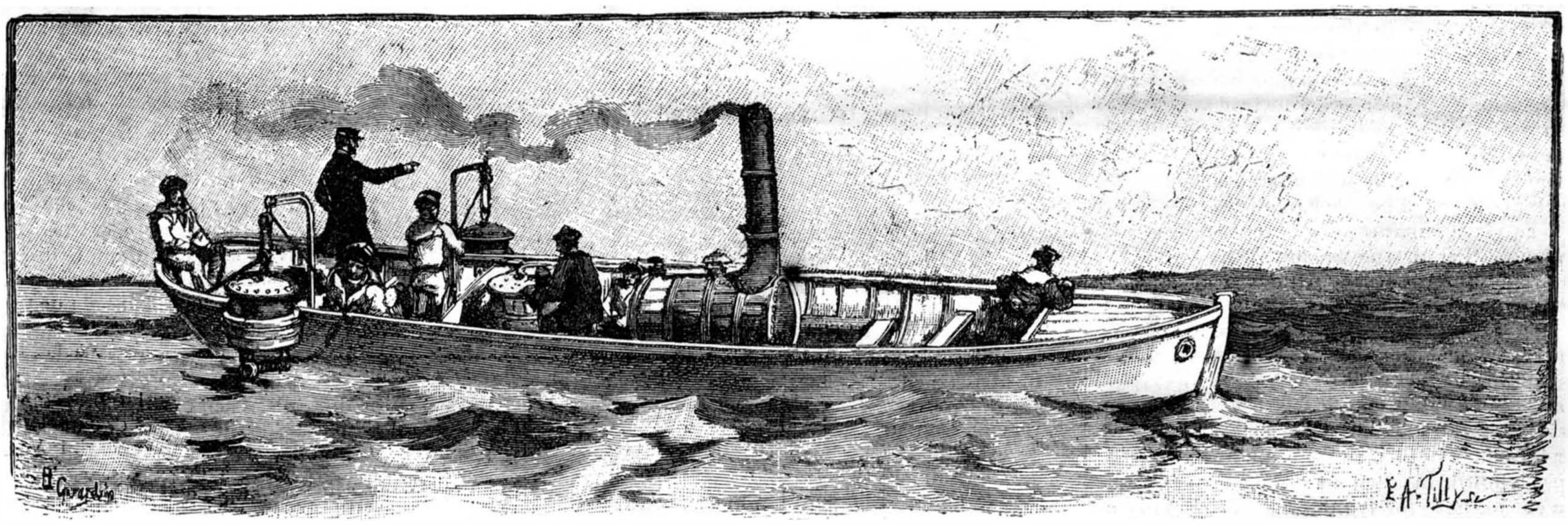
During this time, the squadron had continued toward the northeast, and Admiral Lafont decided to cross the meridian of Cape Corsica. At midnight, at about fifteen miles from Giraglia, he boldly entered the channel at a speed of ten knots. Although he had expected to be vigorously attacked, since the Brown division knew that the ironclad fleet was to pass there, at least 20 miles from Cape Corsica, Admiral Lafont met with but three torpedo boats, and these he constantly followed with his electric lights. One torpedo boat, although iddled with shells, did not consider itself vanquished, and came 2,000 feet from the Friedland, to burn its Coston fire—a signal indicating that it believed that it had launched its torpedo effectively. This fact is so much the more inadmissible in that Commander Behie of the Friedland so well considered this torpedo boat *hors de combat* that he had given orders not to continue the firing.

From this moment, the torpedo boats gave up the attack, and the ironclad fleet after this met but one adversary up to the hour fixed for the end of the maneuvers. On the 5th, Admiral Lafont anchored at Ajaccio. It was here that the second part of the programme was to be enacted, viz., the ironclad fleet was to take refuge in an open roadstead on the enemy's coast, either for the repair of damages or to allow its crews to rest. And it was to put itself into a shape to repulse an attack of torpedo boats.

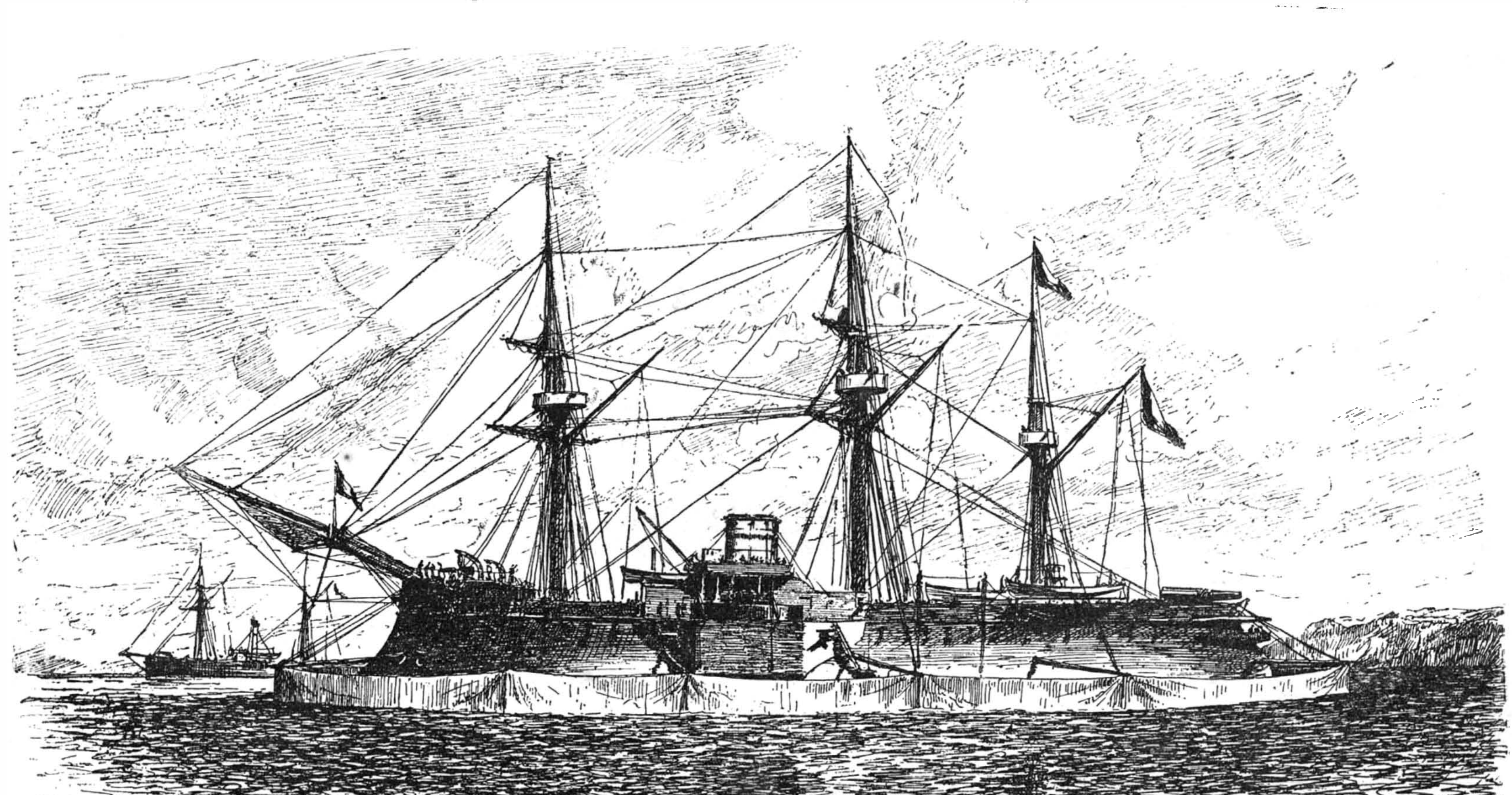
On the 6th of June, all the ships of the ironclad fleet were anchored as closely together as possible (about 1,000 feet apart), at the inner part of the roadstead. On June 9, Admiral Lafont gave a signal to proceed to the construction of a stockade, designed to bar the entrance to the roadstead. This was done in the following way: Rowboats were placed at the entrance to the squadron's anchoring place at about 150 feet apart, so as to form a broken line, whose very obtuse angle opened outwardly, and which extended from the Scoglietti reefs to about 600 feet to the north of the external jetty of the port. The boats were lashed together with Sisal rope, which was supported here and there by empty barrels, and were secured in place by small anchors or grapnels. The boats to the east were armed with revolving guns.

