The three-shilling blades are polished first, then drawn over a wood buff. Razor-blades are, in a great measure, ground on dry stones, which unfortunately causes the atoms of stone and steel to fly about freely, to the great injury of the workmen, and imparts to the whole place where the operation is carried on a peculiar brownish-yellow hue. The minute particles of stone and metal flying about are inhaled by the workmen, and, lodging in the lungs, produce asthma, consumption, and other fatal diseases. This most dangerous feature of the dry-grinding business has, however, been very considerably modified of late by the introduction of an apparatus which in a great measure protects the grinders from the dust flying from the stones. This apparatus consists of a fan on the principle of a winnowing machine, with a flue to take away the dust from each of the stones in the room. The fan is worked, of course, by steam power.

"The difference in the price between the three shilling and the dearer razors is simply in the handles with which they are fitted, the blades being exactly the same in every respect. There are horn handles, ebony handles, plain and carved ivory handles, silver and German silver handles, mother-of-pearl handles, etc. Some idea of the importance and extent of this branch of the cutlery business may be conceived from the fact that some 1500 different patterns of razors are made.—*England's Workshops.*

GLEANINGS FROM THE POLYTECHNIC ASSOCIATION.

Reported for the Scientific American.

The regular meeting of this branch of the American Institute, was held on Thursday evening, December 27th, Prof. Tillman presiding.

THE EARTH A SOLID SPHERE.

After some preliminary proceedings, Mr. Wood read an article, arguing that the interior of the earth is in a solid state, yet having an intensely high temperature. Mayer has shown that when a globe of matter is once in a molten condition, in cooling one common temperature must exist throughout the entire mass; that from its nature one part can not possibly cool faster than another, and even if it were possible, we should look for the first signs of solidification at the center. The formation of the earth's crust, inclosing a molten mass, is hence inadmissible. The temperature certainly increases as we go toward the earth's center, but the pressure becomes greater in an increased ratio, and this latter force prevents the interior matter from assuming the liquid form.

The statement accredited by the speaker to Mayer was disputed by several members, and the existence of molten lava coated with a crust of varying thickness was brought forward as a notable example to sustain this latter view. After some further discussion the society listened to a paper by Prof. R. P. Stevens.

THE IMAGINARY SCHOOL OF PHILOSOPHERS.

Investigation, or the discovery of new facts, principles or truths, must always be conducted with a rigid adherence to truthful experiments. Standing on the borders of the known, we may patiently gather from the unknown, till from the accumulation we are enabled to classify, generalize, and reason, and thus extend our bounds.

It is interesting to show from the past how men of so-called science have found it so much easier to call on their imagination for facts from which to form or support theories, than by continued labor to discover their actual existence.

According to the Phœnician, Sanchoniathon, Chaos and a spirit were the authors of all things. The spirit fell in love with his own principles, hence a commixture, hence an agent capable of performing all we see in nature. The stoics supposed that moisture was the medium through which Deity acted on matter. *Ab mare omnia* was the belief of Ocken, and Prof. Grimes must be ranked in this school, as by his theory the continents are born of the sea. Even Kepler speaks of an animal in the moon drawing the earth toward it. Leibnitz imagined nomads endowed with inward energy and spontaneity, and each a perfect world within itself. Herschel and Laplace call to their aid cosmic matter so attenuated as to fill all space. Aristotle and Epicurus taught that matter was eternal and the world without beginning. The Pantheists hold essentially the same views.

The imaginary school continued with unabated force till Bacon established his inductive philosophy, teaching to observe facts, institute experiments, and from effects reason to causes.

THE NEBULAR THEORY.

Against the nebular hypothesis of Laplace, the following objections were urged. "The impossibility from *known* facts, of matter being so attenuated as to fill all space. It is doubtful that if so attenuated there would be many centers or even one center of gravity. If in this state and heated to so high a temperature, there could be no commingling of gases. We have no reason to suppose matter endowed with motion; rather, that unless moved upon by an extraneous force it would remain quiescent. The *primum mobile* of the centrifugal and rotary forces is merely assumed. The hypothesis fails to account for the eccentric movement of Herschel and Neptune, the movement of Herschel's moons, the movements of the comets, and their unequal rapidity of motion. It is opposed to all our present knowledge of matter as now existing, and this we have reason to believe is but a reappearance of itself in successive phases or rounds of phenomena, manifested by chemical changes and reactions.

THE OCEAN CURRENTS.

