most remarkable feature is the extraordinary capacity of the revolving fortress to annihilate every floating thing that comes within range of its guns. The rock of Gibraltar is an impregnable natural monument; but it would be of very little advantage to the English if its strength consisted in bulk alone. So with the towers; two mountains standing midway in the channel would not appal the soul of the most timid Chinese mariner; but let these mountains belch forth fiery storms of lead and iron, and woe betide the adventurous craft which shall approach, even though trebly clad in the heaviest mail, always providing the shot hit the mark at which they are aimed. This is by no means generally the case. Various causes conflict with the taking of a true and unerring aim in ordinary forts; not the least of which is the unpleasant feeling on the part of the gunner that some shot, inimical to him alone, may enter the open port through which he is sighting his weapon, and deprive him of his head; his aim is consequently hurried and uncertain; and too often the discharge of cannon is merely

"Sound and fury signifying nothing."

We have the fullest proof of this in the history of the present struggle. Tuns of powder and shot have been wasted in firing at passing vessels; but there are very few, if any, instances on record where the gunners who blockaded the Potomac ever hit anything except the river, or the opposite shore. History is full of similar instances; and it is roughly computed that but one shot in about seven hundred ever takes effect! If the certain arrival of every shot at the destination intended could be assured, the cost of war would be reduced enormously; for, following the report of every gun would come the conviction that the enemy had received a vital blow, and that his destruction could soon be accomplished. So far as mechanical ingenuity can provide and foresight penetrate, this greatly desired consummation is within the capacities of the revolving fortress proposed by Timby. The following explanation and engraving will fully illustrate the plan of the inventor, and, we think, convince all that the conception is a correct one.

The second cut on the preceding page represents a section of the battery, or revolving tower, and the several parts are here explained. The main structure, A, of the battery, is provided with a central or inner platform, B, on which the commander of the tower stands; this revolves independently of the main tower by means of the gearing, D. The decks or floors, C, are those on which the guns are mounted, and E, are ventilators through which are discharged all the smoke and gases caused in working the guns. In the foundation walls of the tower may be seen the gearing, F, which, through the medium of the rollers, G, causes the tower to revolve; and which is driven by a steam engine erected within a bomb-proof. The casemates, H, at the foot of the tower, also contain guns which are used independently of those in the tower. Down below these the walls, I, form a subterranean chamber, in which stores of all kinds may be placed. These are, in brief, the principal features. The dome-shaped roof, K, affords a shelter and protection to the commander who sights and fires the guns. The whole battery is thus literally under the control of one man; and, after the guns are loaded, they are fired by him through the agency of a galvanic battery; the current passing through the conductors depending from the roof or floor to each gun.

Let us now examine this feature, by far the most important in the revolving fort. Here are sixty guns, we will assume, that are to be brought into service. In ordinary forts, although the full complement of artillery may far exceed this number, the whole of them are not serviceable, by reason of the character of the work—that is, stationary. With the revolving fort and its peculiar arrangement, every gun can be fired once in a minute, or oftener, if required; depending only upon the rate of speed at which the tower revolves. Absolute accuracy in the flight of the shot is insured, so far as science can guarantee, by the certainty with which the cannon can be brought to bear on the enemy, guided by the telescope of the commander. The engraving shows this personage in the act of sighting, through the peepholes in the dome. As the tower revolves independently of the commanders platform, each gun is discharged at the precise moment when it arrives under the electrical conductor depending from the roof; and it will be seen that, as the flight of the shot to its mark does not depend in the least upon the skill in gunnery of a number of different persons, excited and eager with the heat of battle, much greater execution must ensue than when the reverse obtains. How many shots could an iron-clad vessel receive from guns discharged with such accuracy as is here attainable, before she would be obliged to succumb? Scarcely would the tower have revolved once ere the foe would go to the bottom with all on board; or else, exercising that discretion which is the better part of valor, 'bout ship, and tell the tale of her discomfiture to unwilling ears. As the tower revolves once a minute, 180 guns—supposing there are three tiers of sixty each—could be discharged at every turn; and, if these guns were Admiral Dahlgren's, of 15-inch bore, 32 tuns of iron might be hurled at every revolution of the tower; an amount of ballast which would interfere with the sea-going qualities of any ship that ever floated. No vessel in the world ever carried such a broadside, or could be made strong enough to resist the terrible execution which would be sure to follow therefrom. And though we must not suppose that the enemy will be idle, yet his responses would avail but little, and the chances of his dismounting a gun would be very slight indeed. As the tower rotates, each gun is loaded, after firing, on the safe side, or that opposite the fighting face of the tower, which is continually changing its aggressive front, and the exposure of life and limb thus greatly lessened. Of course the commander in the turret is not silent, but by a telegraph directs each officer to elevate or depress his gun, as may be required to suit the distance from the foe, although this duty must be done at times under exposure.