During the entire time of the experiment, the Hirondelle and Couleuvrine were alternately cruising at the entrance of the bay, in order to signal the enemy's approach. For want of Bullivant nets, the ironclads had, upon anchoring, put in place strong, ballasted canvas, which was suspended from booms running from the ship into the sea. At night, the ironclads and lightship at anchor had to so combine their electric light as to make it impossible for the enemy to advance without passing under a line of light that would betray his presence. Owing to these precautions, the Brown division deferred its attack until the night designated for ending the maneuvers. On this night, at half past one, the Couleuvrine signaled the enemy, and then took refuge in the Bay of Aspretto. The Fulminant, commanded by Captain Veron, of the Brown division, attempted a bold maneuver. As was learned the next day, it was the captain's wish, by detaching two rowboats that were directed toward the barrier, to lash a hawser to the obstacle, carry the end to the Fulminant, and tear away the entire system. The idea was a good one, but impracticable, since the rowboats were covered by the guns of the ironclads. One of them, moreover, remained caught by its screw in the ropes forming the barrier.

Meanwhile, three torpedo boats, regardless of the shower of Hotchkiss balls that was riddling them, kept advancing, and came to burn their Coston fire (saying that they were in a position for launching their torpedoes) much too far from the ironclads, to whom remained the victory. This victory would have been still more certain in time of war, since the approaches to the anchoring ground would have been protected by blockade torpedoes—a sort of cone charged with guncotton, and floating beneath the surface. A boat coming into contact with these, and making them incline, is sufficient to explode them. They are immersed by means of a device called the Petraski windlass, around which is wound the rope that fixes them to



FRENCH STEAM LAUNCH ANCHORING TORPEDOES.



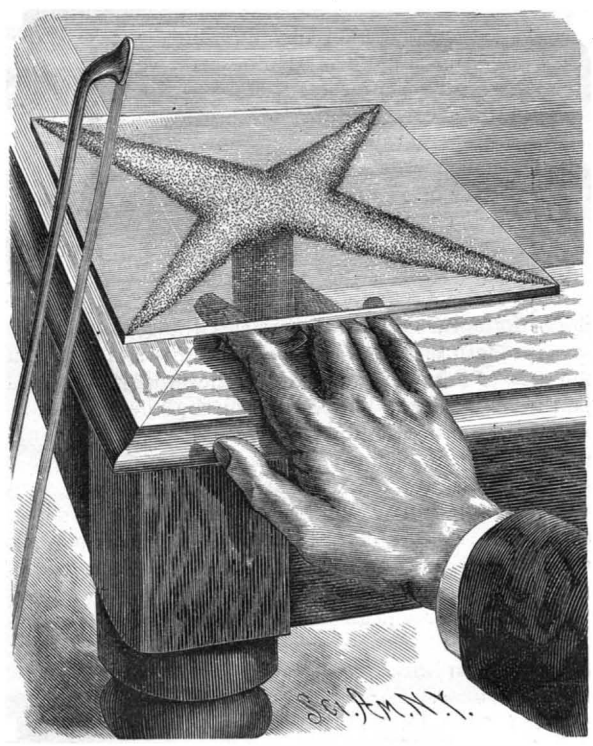
THE FRENCH WAR STEAMER DEVASTATION PROTECTED BY CANVAS AGAINST TORPEDOES.

the bottom. A steam launch can easily effect their anchorage by holding them suspended at each side from small cranes, and afterward dropping them at the desired spot.—*L'Illustration.*

EXPERIMENTS IN SOUND.—CHLADNI'S PLATES.

T. O'CONOR SLOANE, PH.D.

The fact that all sounding bodies are in vibration may receive additional illustrations from the tuning fork. If the tines of one are started into strong vibration, and the extreme ends are dipped into water, a characteristic disturbance and splashing of the water is produced, and quite a shower of minute droplets is produced. Held against the cheek, a slight tickling is experienced, and the sensation when the vibrating prongs are touched to the teeth or lips is



CHLADNI PLATE WITH SAND.

almost unendurable. In a good tuning fork, the vibrations last a long time. One of large size, such as used for experiments, will vibrate for five minutes or more. Edison, in one of his dynamos, tried to avail himself of this principle, mounting coils of wire on the prongs of a gigantic fork, and using its oscillations, maintained by external power, as the generating motion.

The monochord, already described, can be made to illustrate longitudinal vibrations. If the finger and thumb, well resined, are drawn along the wire, it will emit a comparatively acute sound. With a violin bow the same can be produced. This illustrates the importance, in playing the violin, of keeping the bow at right angles to the strings, as otherwise more or less of the longitudinal note will creep in and alter the melody.

From what has been said, it will be understood that a cord may vibrate in several loops, or as a whole, producing different notes, one or more octaves apart. If a flat plate could be sustained properly or without interference, it could probably be made to vibrate as a whole. But as its mechanical support always involves one point of rest, loops and nodes are invariably established. The study of these is, from an experimental point of view, one of the most interesting parts of the subject of sound.

A piece of glass, of a regular shape, is good to commence with. A square, six or eight inches on a side, is cut from any piece of window glass. The sides are smoothed off with a file, a coarse whetstone, or on a grindstone. A little dry sand, a spool, and a violoncello bow, with resin, is all that is required for work. The glass plate is placed upon the end of the upright spool, and a little sand is dusted over it. The thumb of the left hand is pressed down upon the plate, and the bow, held vertically, is drawn down against the edge of the plate in the middle of one side. After one or two trials, the note will be found, and the sand will begin to dance about. After a few seconds, it will collect upon the nodes. In doing this, it carries out the phenomena of the riders of the cord. The sand is thrown off the vibrating parts, and rests upon the quiescent places. As soon as the permanent figure is attained, it will be found to form a cross, whose arms, tapering to points, run to the four corners of the plate. This proves that from each corner to the center a long node is formed.

By means of a little sealing wax or Burgundy pitch, the glass may be cemented to the spool. Even then it will be found that the best way to use the plates is to press down the center with the thumb. Another way of sounding is shown in the cut, by which the upper surface is left quite free.

To suggest a conception of how the plate vibrates, the familiar action of the bottom of an oiler, or hand oil can, may be cited. Every one knows how it springs in and out, as pressed or released from pressure. In a sounding plate, each loop, or venter, as it is more correctly termed, acts in this way, but on a far smaller scale as regards amplitude of vibrations. Recurring to the loops of a cord, one of the loops rises as its neighbor descends, and *vice versa.* It is the same in the plate. As one venter rises, the next descends. One phase of a plate in this form of vibration is shown in the cut on a greatly exaggerated scale. Assuming the plate to vibrate two hundred and fifty times a second, then it exists in this phase that number of times per second, the phase being succeeded by exactly the reverse condition the same number of times.

This much is the beginning of the subject only. If the plate is touched at the center of one of its sides with the finger, and the bowing is executed on any side at a point as near the corner as possible, another cross will be produced, whose arms will run to the center of the sides, instead of the corners. With good plates of glass, more complicated figures can be produced. To execute the experiments, different nodes must be established, by touching different points with one or more fingers and bowing in different places. Heavy plate glass, ten inches on a side, may be thrown into vibration with ease, showing how wonderfully efficient a contrivance a violin bow is. Almost anything that has a sound in it can be made to produce it by this instrument.