The first statement made by Prof. Grimes was that the ocean primitively covered the globe. Physicists calculate that had this ever been true, the sea would have been from one to two miles deep, too deep to fortify his second assertion, for currents do not abrade in deep water, hence the forming of vast continents by them is absurd. His second statement was that currents in this primitive ocean moved in six ellipses. We do not know the conditions attending the movement of currents in a shoreless ocean, and the mechanical problem proposed to account for this elliptical motion can not be shown by experiment. In the North Atlantic the current is exhausted at the 45th degree of latitude: then how was land above this parallel formed? Finally, he has not cited one fact or illustration from geology that has the remotest application to his hypotheses.

[For the Scientific American.]

BOSTON INSTITUTE OF TECHNOLOGY.

IMPROVEMENT IN TELESCOPES AND MICROSCOPES.

At the second regular meeting of the Boston Institute of Technology, a miniature telescope was exhibited (the invention of Mr. Tolles, the celebrated maker of microscopes,) four inches long, with an object glass only seven tenths of an inch in diameter, and magnifying thirteen diameters. This was proved equal in power to ordinary telescopes of two inches diameter of object glass and four feet long. In this small instrument the satellites of Jupiter and similar astronomical objects had been seen. This invention tends to diminish by one half the cost of telescopes, by diminishing the size of the lenses. Mr. Tolles had also invented a method of throwing light upon an opaque object when under examination under the microscope, by means of a rectangular prism introduced into the side of the instrument just above the lower glass, so that the light is thrown directly down upon the object; a long sought for improvement in the examination of opaque objects.

A NOVEL PLAN FOR FIRE-PROOF SAFES.

At a meeting of the Massachusetts Institute of Technology, in December, 1866, Rev. Rufus S. Sanborn, of Wisconsin, exhibited and explained a fire-proof safe invented by himself, in which steam acts as the preserving medium.

The nature of this invention consists in placing one or more boxes, or unfilled safes, one within the other, the outside case being filled or otherwise in the ordinary way, and these inner boxes detached from each other and the outside case by means of flanges or spurs, so as to form air chambers all around said inside box or boxes; and into these air chambers are inserted metallic vessels for holding water, with simple steam valves, which will be opened so as to allow the steam to escape when the heat of the inside of the safe shall become sufficient for that purpose.

This steam saturates the air chambers, and its surplus escapes by the doors, so as to keep the temperature of the inside of the safe about that of boiling water, in which temperature none of the papers of the inside box can either burn or char so long as any steam can be maintained.

By a peculiar arrangement of a succession of these vessels, one is exhausted after another, and thus for a long time there is the most complete protection in addition to the other protection which the filling and air chambers afford. In an ordinary sized safe there would be about fifteen gallons of water, which, under the arrangement described, would require a very long time for its conversion into steam and its total escape by the door.

A trial has since been made, of six hours' duration, in a fire so intense as to melt the knobs from the door, the safe being kept red hot for over five hours. In the trial, a safe of one of the best makers, on being opened after three hours' exposure, presented all the interior wood work on fire and its contents completely destroyed: on the contrary, the Sanborn safe showed its contents entirely uninjured, and its steam would have formed a perfect protection for six times, at least, the time of the exposure. An account of the trial may be found in the Boston *Advertiser* of Dec. 24, 1866. K.

A NEW EARTH EXCAVATOR.

Mr. B. A. Oliver, of Bunker Hill, Ill., has sent us a model of what appears to be an excellent machine for cutting ditches, canals, and railways, and also for grading roads, etc. It can be very easily described, being simple in construction and operation. A platform supports an upright frame, in which revolves a disc, carrying on its outer circumference a number of scoops closed at one end. In front of the machine are two plows with side attachments for cutting down the bank, which may be fixed to cut a perpendicular wall or one inclined at an angle. The shape of the plow shares is such that the earth loosened is thrown directly in the path of the revolving scoops. These take the earth up and carry it over the top of the disk, discharging it at the rear in two windrows, one on each side of the excavation. This division of the debris is secured by a partition passing through each scoop in the direction of its rotation, and also by doors on the sides of the scoop which, while in the act of digging, are closed automatically by side fixtures like cams, and are opened when in the proper position by the same means.

The large central disk to which these scoops are affixed has neither spokes nor hub, but is kept in place and rotated in a vertical plane by means of two friction wheels. Inside, the disk is furnished with segments of cogs in which a cog-wheel meshes, which is revolved by suitable connections with the main axle. The driving power is the supporting wheels of the apparatus, which have projecting lugs on their outer peripheries. The machine is drawn by horses or oxen, attached so that the animals walk on each side of the excavation. Direction is given to the machine by means of a lever in front of the driver's seat.

