capable of yielding. The clouds at Tusquitta, upon meeting, were observed, at once, to ascend swiftly, as if doubling upon each other. This of course, brought more cloud surface into contact than would have been the case had the clouds, on meeting, blended together at once. May I not suggest, therefore, that this sudden folding of the clouds upon each other, by their upward motion, might have produced an almost solid sheet of water, at the main points of contact, which, upon descending to the earth, would be capable of cutting its way down through any extent of clays and decomposed rocks, so as to bear them away, and leave an open canal as the result? That the descending water sheet remained stationary for a few moments, so as to limit the excavations to the spot first struck, is supposable from the fact that the motion of the clouds may have been momentarily arrested by their collision with each other. But I must leave this whole question to the philosophers. D. C.

THE NEEDLE GUN.

The merits and defects of this celebrated breech-loader were detailed by Mr. Norman Wiard, before the Polytechnic Association, recently, in an interesting comparison between this weapon and those of this class more familiar to us.

The Prussian needle gun is not to be commended as a finished piece of mechanism, but, in the opinion of the speaker, it combined advantages that render it in many respects far superior to any weapon of like character heretofore constructed. The most noticeable peculiarities of this gun are its length and weight toward the muzzle. According to our received ideas, these features should be looked upon as disadvantages, but in reality great accuracy and steadiness of aim are thereby attained, and when pointed, the weight and length make it easier to hold, and the end of the muzzle is not deviated by the recoil.

The peculiarity of placing the charge nearer the muzzle of the gun than has been customary, is an advantage which the speaker believed might be still more improved upon, for the further forward the powder is placed the less force is wasted in overcoming the friction resulting from contact of the ball with the barrel, and by igniting the cartridge at the front end the whole power is employed simply in propelling the ball. In this gun all the expansive force of the powder, and also of the fulminating gases, are utilized, but in the Sharps rifle, the propulsive power that might have been obtained from this latter force is lost, and a portion of the other force escapes through the nipple orifice.

The breech of the Prussian gun is nearly on a line with the muzzle, while in the ordinary musket a considerable angle is formed, and, in consequence, a muscular effort is required to bring the gun into position for taking aim, and the force of the recoil is not so easily resisted. The certainty of becoming foul, after a number of charges have been fired, limits the capacity of the Springfield rifle to twenty rounds, hence the superiority of breech-loaders in this respect, for every ball acts as a swab in cleansing the barrel of the solid residue from the powder.

In conclusion, Mr. Wiard presented some curious statements furnished in an official report on the battle of Gettysburg, stating that 27,574 guns were picked up on the field after the engagement, 24,000 of which were loaded. Of this number one-half had two loads each remaining unfired, one-quarter had three loads, and the remaining six thousand contained over ten loads apiece. Many were found having from two to six bullets over one charge, in others the powder was placed above the ball, one gun had six cartridges with the paper untorn, in one Springfield rifle twenty-three separate charges were found, while one smooth-bore musket contained twenty-two bullets and sixty buckshot rammed in promiscuously.

Japan.

Dr. McGowan recently delivered a lecture in San Francisco, upon "Japan and the Japanese," in which he said: The geological formation of the mountains is generally igneous in character, with the superimposition of limestone, sandstone, and coal measures. Gold is found in abundance, and when the speaker went there it could be obtained for its weight in silver. The Japanese, however, soon saw that the gold was leaving their country in large quantities so rapidly that they increased its value. Japan is pre-eminently a copper country. So plentiful is it that the traveler will find their boats, inside and out, lined with it, as also the shutters and roofs of their houses. They have spades and cooking utensils made of it. There is one of these islands which contains nothing else but copper ore. Conversely iron is met with in only limited quantity. You will see the Japanese washing it out of the sand in the beds of rivers, after the fashion of the placer miners of California, who pan out their gold. Coal is found all over the country, though the mines are not much worked, nor is there a great deal of demand for it, as the people dress very warmly and use chafing dishes in their houses to keep them warm. But when one line of steamers gets established this will come in very conveniently, and the supply will be quite equal to the demand.

New Safe Lock.