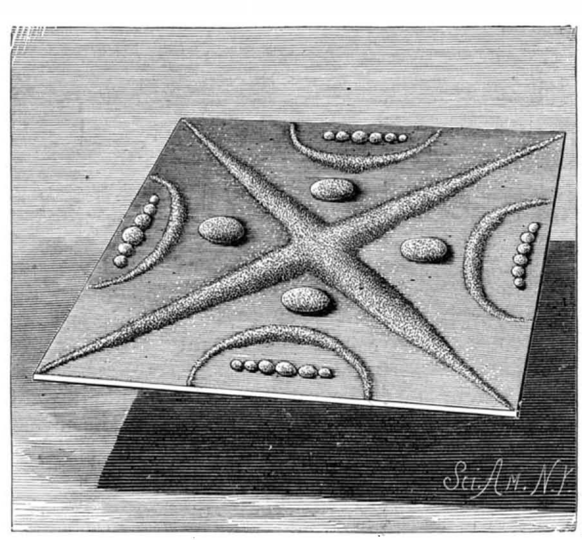
The plate, in vibrating, establishes air currents that are directed toward the venters of the plate. If lycopodium is sprinkled over the plate, owing to its lightness, it will be acted on by these currents, and will be drawn toward the venters, acting exactly the reverse of sand. It accumulates in curious circular piles wherever there is the most motion. If the plate is strewn with a mixture of sand and lycopodium, and is sounded, a separation, more or less perfect, of the two takes place, the sand going to the nodes and the lycopodium to the venters. This experiment, properly carried out, surpasses anything that can be done with the plates.

For it, and for the production of complicated forms, a metal plate should be used in preference to glass. A piece of sheet brass, of the size given for glass, answers all requirements. By careful manipulation, with a certain amount of chance, it can be divided into little squares, or other equally curious figures. In the cut a representation of a figure produced on such a plate, with sand and lycopodium mixed, is shown. The plate should be from one-sixteenth to one-eighth of an inch thick, and secured to its standard by a screw through the center. The vibrations in such a plate last for a few seconds after the bow is removed, keeping the sand dancing most curiously, while the lycopodium will form little clouds of dust when the vibration is powerful.

So far the reference has been to square plates, but any shape can be used. A circle, equilateral triangle, and regular hexagon, with the square, make a good set. The different figures produced run into the hundreds, so there is a large field open for experimenters.

Skinning of Small Quadrupeds for Mounting.

The following is taken from a pamphlet by Wm. T. Hornaday, chief taxidermist at the National Museum, and published by the Smithsonian Institution.



EXPERIMENT WITH SAND AND LYCOPODIUM ON METALLIC CHLADNI PLATE.

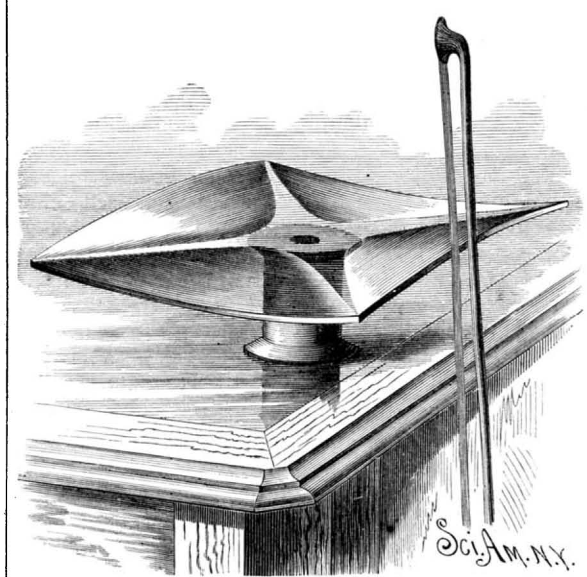
Lay the animal flat upon its back, and beginning at the throat, make a straight, clean cut in the skin along the middle of the neck, breast, and abdomen, quite to the base of the tail. Except in very small animals, the tail also must be slit open along the under side, from about one inch above the root quite to the tip.

The bottom of the foot must be slit open lengthwise from the base of the middle toe to the heel. All the opening cuts in the skin are now made

Begin at the middle of the abdomen, and cut the skin neatly from the body, leaving no flesh, or at least but very little, adhering to it. We come very soon to where the foreleg joins the body at the shoulder, and the hindleg at the hip. Cut through the muscles at those points, disjoint the legs, and detach them entirely from the body.

Skin each leg by turning the skin wrong side out over the foot, quite down to the toes. When this has been done, cut the flesh away from the bones of the leg and foot, but be careful to leave the bones attached to each other by their natural ligaments, and to the skin itself at the toes. *Never throw away the bones of an animal if the skin is to be mounted,* but leave them attached to the skin.

Detach the skin from the back, shoulders, and neck,



NODES AND VENTERS IN A VIBRATING PLATE.

and when you come to the ears cut them off close to the head. Turn the skin wrong side out over the head and proceed until you come to the eyes. Now work slowly with the knife, keeping close to the edge of the bony orbit until you can see, through a thin membrane under your knife edge, the dark portion of the eye. You may now cut fearlessly through this membrane and expose the eyeball. It is a good plan with large mammals to hold one finger of the left hand in the eye and cut against it to avoid cutting the lid.

Skin down to the end of the nose, cut through the cartilage close to the bone, and cut on down to where the upper lip joins the gum. Cut both lips away from the skull close to the bone all the way around the mouth, except directly in front of the incisors.

The lips are thick and fleshy, and must be split open from the inside and flattened out, so that the flesh in them may be pared off. Do not cut off the roots of the whiskers, or they will fall out. Pare away the membrane which adheres to the inside of the eyelids and turn the ear wrong side out at the base, in order to cut away the flesh around it.

If the ears have hair upon them they must be skinned up from the inside and turned wrong side out quite to the tip, in order to separate the outside skin, which holds the hair, from the cartilage which supports the ear.

To clean the skull, cut the flesh all off the cranium, cut out the eyes and tongue, and with a bent wire, or a spoon handle bent up at the end, draw out the brain through the occipital opening at the back of the skull.

By this time the skin will most surely have become bloody in several places, and before applying any preservative it must be washed *perfectly clean.* Blood left upon the hair imparts to it a lasting stain, and usually causes the hair to come off in mounting.

A Lubricant for Brass Work.

Writing to *Nature* regarding various fats which are used to smooth and bind the surfaces of various kinds of apparatus, such as air pumps, stop cocks, etc., Mr. H. G. Madan says:

"Melted India rubber answers fairly, but it has too little 'body' and too much glutinosity; moreover, it does, undoubtedly, in course of time, harden into a brittle, resinous substance. Vaseline is quite without action on brass, and never hardens; but it has not sufficient tenacity and adhesiveness. A mixture of two parts by weight of vaseline (the common thick brown kind) and one part of melted India rubber seems to combine the good qualities of both without the drawbacks of either. The India rubber should, of course, be pure (not vulcanized), and should be cut up into shreds and melted at the lowest possible temperature in an iron cup, being constantly pressed down against the hot surface and stirred until a uniform glutinous mass is obtained. Then the proper weight of vaseline should be added, and the whole thoroughly stirred together. This may be left on an air pump plate for, at any rate, a couple of years without perceptible alteration, either in itself or the brass."

DECISIONS RELATING TO PATENTS.

U. S. Circuit Court.—Southern District of Ohio, Eastern Division.

ADAMS *vs.* THE BELLAIRE STAMPING COMPANY *et al.*

LANTERN PATENT.

Jackson, J.

Where the prior state of the art is such that the field of invention is limited and circumscribed, not admitting of any great original discovery, the invention in a patent must be strictly confined to its claim.

To constitute a patentable invention, there must be a novelty created by or originating in the mind of the inventor, and not deduced as a matter of inference, reasoning, or mechanical skill.

If the patentee did nothing more than take a lantern top, such as he could then have found in use, and secure it to the guard by a hinge and catch, substantially as lantern tops had previously been fastened to the guard, this improvement would not amount to invention.

The mere change of location of the parts of a mechanism, so long as no different or additional function is performed, does not make the change an invention, even though one of the parts thus transposed performs a double function, if the same part had been used before to perform the same functions in separate mechanisms.

While it may be true that none of the earlier lanterns are equal to that of the patentee in beauty of form or convenience for the particular use, yet if every part had been anticipated and used in some form or other for the very purpose to which it is applied in the patent and claim, the patentee could not properly be regarded as an inventor of the same.

A description in prior publications, in order to defeat a patent, must be in such terms as would enable a person skilled in the art to make, construct, or practice the invention, as he could from a prior patent or from the patent in suit.

When a prior patent had the same construction of parts, except that two catches were used to secure the top to the guard, instead of a hinge and a catch, and hinges and catches had been before used to secure tops to lanterns, then the substitution of the old hinge and catch for the two old catches required no invention, and the prior patent is an anticipation.