The principle of the machine seems to be correct, and Mr. Oliver has succeeded—so far as can be judged by his model—in applying it in a practical and efficient manner. He desires to procure some party to assist him in taking out his patents and introducing the machine to the public, and is willing to cede a portion of his rights as inventor, for the accommodation.

How to Straighten Hardened Steel.

To straighten steel after it has been hardened is a great annoyance to the machinist. It is one thing to finish a tool or mechanical appendage requiring hardening, and another to bring it out, hardened as it should be, right. Many a drill, turning tool, tap, etc., is ruined simply for want of knowledge of this art. To be sure, the bulk of the responsibility rests with the temperer or hardener; but what they fail in may in many cases be remedied by a knowledge of simple fact.

To straighten a piece of steel already hardened and tempered, heat it lightly, not enough to draw the temper, and you may straighten it even on an anvil, if not really dead cold, by a hammer; but it is best to straighten it between the centers of a lathe, if a turned article, or on a block of wood with a mallet, where the article, cold, would break like glass. Warm, it will yield readily to such blows as are said to kill the devil easy.

The Gatling Gun.

This destructive piece of field ordnance, of which we gave a description and engraving in the last number of the SCIENTIFIC AMERICAN, with an extract from the emphatic testimonial of the Examining Board to its efficiency, has been adopted by the U. S. Government, and an order for one hundred of the deadly machines for the army, is now being filled at Colt's Armory, Hartford.

PLANING CURVED SURFACES.—Hitherto, it has been found impossible to adapt the ordinary planing machines for curvilinear planing, but at length this problem has been solved by Mr. Middleton, the head of the machinery department in Chatham dockyard, who has succeeded in planing the whole of the curves and angular surfaces of the iron stem-piece for the *Monarch*, with no other appliances than the common planing machine.—*Engineer.*

[Links for locomotive valve gear have been planed for years in our machine shops on common planers, and by half a dozen different methods. It is no trouble at all. A common way is to take the vertical screw out of the tool holder, and attach a rod to the slide, with the bottom of said rod working in a curve of the required radius formed in a piece bolted to the bed of the planer.—EDS.

THE shop is getting to be only a primary school for mechanics. Time was when to be a first-class workman—capable of handling the file, or running the lathe or planer, or better still "doing a job"—was the hight of a mechanic's aspirations. All is changed. The mechanic, to be worthy of the name, must be more than a mechanical workman. He must understand the principles of his business and must be capable of not only doing a job, but preparing it and directing it. The world needs scientific mechanics as well as mechanical mechanics.

LIGHTING CIGARS.—The pyrophorus used for lighting cigars is a highly combustible powder, requiring only exposure to air and slight warmth to ignite. It is preserved in a small tin case with a narrow orifice, from which a little is dropped on the end of the cigar, and ignited by the aid of the breath. It seems to be even more dangerous to property than he cigar itself.

LAUNDRY GLOSS.—The beautiful finish of linen got up for sale is imparted by pressure and friction upon curved surfaces of hard pasteboard. Try a true cylinder, or convex table, veneered with the best quality of press board, such as printers use, instead of the usual domestic "ironing sheet."

HOT AND COLD BLAST.—An inquiry instituted by the British Association has determined the ratio of strength in hot-blast iron as 1,024.8, and of power to sustain impact as 1,226.3, to 1,000 in cold-blast iron.

SYRACUSE papers say, that the water in the fire engines of that city is kept constantly hot by jets of gas which are brought into contact with the boilers. It is said that gas costs in Syracuse only a dollar per thousand.

MR. SPILLER, of the Woolwich arsenal, has remarked that the barrels of the rifles used by the volunteers there are strongly magnetic. The range at which they are fired is situated due north and south.

A COSMOPOLITAN bank, whose checks will be everywhere at par or premium is to be established at London, with branches in the leading cities of the world. This will do away with bills of exchange.

A LOCOMOTIVE exploded lately at Rochester under a pressure of ninety pounds, and was thrown across the street into a saloon without doing much damage.

AN excellent bronze for small castings may be made by fusing together in a closed crucible ninety-five parts of copper by weight, and thirty-six parts of tin.

FORTY tons of rust were taken out of the Menai tubular bridge at one thorough cleaning.

IT has been calculated that 96,000 pounds of candles are used weekly in the mines of Cornwall.

M. PISANI proved the presence of soluble hyposulphates in the aerolite which fell at Orgueil.