So far we have considered only a single tower; but when we have a cordon of revolving forts extending across our harbors, Mr. Timby proposes to stretch between the two a gang of heavy chain cables, in the manner shown in the engraving on the preceding page. These chains pass in through hawse-holes in the foundation of the tower, and are sustained by metallic buoys capable of carrying nine-tenths of the cables weight below the surface. These chains do not in the least interfere with the channel way, as they are slacked away the moment danger disappears; and, resting quietly on the bottom, permit pacific vessels to enter as they please. The object of these chains is to detain the enemy under fire; for, when he arrives at them, should he be foolish enough to run his ship against such a barrier, he will find the converging fire of two revolving forts bearing upon him with a deadly accuracy of aim from which there is no escape. We need not dilate upon the effect which will follow; nor is it necessary for us to pursue this subject through interminable columns. Very few unfavorable criticisms can be presented against the plans herein detailed, which Mr. Timby has been engaged for the past 22 years in perfecting. Were such fortifications as those proposed erected at the entrance of our harbors, we might dismiss all fears of invasion; defying alike hostile ships and those who sail them.

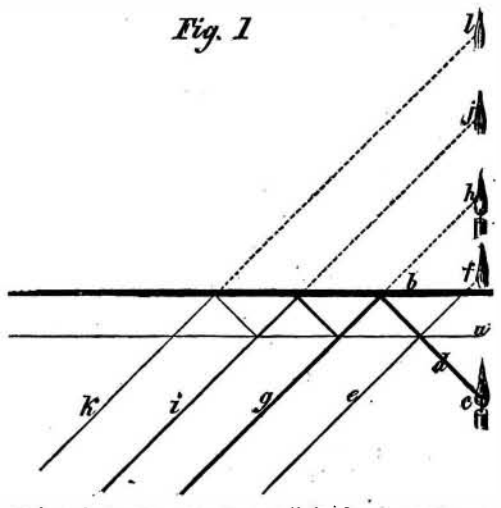
Permanency of Photographs.

The Paris correspondent of *The Photographic News* (London) states that, at a late meeting of the Paris Photographic Society, M. Davanne presented two photographic pictures, on paper which had been submitted to the test of exposure in two exhibitions (1861 and 1862), and which showed no signs of fading or alteration whatever. This, then, may be accepted as a satisfactory proof that photographs, when carefully prepared, are permanent; for the pictures in question were submitted to the severest test to which photographs are ever likely to be exposed, the conditions being every variation of light, heat, moisture, &c., and they remain as fresh and pure as at first. It was also remarked that photographs are more liable to change when kept in a portfolio than under glass exposed to luminous action. A sulphurized proof, if kept in a perfectly dry place, remains for a very long time without exhibiting any signs of alteration, while in a damp place change is immediately evident. Thus, a photograph carefully framed is much better sheltered from humidity than when kept in a portfolio.

THE OPTICS OF A LOOKING-GLASS.

When a beam of light, from a candle or other body, strikes a looking-glass, a small portion of the light is reflected from the front surface of the glass; but the principal portion passes through, and is reflected from the smooth surface of metal at the back. A looking-glass is as truly a metallic mirror as those which were anciently made of polished silver. The office of the glass is simply to hold the amalgam of tin and mercury in place, and to give it a finely polished surface. It answers this purpose admirably, as it permits the use of an exceedingly thin sheet of metal, and gives a surface so smooth that the metal is absolutely invisible.