Where the patentee had an earlier patent differing from that in suit only in the location of the hinge, but without difference in function, the prior patent anticipates the latter, although the latter may have been in fact the earlier invention.

A patentee cannot claim the same thing described by him in a prior patent in which there is no reservation, and what he omitted to claim and reserve in a prior patent in which the invention was described he dedicates to the public. Whether the two patents cover the same thing must be determined by the scope of the claim in the later patent, rather than by the description in the specification.

If in view of the prior state of the art the patent in suit is valid, it must be for a combination of devices which amount to a new lantern, and would be infringed only by substantially a duplicate lantern.

A sale of a single license at an early date is not sufficient to establish a royalty or uniform license fee. License fees must be sufficient in number to establish the fee or royalty charged, and must be uniform, and be actually paid or secured before the infringement of defendants was committed.

License fees for the use of the patent in suit and another patent blended together would not establish a royalty as to either patent. If the license embraces other inducements and agreements which actually or probably influenced the licensees to pay the royalty, then the license would not constitute an established royalty.

NOTE.—This was a suit at law for the infringement of letters patent No. 50,591, granted to J. H. Irwin, October 24, 1865, for an improvement in lanterns, and was tried in June, 1886, before Judges Jackson and Sage and a jury. The charge was given by Judge Jackson. The jury returned special findings, as follows: 1. That the Irwin patent did not disclose invention. 2. That it was anticipated. 3. That the defendants had not infringed. 4. That there was no proof of damages.

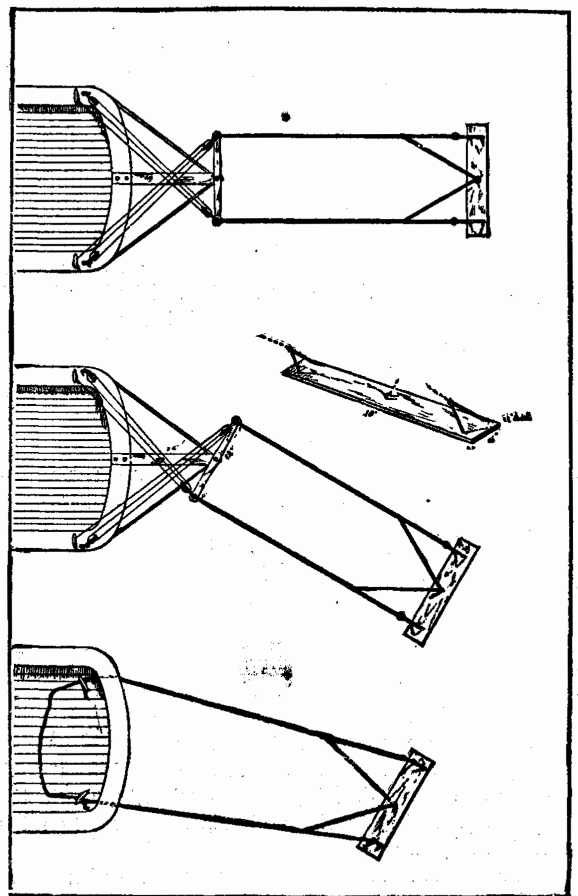
To Stop a Large Hole with Putty.

When you come across a hole while doing an old job, and one which will not pay you to spend the time of properly replacing it with a new panel or piece, we have often succeeded in effectually hiding the defect by taking small tacks and driving them into the hole in all directions, the more crooks the better for the purpose wanted, and then taking putty, mixed soft and pliable, forcing the same thoroughly all through and among the tacks, then letting the first dose dry hard, after which we reputtied until we could level it down even with the panel surface.

After the putty is dry and sanded or rubbed, if the other portion is in good condition as regards varnish, before you put the color on the putty, run a light coat of varnish and japan over it. After that dries put your color on, and you will find that there will be no sinking down of the color or color and varnish into the putty, but it will stand out equally with the rest.—*Carriage Monthly.*

TEMPORARY STEERING GEAR.

Capt. C. F. Swan, of San Francisco, has devised a very simple and ingenious plan for steering a ship or steamer having a disabled rudder, and one which is so easily constructed that we have had engravings made to show the plan. It is not patented. The main feature is the method of securing the plank or drag to the steering lines or guys. A 16 inch plank, 16 feet long and 2½ inches thick, has *iron* bridles secured to it, one arm of the bridle being longer than the other. Then, when the strain comes by the motion of the vessel, the plank is dragged at such an angle (the long arm being uppermost) that it submerges itself, no weight being necessary. The base inclines toward the ship, so the plank is kept down. The plank is veered astern by the guys. The inner ends of the guys are secured to the ends of a pivoted brace, and tackles lead from these ends to the barrel of the wheel of the ship, so that it can be steered from the wheel.



SWAN'S DEVICE FOR TEMPORARILY STEERING VESSELS.

The upper figure of the cuts shows the drag or temporary rudder towing directly astern, in line with the keel. The next figure shows it turned to one side, so as to swing the ship's head in the same direction. When the temporary rudder is swung to "port," it swings the ship's head to "port," and *vice versa.*

The bumpkin or spar projecting over the stern of the vessel is simply a matter of convenience, as the pivot could be put on the taffrail itself if necessary. In fact, even the pivoted bar can be dispensed with, but it is more labor to use the device. The third, or lower, engraving shows, for instance, how the great steamer Alaska could have been steered when she lost her rudder, and they had so much difficulty managing the huge vessel. If they had rigged the bridled plank, the guys or steering lines could have been led to the quarters, and by slacking on one line and hauling on the other, the vessel could have been steered.

The faster the vessel goes the easier she will steer, as the drag is hauled down at an angle deep under water and gives resistance. It will not "tack" a ship, because as she comes in stays she slows up, and the drag rises to the surface. But it will "wear" a ship; that is, turn her from one tack to the other by running her off before the wind. Brace lines (shown in the upper figures) help strengthen the center of the plank.

If the ship is low in the water, the guys or steering lines need not be very long, but if high out of water—say 25 or 30 feet—they should be 25 or 30 fathoms long. Capt. Swan used this steering gear on the City of Brooklyn, a 1,700 ton ship, for two days without the slightest trouble. If the vessel goes slower than four knots an hour, the drag does not do as well, as it is apt to rise to the surface, where it is not so efficient. The gear used on the City of Brooklyn did not cost over $100. The size of the drag should be in proportion to the vessel, but it should present a flat surface, as shown, and the bridles must be made as shown to be effective. A large ocean steamer could have this gear ready at hand for use in case of accident to the rudder. —*Min. and Sci. Press.*

The Wood-working Exhibit in the National Museum.

The United States Department of Agriculture has recently issued "A Descriptive Catalogue of Manufactures from Native Woods," as shown in its collection displayed at the New Orleans exposition. As the exhibit is now in the National Museum, at Washington, the catalogue has a permanent value. It is the work of Charles Richards Dodge, and was prepared with much care, giving a comprehensive idea of the extent and importance of the wood-working industry in its varied ramifications, and containing facts of great interest to manufacturers. The exhibit is chiefly made up of manufactured articles in all stages of work, making a useful aid in the study of forestry from the economic standpoint. In forming the exhibit, many hundreds of manufacturers were asked by circular letter about the woods most commonly used, chief sources of supply, value of lumber for different uses, wastage, processes of manufacture, opinions as to future supply, etc. The answers received showed that, while the wood-manufacturing industries are rapidly using up the best timber growth in the country, it seems as if wise legislation and proper education of the people to the necessity of keeping up the old or producing new forest growth would ultimately result in restoring and preserving the more valuable kinds of hard wood.

Interesting facts are stated regarding quality of wood used, or the particular parts of the tree required for the manufacture of certain articles, the various stages of manufacture, extent of special industries, etc. In the greater number of cases, "home supply" is stated as the chief dependence, though the more valuable woods are brought long distances. A provisional classification under seven heads has been adopted. These comprise architecture and building, transportation, manufacture of implements of industry, articles relating to trade, articles for man's physical comfort, articles for education, culture, or recreation, and miscellaneous uses, not included in the foregoing.