The London *Engineer* gives the following account of a new lock which seems to be constructed upon new principles:—"It is composed of neither more nor less than steel wires—call them needles if you like—strung together on two stumps, attached to the running bolt upon which they revolve, and they require to be lifted by the key to a position to admit of their being passed through certain holes in a plate of brass, and thus passing, carry the running bolt with them, which carries the real bolt. The needles move obliquely, perpendicularly, laterally, and, indeed, in any direction; hence the difficulty in raising all the needles with an instrument, simultaneously, to their required positions to run through their own apertures, and escape the many traps set for them in the shape of a number of holes, pierced nearly half way through the fence plate, of the exact size to fit the needles. In the more expensive latches, as we have only been describing the cheapest ones, there are protectors and detectors."

Statistics of Photography.

The rapid growth of new and special industries, says the *British Quarterly Review*, is a fact so characteristic of the present day, that the statistics of photography can scarcely be regarded as wonderful, viewed merely as a question of economies. Nevertheless, some of the facts are sufficiently startling. Twenty years ago one person claimed the sole right to practice photography professionally in England. According to the census of 1861, the number of persons who entered their names as photographers was 2,534. There is reason, however, to believe that these figures fall short of the real number; since then it is probable the number has been doubled or trebled, and that including those collaterally associated with the art, it is even four or five times that number. But these figures fall far short of the number interested in photography as amateurs. We are informed that eight years ago, in establishing a periodical which has since become the leading photographic journal, a large publishing firm sent out twenty-five thousand circulars—not sown broadcast, but specially addressed to persons known to be interested in the new art-science. The number of professional photographers in the United States is said to be over fifteen thousand, and a proportionate number may with propriety be estimated as spread over continental Europe and other parts of the civilized globe.

But a more curious estimate of the ramifications of this industry may be formed by a glance at the consumption of some of the materials employed. A single firm in London consumes, on an average, the whites of two thousand eggs daily in the manufacture of albumenized paper for photographic printing, amounting to six hundred thousand annually. As it may be fairly assumed that this is but a tenth of the total amount consumed in this country, we obtain an average of six millions of inchoate fowls sacrificed annually in this new worship of the sun in the United Kingdom alone. When to this is added the far larger consumption of Europe and America, which we do not attempt to put in figures, the imagination is startled by the enormous total inevitably presented for its realization.

In the absence of exact data we hesitate to estimate the consumption of the precious metals, the mountains of silver and monuments of gold which follow as matters of necessity. A calculation based on facts enables us to state, however, that for every twenty thousand eggs employed, nearly one hundred weight of nitrate of silver is consumed. We arrive thus at an estimate of three hundred cwt. of nitrate of silver annually used in this country alone in the production of photographs. To descend to individual facts more easily grasped, we learn that the consumption of materials in the photographs of the International Exhibition of 1862, produced by Mr. England for the London Stereoscopic Company, amounted to twenty-four ounces of nitrate of silver, nearly fifty-four ounces of terchloride of gold, two hundred gallons of albumen, amounting to the whites of thirty-two thousand eggs, and seventy reams of paper; the issue of pictures approaching to nearly a million, the number of stereoscopic prints amounting to nearly eight hundred thousand copies.

The Breweries of Chicago.

The Chicago *Republican* has an article upon this subject, describing the process of brewing, and giving the history and statistics of the business in that city. Beer, porter, stout, and the numerous kinds of ale, are manufactured in nearly the same way, the difference lying in the malting and fermenting. The most approved grain is barley, of the species called "Rath." The grain must be full, and must contain a large proportion of starch. In malting, the first process is to steep the barley. This occupies about forty-eight hours. When taken out, the grain has increased in weight about forty-seven per cent. It is next dried, and "conched." This process is simply piling the grain upon the malt floor, in rectangular heaps, from twelve to sixteen feet in hight. After a short time the grain becomes moist and hot, and germination begins. This is checked as soon as the stem begins to grow, and the grain is spread on the floor and turned two or three times a day. In this process it becomes white and crumbly. It is then placed in the kiln, and is gradually heated, first to 90 deg., and then to 140 deg. This takes from two to three weeks. It is at this point the character of the liquor is determined, ale being made from the palest, and porter from the brownest malt.