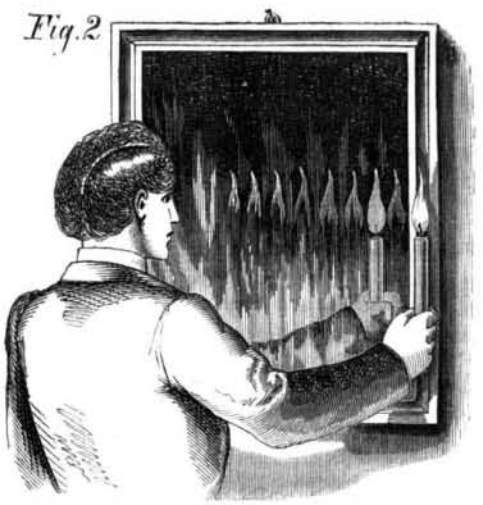
Fig. 1



It is only by the reflection of light from rough surfaces that any non-luminous objects are visible. Were all surfaces as smooth as that of the amalgam on the back of a good looking-glass, the eye would perceive nothing anywhere but a confused glitter.

When a beam of light from a lamp or candle strikes a looking-glass at an acute angle, a sufficient portion is reflected from the front surface of the glass to form an image of the lamp or candle; and if the eye is placed in the right position to receive the reflected ray, the image will be perceived. Even in this case, however, the principal portion of the beam will pass through the glass, and will be reflected by the metal at the back, forming a brighter image than the first; and this second image may be seen at a greater depth within the glass.

Fig. 2



The accompanying diagram illustrates the subject. *a*, is the front surface of the mirror, and *b*, the metal sheet at the back; *c*, is the candle, and *d*, the beam of light issuing from it. As this beam strikes the front surface of the mirror, a portion is reflected in the direction *e*, and if this ray is received by an eye, an image of the lamp will be seen at *f*. The ray reflected by the metallic surface is represented by the line, *g*, and the image of the candle formed by this may be seen at *h*. This image is brighter than the first, in proportion to the larger amount of light reflected from the front surface of the glass.

If the angle is sufficiently acute, as the ray, *g*, emerges from the glass, a portion of it will be reflected inward, against the metal back, and will rebound outward at *i*, forming a third image at *j*, fainter than that at *h*.

© 1863 SCIENTIFIC AMERICAN, INC.

As the ray, *i*, emerges, a portion of it will be reflected inward from the surface; rebounding against the metal back, issuing in the direction, *k*, and forming a fourth and still fainter image at *l*. The beam of light will thus continue to be subdivided; forming images more and more faint, until they cease to be visible.

The reflection of light from the surface inward, as it emerges from one transparent medium into another, takes place at an acute angle only; and the requisite acuteness of the angle varies with different media; varying even with different kinds of glass.

Correspondence

Steel Guns.

Messrs. Editors:—The author of the article entitled "Why our Big Guns Fail," published on page 70, current volume of the Scientific American, is on the right track; and he reasons correctly. Cast-iron for guns has had its day. If the guns on the Monitor iron-clads were made of cast-steel, instead of cast-iron, they could be used with sixty, instead of thirty-pound charges. The guns employed in our navy are undoubtedly good of their kind; but the material employed in their construction is not the best for the purpose; as cast-steel possesses double the strength of cast-iron. Many persons may suppose tnat it is impossible to obtain such large castings of steel; but I am informed that Mr. Frederick Krupp, of Prussia, is making cast-steel guns of every size, from six-pounders up to guns weighing twenty tuns; and almost all nations, except ours, are having such guns made for them. I am credibly informed that the iron-clad war-vessels now building in England for the Confederates are to have ten large cast-steel guns. We may awake some unfortunate time to discover that we are behind our neighbors on this important subject. G. J. Mix.

Wallingford, Conn., August 1, 1863.