Under the first head come house building, bridge and trestle construction, and construction of railway and telegraph lines. These industries are the greatest users of timber. For instance, the railways consume not far from 60,000,000 ties annually, according to Prof. C. S. Sargent, and the value of ties put down in 1880 amounted to nearly $10,000,000.

It is claimed that Chicago furnishes one-third of all the telegraph poles used in the United States, one-ninth of all the railway ties, and 5 per cent of the posts, supplying railroad and telegraph lines from New York State to Utah.

The uses of woods in transportation comprise ship and boat building, car building, carriage and wagon building, harness woodwork, etc. The implements of industry are divided into mining and excavating, farming and dairying, surveying, wood-working, printing and engraving, spinning and weaving, etc. The articles devoted to trade include cooperage, split and shaved woods for measures, pill boxes, baskets, etc; turned articles and veneers. The articles of physical comfort or luxury comprise house furnishing and decoration, and objects for domestic economy. Under the head of articles for education, culture, or recreation, come school apparatus, artists' materials, musical instruments, games and amusements, and toys and children's games. Under miscellaneous uses are ranked gun stocks, wooden shoes, artificial limbs, crutches, canes, surgical implements, wood pulps, etc.

The work contains many highly interesting facts as to details and processes of the varied manufactures that, employing many millions of capital and hundreds of thousands of laborers, are devouring the forests of the country at a prodigious rate. Some of the exhibits are of a novel character, showing the employment of forest products for unsuspected purposes, as, for instance, that of a manufacturing company in Wilmington, N. C., showing samples of manufactures from the long-leaved pine, comprising "pine hair" for upholstering purposes, being clean and sweet, so prepared as to preserve the balsamic odor; one bag of substitute for hair in plastering; one same pile of real pine hair, one bag of pine wool, one bottle of pine burr oil, one bag of pine dust (as a fertilizer, said to contain a high percentage of ammonia), and one bottle of pine oil. The pine wool is claimed to be the nearest approach to natural wool ever made from vegetable fiber, being intended for spinning and weaving into mattings and carpets, and taking and retaining dyes without a mordant.

Alcohol from Turpentine.

Messrs. Bouchardat & Lafont, in the *Comptes Rendus*, state that French turpentine oil reacts with acetic acid, forming several acetates of the formula $C_{10}H_{16}C_2H_4O_2$, which are of various properties. From these acetates the *savants* in question obtained various single valued alcohols, $C_{10}H_{18}O$, by heating with an equal weight of potash and five or six times the weight of alcohol in a closed vessel for ten hours up to the boiling point. By the addition of water, the combination thus formed can be separated, and can be purified by distillation in a vacuum.

What Machinery Does.

There are men still living, and some of them may be met with on the streets of Chicago to-day, who remember the time when the laboring classes were in a comparatively helpless condition. They lived poorly; were awkwardly clothed, their garments of the coarsest material, and were content with fare limited in quantity and meager in quality. In the sense in which we to-day understand popular education, it was then unknown. The time of which we speak does not extend back to a period over sixty-five or seventy years ago. The workingman gained from the soil a scanty living, or toiled hard to produce it in ill-ventilated factories, aided by the rudest tools and devices; and when his wise fellows sought to lighten his task by labor-saving machines, he fought against them, precisely as some men do to-day, and with his own hands strengthened his shackles and renewed his fealty to honest manual toil without the aid of any new-fangled machinery, which he regarded with suspicion, and did not care to understand. One of the peculiarities of those days, however, was that the laboring man did not fly off at a tangent and enter upon a strike. There were no combinations formed then, not in this country at least, to compel employers to advance wages, or to dictate to an employe what he should or should not do.

The laboring man and mechanic struggled upward slowly, and was convinced only after he was defeated. Argument did not make him give up his prejudices, but facts did. When it was shown to him that a cotton gin could clean more cotton and do it better than his own hands, he very reluctantly admitted the fact, but denied the general application of it. He fought every improvement in his condition, as he would have fought an enemy, and not until his generation and succeeding ones had passed away was he slowly educated into the knowledge that machines could do more work, and do it better, than his hands. He regarded all labor-saving machines as so many enemies, eating up the bread of himself and his children, and crowding him out of the world, when the fact was then, as now, that they are his truest benefactors; instead of depressing his condition, they elevate it; instead of decreasing the demand for his services, they increase it.

Directly and indirectly, in a hundred diverse yet directly traceable ways, machines have been the truest friends of the human race. Men lose sight of these facts in the whirl and bustle of life. They accept the spectacle of the locomotive in place of the stage coach, the steamer instead of the sailing vessel, the telegraph in lieu of the mail, the modern Winchester rifle as a substitute for the flint lock musket, and yet fail to see how greatly these inventions have added to the blessings we now enjoy. By the development of the industries of this country, and not through the efforts of politicians, America stands the leading nation on the earth. The advances made in the past twenty-five or thirty years are truly wonderful, even to the expert; and what must they be then to those whose avocations lie elsewhere, and who know little of what is taking place in mechanics?

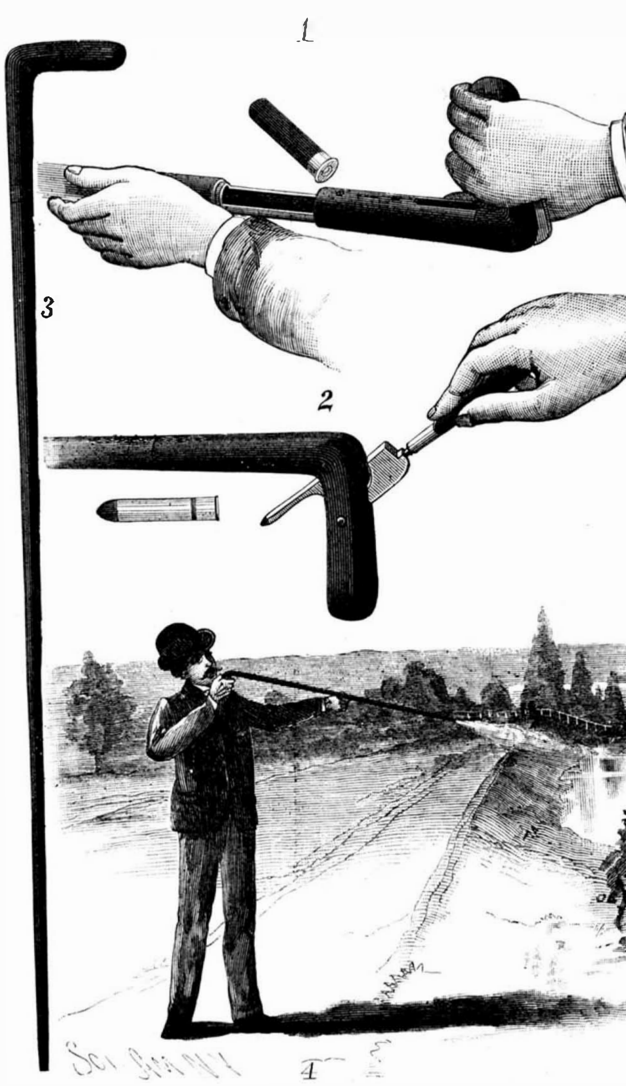
It is now possible to construct a complete sewing machine in a minute, or sixty in one hour; a reaper every fifteen minutes, or less; three hundred watches in a day, complete in all their appointments. More important than this even is the fact that it is possible to construct a locomotive in a day. From the plans of the draughtsman to the execution of them by the workmen, every wheel, lever, valve, and rod may be constructed from the metal to the engine intact.

Every rivet may be driven in the boiler, every tube in the tube sheets, and, from the smoke stack to the ash pan, a locomotive may be turned out in one working day, completely equipped, ready to do the work of a hundred horses. This is only possible by the use of machines, guided and controlled by human intelligence, by a close system of supervision, and accurate economy of time and force, and a thorough knowledge of business. As the number of machines annually produced, and the mechanical facilities for making them, are increased, statistics show that the number of workmen is always augmented. Machines do not supplant workmen, but create a demand for them. If a workman is taken away from one position, it is only to find employment in another contiguous one. The opponents of machinery may say that if machines had not been employed, more men would have been needed; but it is easy to see that the production would decrease, fewer machines would be made, and fewer men needed to make them; for it is the province of the machine to supplement man's labor, to elevate him, and to increase his earnings, instead of the reverse. A man with a pair of stocks and dies may cut, by hard labor and a low rate of wages, one hundred five-eighths of an inch bolts in one day; but give him a modern bolt-cutting machine, and he will cut four thousand bolts per day, and cut them better than with his hands alone.