The malt is next ground and thrown into water at 160 deg., where it is thoroughly soaked. At the end of half an hour more water is added, increasing the temperature to 167 deg. After a few hours the "sweet wort" is run off into the "undertack." This wort is a clear, sweet liquor, of the same color as the malt from which it was made. The same process is repeated, the second solution being mixed with the first. The third solution becomes small beer. The liquor is boiled in copper vessels, at 212 deg., strained through the "hop-buck," and cooled as rapidly as possible to prevent souring. Lager-beer is cooled by the application of ice water. The liquor is then let into the fermenting vats, cleansed by isinglass, and barreled for use.

Dundas Cultivator Reissue.

We publish on another page an important decision of the Examiners-in-Chief in the above case, which is one of great public interest. A petition, with some eleven thousand signatures, was presented to Congress last winter desiring it to prevent the grant of the reissue; and a resolution passed that body requesting the Commissioner of Patents to suspend action until the matter could be investigated. The application was consequently suspended, but as Congress adjourned without making the investigation, the Commissioner allowed the case to proceed. The Secretary of the Interior has received many letters since from Members of Congress, and others, asking that action be delayed until Congress meets again, but after mature deliberation, he decided to let the case go on. The report, therefore, is one of unusual interest.

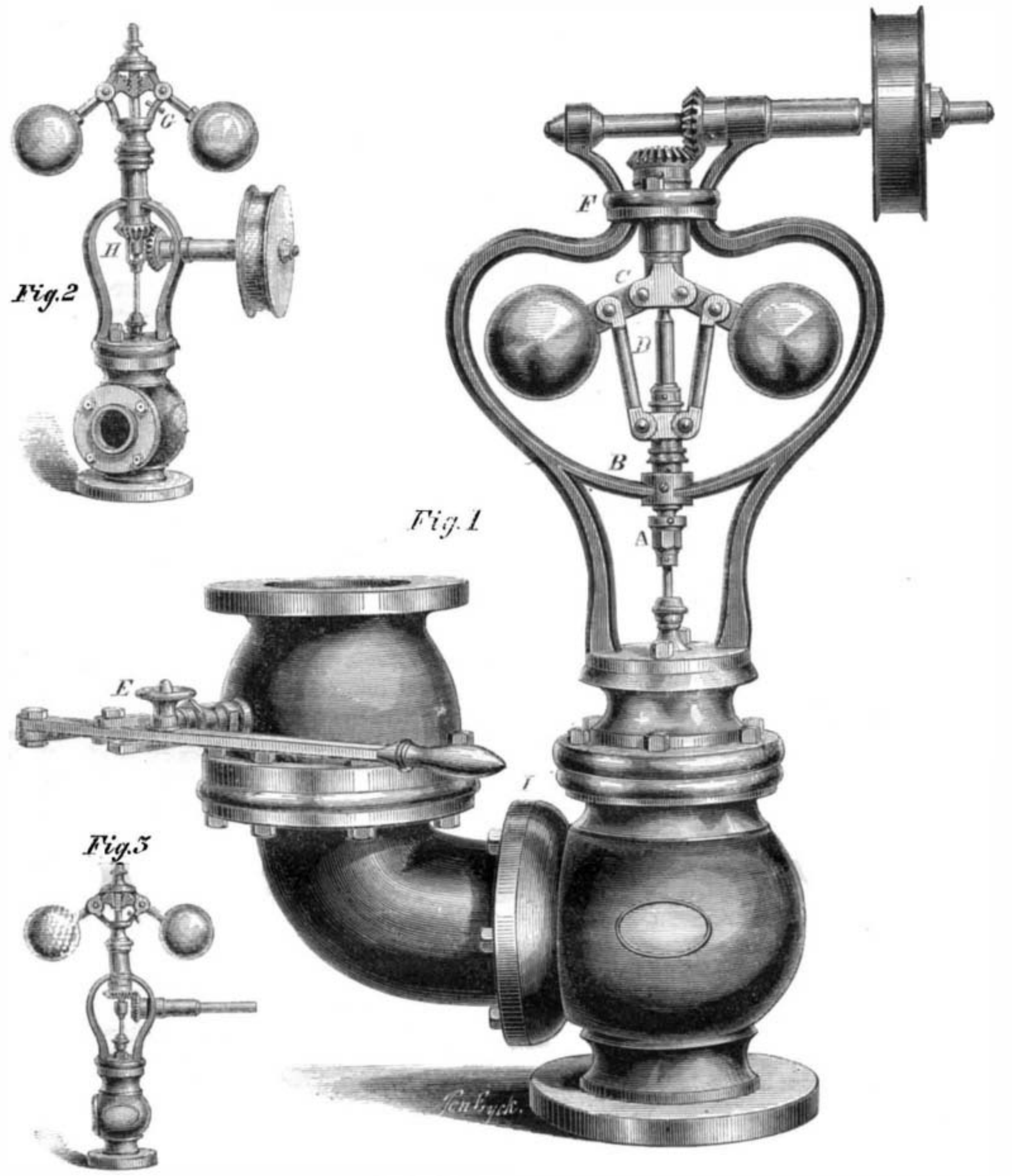
ERRATA.—On page 320, article "Porcelain," fourth paragraph, for "oxide too" read oxide of tin. On page 335, article "Inclosing Electricity," thirteenth line from top, for "glue bottle" read glass bottle. These typographical errors provoke the editor much more than they do the reader. The poor printer often has a narrow escape of well-merited chastisement.