[Whether the cast-steel guns of Krupp are superior to the built-up guns of Armstrong, Blakely, and Parrott, embracing the system of Treadwell, we cannot tell; as there are no recorded experiments in our possession, relating to the comparative tests with his guns. We had become impressed with the idea, that a large gun made wholly of cast-steel, was more liable to burst than a built-up or banded gun. On page 121, Vol. VI., current series of the Scientific American, we directed attention, in an article on "Strong Cannon," to the defective character of cast-iron, and said, "The government which would adopt cast-iron muskets, rifles, and pistols, would be considered as insane as a railroad company that would adopt cast-iron for the boilers of their engines. Why? Because cast-iron is so weak and unreliable, in comparison with wrought-iron and steel."—Eds.

Extensive Prairie and Forest Fires.

Messrs. Editors:—On the 19th of the present month, and continuing through the four succeeding days, the upper atmosphere wore an unusual copper-colored hue, through which the sun was scarcely visible; particularly on the three first days. On the 12th and 18th, the sun shed that peculiar mellow light that we are accustomed to see during our autumnal Indian Summer days. The weather was calm, and the surface of Lake Erie was scarcely ruffled during the five days. The mean temperature of each day ranged from 63 to 73 degrees. The surface wind (what was of it), was variable; mostly however from the east and northeast. At 2 A. M., on the 12th, there was a slight rain, sufficient only to "lay the dust." At 5 A. M., on the 14th, there was distant thunder; followed at 5½ to 9½ A. M., with a moderate rain; after which the heavens were overcast by the cirro-stratus cloud, through which pure sky was observed during the afternoon.

Recent intelligence from the far West leaves no doubt as to the cause of this untimely Indian Summer appearance. It was the result of smoke from the vast burning prairies west and north of the upper Mississippi and Missouri rivers; and the extensive pine forests in northern Wisconsin, in the vicinity of Lake Superior. Probably at no time since the whites have been acquainted with them have those prairie regions been visited with drought so severe, either in intensity or extent. The rivers and small streams in Minnesota, Dacotah, and Nebraska, are reported lower than they have been known for many years. In the pine lumber territory of north-western Wisconsin, many of the mills have stopped, for want of water in the streams to float a supply of logs to them. On the road from St. Paul to Lake Superior, well up the St. Croix river, the pine woods, to the extent of twenty-five miles, have been burnt over. The entire Red River country of the North, from Fort Abercrombie to Pembina, nearly all of which is prairie, has been burnt over, so that it is impossible to subsist animals on the route. This is believed to have been the work of Indians. The smoke from these prairie and forest lands has been wafted by the varying winds over nearly all the Northern and Western States, and Canada.

We hear of it as far south as St. Louis, and Cairo: where the sun was much obscured, and the atmosphere so filled with it, that navigation on the Mississippi and Ohio was considerably interfered with. At St. Paul, the smoke was so thick that objects at a short distance from the observer were quite invisible. On Lakes Superior and Michigan, and at the Straits of Mackinaw, this murky element was so prevalent that navigation became exceedingly hazardous, and in some instances disastrous. Many sailing vessels even were put in peril by getting off their course; an upward bound propeller ran ashore in the vicinity of Mackinaw, and got afloat again only by parting with some twelve thousand dollars worth of her cargo. The absence of any unusual aërial odor at this point, during the obscuration of the sky, with the fact that we had shifting surface winds with rain, seem to indicate a great elevation—far above the rain-cloud region—of this dusky visitation.

W. I.

Buffalo, July 23, 1863.

Slate-dressing Machine Wanted.

Messrs. Editors:—You are probably aware that the manufacture of roofing slate is extensively pursued in Maine, Vermont, New York and Pennsylvania. The processes are comparatively simple, and yet have hitherto seemed necessarily confined to manual labor. The slate stone is quarried in the usual manner; then split into thin sheets or lamina, which sheets are afterwards dressed, or cut into the desired shapes by the laborer. These two processes of splitting and dressing, though very simple, require skill and practice; and consequently the number of persons who can split and dress are few, and their wages high. The best workmen are from Wales, England, nearly all of whom come from the great welsh slate quarries; strange as it may seem, although these laborers get very high wages, at this time $1 75 per day for the season, their children seem disinclined to learn the trade, and consequently there is no home growth of workmen. Any manufacture is necessarily precarious which is dependant on a limited supply of laborers, particularly when the labor must be imported, and the price of the article manufactured is fluctuating. In view of these facts, the slate workers of this region desire exceedingly to procure some cheap, simple and practicable machine to aid them in their work. It can hardly be hoped that a machine can ever be made for splitting, as the variation of split in different rocks, the presence of foreign material which deflects the split, and varying hardness of material, seem to require the eye of the workman, and the constant action of his judgment, as a guide to his hand.