The machine shop is one of the promoters of civilization. The arts of politicians are subordinate to it. Without the aid given by machines, their schemes would fall dead; without the locomotive and printing press, and the telegraph, they could not reach the ears of men in certain lines of thought. The ability to design a machine that will execute with automatic precision any given form requires a special development of brain power, and this development is by no means confined to the operator, but is shared by many persons. One machine leads to another, and as a consequence the intelligence of men turning out machinery of a high class is very marked, although they are unknown, for the most part, except locally. The machinist speaks through the work of his hand and brain. He adds to the population of the world when he sends forth a machine capable of increasing its working force; he frees his fellows from the bondage of mere handwork, and sets them higher problems to solve. In every way he advances the cause of his race, and leaves the world richer by his labors.—*Western Manufacturer.*

A WALKING STICK GUN.

The cane from which this illustration was made is apparently a plain, black walkingstick, although when taken in the hand it will be noticed that it is a little heavy, and the handle has a cold, metallic touch. Fig. 1 shows the removal of a cartridge that has been used,



A CANE THAT CAN BE USED AS A GUN.

and the aperture in which a fresh cartridge is placed in loading, this aperture being disclosed on pulling up or out on the handle when the trigger is at half cock. The trigger lies in the under side of the handle, and is made to obtrude therefrom, the hammer at the same time being lifted by the use of a small lever, about the size of a lead pencil, the point of which is inserted in a little hole at the bend in the handle, as shown in Fig. 2, this lever itself constituting the ferrule of the cane, in which capacity it prevents the mouth of the barrel from getting clogged up with dirt. To load this cane gun, the previous cartridge having been removed as stated, it is only necessary to put in a new cartridge, push the handle part and the main part of the cane together, and twist the handle till the two portions are in line, as shown by arrows. Unless these arrows are in line, the hammer will not work to discharge the cartridge, which is of the central fire pattern. There is no reason why a good specimen of firearms as well as a serviceable gun cannot be made after the manner shown in the article from which our drawings were made.

ACCORDING to a pamphlet on lubricators published by Messrs. MacArthur & Jackson, of Glasgow, a first class oil should stand exposure to a temperature of boiling water in a water bath of six hours without showing any appreciable loss by evaporation; its flashing point should not be below 300°; and it should not congeal at a temperature of several degrees below zero. For cylinder oils, whether pale or black, the flashing point should not be less than 500°.

Locomotive Headlights.

A statement purporting to have originated with "a railway official" is going the rounds of the press, in which the affirmation is made that there is more danger in the use than the absence of headlights on locomotives. It is admitted that the headlight is good on yard engines, but the alleged official is made to say:

"On a road engine the headlight is of no earthly use to the engineer; it obstructs the vision so that he cannot see his switch lights, and I think that every thinking engineer will come to the conclusion that he would rather run in the night without a lamp than with it, as he can see better in the dark. Red cannot be seen distinctly under such a powerful light when the engine is running rapidly. A green light under the brilliant illumination of a headlight appears yellow, and a blue light appears pale. I know of accidents which have occurred from this cause, and the eyesight of every engineer having a night run is put under a terrible strain by continually gazing ahead into such a light surrounded by such dense darkness. The new electric headlight put on the market a few years ago was a success as a light giver, but it has not been generally introduced, simply because railroad managers know that headlights on road locomotives are practically useless, and that a more powerful light would be positively dangerous."

Mr. Toucey, General Superintendent of the New York Central and Hudson River Railroad Company, says that "all that is simply nonsensical. The headlight is necessary, and this company recognizes that fact in its general rule that 'all trains and engines running after dark must display the white headlight in front of the engine.' As for that statement about the electric headlight, I am not aware that the electric headlight has ever been successfully applied for use on a locomotive. The oscillation and jarring of the engine would certainly have a tendency to throw the carbon points out of line, and that would stop the light. If that could be overcome, there would be no objection to its use in the fact of its greater brilliancy. It is not needed, however. The present light is brilliant enough, and is undoubtedly of service."

Mr. Wm. Buchanan, superintendent of motive power of the New York Central and Hudson River Railroad Company, said: "The road locomotive certainly needs a headlight when running into stations. And in going into and through a yard where there are several tracks, it is necessary to enable the engineer to see ahead that his track is clear and the switches set rightly. He is then, of course, going at a reduced rate of speed, and can stop if he sees anything wrong. While running on the road at full speed, the headlight throws its rays on the track so as to illuminate it clearly 150 or 200 feet ahead. Seeing that far would not give the engineer time to come to a full stop before reaching a sighted obstruction, for it takes six or eight hundred feet to halt a heavy train, dependent, of course, upon the grade and condition of the track, the speed and the weight of the train, but it would give him time to slow up very considerably and reduce danger. The headlight is useful in running through towns and villages, where speed is generally somewhat slackened, not only to enable the engineer to see what is ahead of him, but to give warning to persons on the track or near it of the approach of a locomotive, and to signal gatemen to close the approaches to roads on the grade of the track. As for the illumination from the headlight obstructing sight of the switch lights, that is not true. I have been a locomotive engineer and know that it is not, and if I were going out again to run an engine at night I am very sure that I would want a headlight. The colored switch lights are not in the line of white light thrown by the headlight, but to one side, and are seen clearly far beyond the limit that the headlight's rays reach. A red or green light can be distinguished a mile or a mile and a half away, while, as already said, the headlight only reaches 150 or 200 feet clearly."

In response to a question whether the whistle of a locomotive could not advantageously be done away with, Mr. Buchanan replied in the negative. It would always, he thought, be needed, so long as there are grade crossings. The bell is not always sufficient to give warning of the approach of a train.—*New York Sun.*

A New Solvent of Urinary Calculi.

At a recent meeting of the French Therapeutical Society, a specimen of pichu, or piche, was shown by M. Limousin. In its native country (Chili) it was believed to disintegrate urinary calculi. M. Limousin expressed the belief that piche acted especially on the mucin which held together the different elements of calculi and dissolved it, and lessened vesical catarrh, a belief which, in consequence of the resin it contained, was shared and confirmed by M. Dujardin-Beaumetz. A fluid extract has been prepared, of which four dessertspoonfuls represent 30 grm. of the plant—the dose generally administered in 24 hours.

Some of the Papers Read before the American Association for the Advancement of Science, Buffalo Meeting, August, 1886.

In giving the titles and abstracts of papers, it is quite likely that some of the most meritorious of the 252 that were approved by the standing committee may be passed by, while others less deserving may be noticed. The object, however, is less to report the proceedings fully, than to give a few specimens of the work done in the different sections.

THE SOARING BIRDS.

A rather fanciful and highly wrought, yet interesting and suggestive, paper was read by Mr. I. Lancaster, of Chicago, who has for many years made a special study of the flight of birds. For five years he gave himself up to this problem during a residence in Southern Florida, where facilities for observation were remarkably abundant. Hidden by a mask of cotton fabric large enough to cover the whole person, and painted green and brown like the foliage of the trees in whose tops the observer took his stand, he was able to study more closely the mystery that seemed to set at defiance the laws of matter and motion, as the buzzards, gannets, and other soaring birds would lazily float within a few yards from his face, their wings as immovable as a pair of boards. The position of the wings was always on an incline that was highest in front, and the heavier the bird, the greater this inclination; but all birds seemed able to vary it at will. The relation of the wings to the bodies widely varied. Some birds carried them upward, with the tips above the bodies; while the frigate bird, on the contrary, bent them downward like a flattened letter *m*. Herons carry their bodies higher than their wings; while the sandhill crane keeps nearly on a level.