Improvement in the Snow Governor Valve.

Those who have used the Snow governor valve will recognize at once the value of the improvements herewith illustrated. They consist, first, in an outside adjustment of valve and governor combined. The adjustable nut, A (Fig. 1), screws on to the spindle, D, which passes through and is centered by the bar, B, and extends up through the head, C. When the top of the nut, A, strikes the bottom of the bar, B, it determines the highest plane in which the balls revolve, when the engine is running at the speed required—which is first determined by the size of the driving pulleys. The valve, being attached to the bottom of the nut by the small rod, is lifted up toward its closing point, till the nut strikes the bar, which determines the proper position of both valve and governor; the valve at this point being held open the fiftieth part of an inch, or enough to allow the engine to run nearly up to speed with the highest pressure of steam and no load upon the engine. Lowering the nut, A, upon the spindle allows the balls to rise to a higher plane of revolution, and it also drops the valve correspondingly, thus involving an increase of speed of the engine. Screwing the nut up on the spindle causes the engine to run slower, because it stops the governor in a lower plane, and raises the valve correspondingly. Thus it will be seen that the speed of the engine can be varied from the fraction of one revolution to ten or twenty, either faster or slower than the speed first arranged by the pulleys. The spindle does not revolve, and hence the engineer can change the speed of the engine as well while in motion as when at rest. Next in importance is the substitution of a locomotive slide valve, E, with lever and quadrant in place of the common wheel and screw. Third, flanging on of the elbow at I, in place of screwing it into the valve cylinder, as before; and, fourth, the flanging the yoke, F, on to the frame instead of the collar and set screw, as before used. The throttle valve is adjustable, so that the lever can be put in the most convenient position, as also the frame upon the valve cylinder, and the yoke upon the frame.

Fig. 2 is a cheaper modification with the same valve and cylinder, and an improved head, the spindle revolving with segments on the end of the arms working in a rack on top of the spindle with an adjustable screw, G, by which the governor is prevented from rising above the most available point, attaining a nicety by governing, so essential in all establishments driven by steam power, and a swivel, H, to prevent rotation of the valve spindle. When the segment touches the screw, it determines the highest plane the balls are allowed to assume when the valve is at or near its closing. This governor is fitted with a throttle like that represented in Fig. 1, or with pipe flange as seen in the engraving. Fig. 3 is the same, intended for portable and small stationary engines, with valve cylinder tapped to receive the pipe.

For further particulars address G. W. Lasell, 437 Broadway, New York, or H. D. Snow, Bennington, Vt.



SNOW'S GOVERNOR VALVE.

BANQUET TO CYRUS W. FIELD.