But the process of cutting, trimming or dressing the split slate is simple, and might be done by machinery. Machines are used in the Welsh quarries with considerable success. A machine was used at Guilford, Vt., with imperfect success, and small machines for cutting the manufactured article into special shapes are in use in many slate yards. But no simple and successful American machine for general quarry use has ever been invented. The want is very great, and a successful machine would meet with a ready and extensive sale. If there is any one among your readers disposed to apply his inventive powers to this subject, he may rest assured that if successful he will be well repaid. I will gladly answer any questions; and inquiries may be addressed to Mr. Eleazer Jones, No. 23 Broadway, New York.

As your paper is devoted to the advancement of the mechanic arts, I am led to believe you will be glad to forward this matter. There can be no doubt that a successful invention would not only be a great public benefit, but would also prove very profitable to the inventor.

B. Morris Copeland, } Committee on Publications of the Rutland and Washington Counties Slate Dealer's Association.

West Castleton, Vt., July 27, 1863.

The Oil of Life.

Messrs. Munn & Co.—I am pleased to inform you that my Letters Patent came duly to hand a few days ago. In addition allow me to say that this last patent of my wagon-pole check-arrester constitutes the fifth patent granted me within four years, in four of which you have acted as my attorneys, and in each case have always conducted and discharged the business with dispatch and honesty. Accept my thanks, and rely upon it if ever I may have occasion for business of a like character, I shall call upon you to serve me again. J. McNamee.

Easton, Pa., July 27, 1863.

A Mammoth Contract.

Messrs. Woodruff & Beach, well-known machinists of Hartford, have contracted with the United States to build the machinery for three large steam frigates. The Government has fifteen of these steam vessels ordered to be built. Each of the engines to be built will have a sixty-inch cylinder, with three feet stroke, and four tubular boilers, each of which are about one hundred thousand pounds weight. The propellers for the vessels will be of composition, or gun metal, four bladed, and sixteen feet in diameter. The crank shafts will be seventy-five feet long and thirteen inches in diameter.

The above contract will amount to about $1,500,000; and will be sufficient, it is estimated, to keep a force of five hundred men employed without cessation, from twelve to fifteen months. It is further stated that so urgent is the desire of the Government to have this contract filled at the earliest possible day that men who are engaged as employees in the concern alluded to, will, on being drafted, be at once detailed for service there. In order to execute this immense job, large additions are to be made, both to the works of the establishment and to the force employed therein. A new foundry 240 by 65 feet is to be built; and the present extensive machine shop will be made double its present size. A boiler shop 150 feet long is to be erected, and the paraphernalia of steam-hammers, lathes, furnaces, derricks and other mechanical appliances, will be multiplied to an almost indefinite extent.

[This is certainly a heavy contract, but much larger orders have been executed at one time by the marine engine works in this city. It would be lost in the Novelty Works.—Eds.

THE FERTILITY OF INVENTORS.

As an evidence of the activity of inventors, we would state that, for the week ending July 31st, there were ordered to issue from the United States Patent Office, FORTY-EIGHT PATENTS the specifications and drawings of which were prepared at the Scientific American Offices. Of the total number of patents ordered to issue during the week we are not informed, but from the large number ordered to issue to the patrons of this office, we suppose the total amount must exceed one hundred. This is very encouraging, especially when we consider how many of our noble inventors have left their accustomed occupations and taken up arms for the support of our Government. There never was a time when good labor-saving machines were so much needed as the present, and we are rejoiced that our inventors are so active in supplying the demand.

At Berrien, Michigan, a barrel of sorghum syrup was stored away some five years ago; it was recently opened, when the contents were found to be dry sugar.

© 1863 SCIENTIFIC AMERICAN, INC.