It was found that the soaring flight is carried on in wind or calm, the latter being best, and is generally done in circles. The bird can go with or against the wind, its power to move in the air being somehow derived from itself; and when this force is not exerted, it simply floats like a boat drifting with the tide. The crane lifts itself spirally to the height of 10,000 feet or more, and the buzzard translates himself three miles through air so calm that swan's down would fall vertically and a tissue paper balloon ascend straight into the sky.

After stating many facts of this nature and the problems thus arising, Mr. Lancaster claimed that he had constructed floating planes, or "effigies," with the under surface rough to motion from rear to front, but smooth the other way. He had made scores of them, which would float steadily in any ordinary breeze, and some of them that had been launched from the Egmont lighthouse might be floating yet if not capsized by storms. He watched one effigy as it traveled for three days. The application of all this, and much more, to the problem of aerial navigation led him to construct a large machine, ten feet by thirty-five, on which a man could ride when the wind blew at the rate of thirty-five miles an hour. Mr. Lancaster had a number of diagrams to explain his paper, after which it was understood that he was to exhibit his model and let it soar. But as said model was not forthcoming, disappointment grew to indignation, and members offered $1,000 for a model that would work.

The president of the association, Prof. Morse, attacked the principles and facts of the "soaring-bird-man," moving a suspension of business that all might go out on the square and try a model. Great interest was excited, and multitudes were willing to be spectators of the remarkable performance. But Prof. Lancaster finally disclaimed a knowledge of mechanics, saying that he had made his models fly in Florida, and that his theory was demonstrated. Considering the extraordinary claims that had been made, and the amount of time consumed by the paper, the general feeling was that the gentleman should not have stood on his dignity, but should have gratified the association by launching at least a single little model.

COWLES ELECTRICAL FURNACE.

An account was given by Prof. Thurston of the colossal dynamo lately made by the Brush Electrical Company. [This machine was illustrated and described in last week's SCIENTIFIC AMERICAN.] A paper was also read by Prof. Maberry concerning the results of certain experiments made by the Cowles electrical furnace, for which the great dynamo, and other smaller ones, had been constructed. It had been found that the electrodes should enter the furnace at an angle of 35°, and that the charcoal should be coated with lime to increase its efficiency. By other improvements the furnace was enabled to utilize far more powerful currents than had formerly been possible.

The resources of the company have thus far been so occupied commercially, that less attention has been paid to scientific questions than might be desirable. There can be no doubt, by those familiar with aluminum, as to its peculiar properties that give it superior value over zinc, tin, and other metals with which it is sometimes compared. The statement that aluminum cannot be produced without copper is erroneous. This furnace has frequently produced it in large quantities. A remarkable effect was noticed when a bar of ten per cent aluminum bronze was heated very hot and then struck, the entire bar taking a crystalline condition. An ingot of metal exhibited showed less silicon and iron than the average commercial aluminum, and methods are being adopted that will greatly reduce its cost.

RIVER AND HARBOR IMPROVEMENTS,

with special reference to the New York entrance, was a paper of importance by L. M. Haupt. The author maintained that all structures of any considerable magnitude intended to regulate currents, and resting on sandy or alluvial bottoms, violated the fundamental requirement that they should not hinder the ingress of the tide nor injuriously modify the currents. Also, that dikes or jetties were, to a great extent, below the zero plane of action of waves of translation, and depended for strength on their mass, which was frequently made up of small fragments not cemented. Such constructions occupy a large volume, produce great pressure of leverage, result in serious modifications in rivers and harbors, are needlessly expensive, and cannot be readily changed if once wrongly located. Mr. Haupt's suggestion was a solution of all these difficulties by a floating system of deflectors attached to buoys or floats, and anchored to heavy moorings of ground chains, held by screw disks sunk in the bottom.

This system is to be guyed in place on the ebb side by wire cables, and depends on the tensile strength of wrought iron for its efficiency. Its parts can be readily assembled, occupy little space, admit the tides readily, yet practically control the currents and deflect them upon the obstructions to be removed. It is comparatively inexpensive, and can be quickly erected or taken down. The physical conditions of the problem at Gedney's Channel were stated, attention called to the existence of a peculiar deep basin on the bar, and the method of utilizing the cause that maintains it for the improvement of the channel. Various other plans for the New York harbor were commented on. Stress was laid on cutting only so much of the crest of the bar as would secure the requisite channel, as excessive cutting was a needless expense, and might injure other channels. Haupt's system depresses the plane of tidal scour on the bottom, while it increases the local volume of the stream, removes enough material to give a clear channel of thirty feet or more, and maintains it against the forces of the flood at a minimum of time and cost.

THE SOCIAL WASTE OF GREAT CITIES,

a paper read by S. L. Seaman, before the section of Economic Science, set forth facts of a startling nature, whether considered by the scientist or philanthropist. A great city is a body politic, having a legitimate waste attending its most thrifty growth, and likewise a pernicious waste that is a dead loss of social capital, threatening ultimate disintegration. A professional service of ten years in New York city, chiefly under the Board of Charities and Correction, enabled the writer to speak understandingly. The contrast was marked between the popular apathy as to the devastations of vice and crime and its dread of financial revulsions and pestilence, although the former causes more poverty, disease, and misery than the latter. The "waste" was signally illustrated by the fact that the chain of beautiful islands studding the eastern border of the metropolis for more than eighteen miles had been surrendered to the service of the criminal, abandoned, and pauper classes; and also by the incalculable outlay from the municipal treasury and private beneficence for the support of vice and crime, far beyond the cost of reparative and educational institutions. Besides the waste of land and money, there are 16,000 colonists on these islands, the ooze of the metropolis, and increasing with greater rapidity proportionally than the remaining population. The whole police are in necessary and congenital relation to this waste, which is the fatal price of crime. The sources of social waste are mostly hidden—under-paid labor, gangs of friendless children, hoodlums baffling the authorities, the army of tramps, those crippled in reckless competitions and financial disasters, badly managed labor disturbances, the heredity of vice, the practical helplessness of the fallen and the pauper class, the Old World drift of outcasts, the sewage of intemperance and debauchery. The first condition of reform and a masterly resistance to this waste lies in the selection, for official supervision, of cultured men versed in sociology, alive to the high functions of such a trust, and absolutely beyond the reach of all political entanglements.

THE BOTANICAL CLUB.

During the Minneapolis meeting, three years ago, permission was obtained to organize a botanical club in connection with the A. A. A. S., provided its meetings were not brought in conflict with those of the general association. Each year since has witnessed the growth of the club, until this year it held daily sessions from eight to ten A. M., and organized separate excursions and receptions, and the members were distinguished by badges. The general feeling is that this is all right, but is a new departure, and worthy of special comment.

THE NATIONAL MICROSCOPIC SOCIETY also meets at the same time and place with the general association. It is necessarily somewhat exclusive, and yet the intention is expressed of holding at least one open meeting during the sessions, to which all will be made welcome.

No decision was reached as to the next place of meeting, and it is a significant fact that no invitation came from any quarter. Possibly the unwieldy size and burdensome cost of these meetings furnish an explanation. And yet there is probably no cheaper way of disseminating science among the masses, and the necessary cost is no greater than that of many other popular gatherings whose burden is borne uncomplainingly. The fact having been stated that Prof. F. W. Putnam, the laborious permanent secretary, had advanced $3,000 to meet arrearages from year to year, led to the subscription of various liberal sums toward a fund to liquidate that indebtedness.

The officers chosen for next year are follows: President, S. P. Langley, of Alleghany, Pa.; Vice-Presidents, (A) Wm. Ferrel, (B) Wm. A. Anthony, (C) A. B. Prescott, (D) Eckley B. Coxe, (E) G. K. Gilbert, (F) W. G. Farlow, (H) D. G. Brinton, (I) Henry E. Alvord; Secretaries, F. W. Putnam, W. H. Pettee, J. C. Arthur, besides the secretaries of the sections; Treasurer, William Lilly, of Mauch Chunk, Pa.

Soda Locomotives.

The Philadelphia *Record* says: At the Baldwin Locomotive Works there are in course of construction four locomotives, which are designed to be run by soda, which takes the place of fire under the boiler. Soda has much the same power as coal, without any of the offensive gases which that fuel emits. The engines are now nearly finished, and are to be shipped within two weeks to Minneapolis, Minn., and are to be run on the streets of that city, where steam engines are forbidden.