On the evening of the 15th inst., the New York Chamber of Commerce gave a grand testimonial banquet, at the Metropolitan Hotel, to our fellow citizen, Mr. Cyrus W. Field, in acknowledgment of the signal service rendered by him in bringing about the successful laying of the Atlantic cable. The large dining hall was artistically decorated by emblems of the science of telegraphy, and about three hundred gentlemen participated in the banquet. Among them were some of the most prominent men of the nation.

In response to a toast, Mr. Field gave a very interesting and graphic account of the history of the submarine telegraph, which was listened to with deep attention. In reference to the recovery of the lost cable, he remarked:—

"After landing the cable safely at Newfoundland, we had another task—to return to mid-ocean and recover that lost in the expedition of last year. This achievement has perhaps excited more surprise than the other. Many, even now, 'don't understand it,' and every day I am asked 'how it was done?' Well, it does seem rather difficult to fish for a jewel at the bottom of the ocean 2½ miles deep. But it is not so *very* difficult when you know how. You may be sure we did not go a-fishing at random, nor was our success mere 'luck.' It was the triumph of the highest nautical and engineering skill. We had four ships, and on board of them some of the best seamen in England, men who knew the ocean as a hunter knows every trail in the forest. There was Capt. Moriarty, who was in the *Agamemnon* in 1857–8. He was in the *Great Eastern* last year, and saw the cable when it broke; and he and Capt. Anderson at once took their observations so exact that they could go right to the spot. After finding it, they marked the line of the cable by a row of buoys; for fogs would come down, and shut out sun and stars, so that no man could take an observation. These buoys were anchored a few miles apart. They were numbered, and each had a flagstaff on it, so that it could be seen by day, and a lantern by night. Thus having taken our bearings, we stood off three or four miles, so as to come broadside on, and then casting over the grapnel, drifted slowly down upon it, dragging the bottom of the ocean as we went. At first it was a little awkward to fish in such deep water, but our men got used to it, and soon could cast a grapnel almost as straight as an old whaler throws a harpoon. Our fishing line was of formidable size. It was made of rope, twisted with wires of steel, so as to bear a strain of 30 tuns. It took about two hours for the grapnel to reach bottom, but we could tell when it struck. I often went to the bow, and sat on the rope, and could feel by the quiver that the grapnel was dragging on the bottom two miles under us. But it was very slow business. We had storms and calms and fogs and squalls. Still we worked on day after day. Once, on the 17th of August, we got the cable up and had it in full sight for five minutes—a long, slimy monster, fresh from the ooze of the ocean's bed, but our men began to cheer so wildly, that it seemed to be frightened and suddenly broke away and went down into the sea. This accident kept us at work two weeks longer, but finally, on the last night of August we caught it. We had cast the grapnel thirty times. It was a little before midnight on Friday that we hooked the cable, and it was a little after midnight Sunday morning when we got it on board. What was the anxiety of those 26 hours! The strain on every man's life was like the strain on the cable itself. When finally it appeared, it was midnight; the lights of the ship, and in the boats around our bows, as they flashed in the faces of the men, showed them eagerly watching for the cable to appear on the water. At length it was brought to the surface. All who were allowed to approach crowded forward to see it. Yet not a word was spoken, only the voices of the officers in command were heard giving orders. All felt as if life and death hung on the issue. It was only when it was brought over the bow and on the deck that men dared to breathe. Even then they hardly believed their eyes. Some crept toward it to feel of it, to be sure it was there. Then we carried it along to the electricians' room to see if our long-sought-for treasure was alive or dead. A few minutes of suspense, and a flash told of the lightning current again set free. Then did the feeling long pent up burst forth. Some turned away their heads and wept. Others broke into cheers, and the cry ran from man to man, and was heard down in the engine rooms, deck below deck, and from the boats on the water, and the other ships, while rockets lighted up the darkness of the sea. Then with thankful hearts we turned our faces again to the west. But soon the wind rose, and for 36 hours we were exposed to all the dangers of a storm on the Atlantic. Yet, in the very hight and fury of the gale, as I sat in the electricians' room, a flash of light came up from the deep, which, having crossed to Ireland, came back