The engine has much the same appearance as a passenger car. It is about 16 ft. long, entirely boxed in, with no visible smokestacks or pipes, as there is no exhaust or refuse. The boiler is of copper, 84½ in. in diameter and 15 ft. long, having tubes running through it as in steam boilers. Inside the boiler will be placed five tons of soda, which, upon being dampened by a jet of steam, produces an intense heat. When the soda is thoroughly saturated, which will occur in about six hours, the action ceases, and then it is necessary to restore it to its original state by forcing through the boiler a stream of superheated steam from a stationary boiler, which drives the moisture entirely from the soda, when it is again ready for use. The exhaust steam from the cylinders is used to saturate the soda, and by this means all refuse is used.

These engines are the first of their kind that have been built in this country, and are being constructed under the supervision of George Kuchler, a German engineer. The engines will have about the same power as those on the New York elevated roads, and will readily draw four light cars.

Soda engines are now used in Berlin and other European cities very successfully, and they also traverse the St. Gothard Tunnel, under the Alps, where the steam engines cannot be used, because the length of the tunnel renders it impossible to devise a system of ventilation which will carry off the foul gases generated by a locomotive. So overpowering would those gases become that suffocation would ensue.

A full account of the soda locomotives, with several illustrations, will be found in SCIENTIFIC AMERICAN SUPPLEMENT, No. 483.

Open and Close Couplings.

Some very interesting experiments were made during the closing days of the brake tests at Burlington, Ia., to test the effect of open and close couplings upon the ability of a locomotive to start a train. This has been a matter of hot dispute betweed the link and hook coupler men for a good while, and it is strange that the matter was not long ago determined by actual experiments. At Burlington it was found that the locomotive could start on a lead 49 loaded cars close coupled and 48 with ordinary link and pin coupling. Afterward, on the grade, the engine started 38 cars with each method of coupling. The general results seem to establish the conclusion that the loose slack of open couplings is of no advantage in starting a long and heavy train, and that the draw-bar springs give all the slack that is needed. The trains run at the brake tests had loose slack as follows: Westinghouse, 10 ft. to 11 couplings; Eames, 11 ft. 5 in.; the American, 11 ft. 8 in., and the Widdefield & Button, 8 ft. 9 in. to the same number of couplings. This would give from 40 to 50 ft. of slack to be taken up before the draw-bar springs were moved in the fifty-car brake-test trains, an amount sufficient to cause the severe shocks of the stops. The results of these experiments are undeniably favorable to the hook coupler interests, though doubtless close couplings can be made with links as well. In the train used at Burlington, the loose slack was taken up by iron wedges in the links.

ENGINEERING INVENTIONS.

A car coupling has been patented by Mr. George L. Walton, of Bougere, La. The invention consists in providing an ordinary drawhead with elliptic springs placed longitudinally, to hold a coupling link in a horizontal position, to enter a corresponding drawhead in an approaching car, to be coupled automatically.

A railroad signal has been patented by Mr. Theodor R. A. Weber, of New York city. Two signals are combined by rods with each other and with mechanism at the sides of the rails for operating the rods, whereby the signals are automatically set to danger by a train and are not changed until the train leaves the section.

A dumping car has been patented by Mr. John Scully, of South Amboy, N. J. Combined with the car body and doors at the bottom of the car is a vertically movable bar, whereby the doors may be opened and closed by a positive movement of the bar longitudinally, which gives a positive down thrust upon the doors, or by which they may be held at any desired angle to regulate the discharge.

A railroad gate has been patented by Messrs. Henry Cluever, of Albany, and Nicholas Thelen, of Schenectady, N. Y. The construction is such that as a train of cars approaches the gate the engine wheels strike down a lever which rocks a shaft that operates wires to draw down sliding bars, that allow the gate bars to swing down by their own weight, the gate being then opened by the wheels in passing.

A car coupling has been patented by Mr. James H. Pollard, of Clarence, Mo. This invention covers novel features of construction and combination of parts for a coupling which will work automatically with a link of an approaching car, having any ordinary link and pin drawhead, and which can be worked with drawheads of different heights, and the coupling and uncoupling can be done from either side or the top of the car.

MECHANICAL INVENTION.

A chuck has been patented by Mr. Edwin F. Lindsey, of Bristol, R. I. The invention consists principally in providing the jaws with spring seats, or supports for opening them, to receive the shank of the tool, the jaws having also inclined outer surfaces to act in connection with a bevel in the chuck core for closing the jaws upon the tool, with other novel features.

AGRICULTURAL INVENTION.

A fertilizer distributer has been patented by Mr. James Van Siclen, of Jamaica, N. Y. It is so made that the discharge opening can be closed, the stirring mechanism thrown out of gear, and the plows raised from the ground, by a single lever, and all returned to working positions by operating a treadle, which can be adjusted to distribute more or less fertilizer to the acre.

MISCELLANEOUS INVENTIONS.

An oil cup has been patented by Mr. John Davies, of Peckville, Pa. It is designed to be readily adjusted for delivering more or less oil, and thicker or thinner oil, or to prevent delivery altogether if required, being adapted for oiling journals, steam cylinders, and other frictional surfaces.

An ice cream freezer has been patented by Mr. Charles Hedges, of Grinnell, Iowa. This invention relates to a wagon or vehicle adapted to carry ice cream in freezers, and covers a mechanism driven from the vehicle wheel or axle for operating the freezer as the vehicle travels along the road, the vehicle being also adapted to deliver milk or other produce.

A calculator has been patented by Mr. Luther M. Carmical, of Jonesville, Va. It is so made with nine parallel bars, each bearing nine equidistant marks, by adjusting certain rings on the bars, to indicate the multiplier, and selecting tablets whose first numbers correspond to those of the multiplicand, then moving the device from right to left over the tablets, the product will be indicated by the number over which the rings pass.

A corset clasp has been patented by Mr. Francois F. Delpy, of Paris, France. It is a plate apertured and bent to form a hook, with a plate apertured and provided with a tongue, making a clasp of which only a small portion of the metal projects, it being mostly covered by the trimming, the clasp being one which can be rapidly and conveniently operated, and which cannot damage the garments or injure or pinch the skin.

A target trap has been patented by Mr. Franklin J. Curran, of Stanford, Ky. It is for casting the frangible targets used in shooting matches, and the target holding and releasing devices are supported on the outer end of a casting lever, in such way that the targets will be cast in different vertical planes, to be readily distinguishable from all points, the invention covering various novel features in construction and combination of parts.

A machine for cutting leather has been patented by Mr. George W. Gross, of Oxford, N. J. It is a readily adjustable machine for cutting leather into strips and straps of various widths, combining with feed rolls, a horizontally adjustable gauge plate in front of the rolls, adapted to regulate the width to be cut, and a vertically movable plate adapted to bear on the leather being cut, the machine being calculated for hand or power operating.

An automatic stock water tank has been patented by Mr. Richard H. Barber, of Galena, Kansas. It has end troughs for horses and cattle, too high for use by smaller animals, and side troughs for sheep, hogs, etc., in which the water is furnished as the animal steps upon a treadle in going to the trough, the water always being freshly furnished and the tank easily inclined; the invention is an improvement on a former patented invention of the same inventor.

A wagon brake has been patented by Mr. Edward M. Allen, of Stafford, Md. It is an improvement on a former patented invention of the same inventor, providing a simple and convenient mechanism by which the oscillating body support, operating the brake, may be connected with the team attaching device, so that when the team is stopped on a level or when ascending a hill side, the part may be so adjusted that any forward motion of the team will serve to apply the brake with great force.

TO INVENTORS.

An experience of forty years, and the preparation of more than one hundred thousand applications for patents at home and abroad, enable us to understand the laws and practice on both continents, and to possess unequaled facilities for procuring patents everywhere. A synopsis of the patent laws of the United States and all foreign countries may be had on application, and persons contemplating the securing of patents, either at home or abroad, are invited to write to this office for prices, which are low, in accordance with the times and our extensive facilities for conducting the business. Address MUNN & CO., office SCIENTIFIC AMERICAN, 361 Broadway, New York.

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