Science Familiarly Illustrated.

The Earth Worm.

Probably there are few boys who read the SCIENTIFIC AMERICAN who do not occasionally indulge in the sport of angling, if not for sport at least for the pleasure of enjoying the fruit of their exertions—if successful—when brought to the table. It is well that we put in this proviso, for "fisherman's luck" is a phrase every boy understands. No fish bait is so generally used in angling as the earth worm, and we shall endeavor to give some information in regard to this despised, but useful creature, which boys who often handle it may not possess.

The earth worm belongs to the class called annelids, from the Latin *anellus*, a small ring, because the body of the worm appears to be composed of a series of small rings joined together like beads on a string. The worm has also another name, *Lumbricus Terrestris*, which is simply the Latin for earth worm, so this apparently insignificant creature bears a high sounding name. And he is worthy of it. He is a remarkable individual, belonging to the only class of invertebrate animals which have red blood. This is quite a distinction, one which many animals much higher in the scale of life do not enjoy.

We have said this is a useful animal. We do not refer to its value as bait for fish, but its usefulness as a cultivator of the soil. It does, beneath the surface, just what the farmer does on the surface, opens the soil to the action of air and moisture by running galleries in every direction. It does even more. It is a superior worker of fertilizers, turning crude and rank manure to valuable compost, fit for the support of vegetable life. If not allowed to do this in the heap, it will carry on the work after the manure has been removed to the field or garden. But this does not exhaust the list of its useful qualifications. It actually turns poor and grudging soil in some cases to valuable and generous mold. In dry times the worm is driven by the necessities of his nature deeper into the earth, as he cannot live in dry soils. When he returns to the surface he brings with him the earth he has swallowed—for he is an earth eater, but of this presently—and voids it upon the surface. And this which he leaves upon the surface is of the very finest quality. Every one has seen these worm castings heaped about the mouth of their holes.

Thus the manures added to the soil by man and the constituents of the soil, themselves, are thoroughly mingled by this indefatigable cultivator, and these castings in time accumulate on the surface, so that instances have been known where several inches of vegetable mold have been added by this means to the surface of a field. In this manner the earth worm proves himself to be one of the farmer's best friends and assistants.

Now let us see whether he, like some of the feathered tribe, has some bad qualities which offset his usefulness. He certainly does not destroy living vegetation, either roots, stems, or leaves; for even those who deny that he is a dirt eater do not charge him with eating living plants. They merely assert that he eats dead and decaying vegetation. A correspondent in our issue of Feb. 9th, gave a well written description of what he had seen him do; eating decayed leaves, and minutely described his process of feeding. The worst that can be said of him is that he defaces our nicely kept walks by his nocturnal deposits of exuviæ.

What does the earth worm eat? This is a disputed question, but we incline to the opinion expressed by Samuelson and Hicks in their treatise on "The Earth Worm and the Common Housefly;" Jean Mace, in his "History of a Mouthful of Bread;" Appleton's Eyclopedia, art. Earth Worms and Annelids; Chambers Educational Course, art. Zoology, and Prof. Seeley in No. 2 current volume SCIENTIFIC AMERICAN, that the earth worm does eat dirt, as much as the Ottomacs, those South American Indians described in "Odd People" by Capt. Mayne Reid. Most boy anglers will also agree with these authorities that the earth worm is a dirt eater, with the exception, perhaps, of the boy who while fishing was asked by an acquaintance passing what he had in his mouth, and replied: "Wums fur bait."

A few other peculiarities of this animal and we will release him and our readers. The swelled protuberances enveloping the body of worms at some seasons, must have been noticed by all who have seen them. These appear like the results of disease or accident, but are simply the envelopes of the ova for the reproduction of the animal. The head of the worm is destitute of eyes and ears. It is furnished with a mouth alone, which may be easily perceived by the aid of a small lens or microscope. Take a worm on your hand and let him crawl across the palm and you will feel a rough sensation on your skin. Or attempt to pull a worm out of a hole in the earth and very likely you will break his body in two. Why? Simply because the worm has legs, or at least, substitutes for them. These substitutes are hair hooks, easily seen through a common magnifying glass and they are retractile at the will of the worm. This will explain the tenacity with which he adheres to the walls of his home when force is used to pull him out.

If this brief account of some of the peculiarities of this reptile are of interest and prompt a wish for more, we refer our juvenile readers to Messrs Samuelson and Hicks book or the interesting volume of Mons. Mace, before alluded to, and also to a close observation of the habits of the *Lumbricus Terrestris*.

The Dental Profession.

The dental art is one of the beneficent products of the nineteenth century. There are men now living who cared for it in its infancy. In 1830, throughout all this country only about one hundred dentists could be found, and these with a few yet conspicuous exceptions were illiterate and awkward. In 1840 the number had increased to 1,000. At the present time there are probably 8,000. The art of dentistry has now become one of our necessities, and its practitioners are a well recognized and honored profession.

Books and periodicals devoted to dentistry, of a high order of literary and scientific merit. are constantly being published. To be qualified for the successful practice of dentistry nearly as much study is required as for divinity or medicine. Several colleges for the education of dentists have been instituted and are in successful operation. There is little doubt that in a few years a high standard of education will be so generally appreciated, that the diploma of a dental college will become a necessary passport for admission to a respectable place in the professien. And it may even be hoped that the dental profession may rank evenly with other learned professions.

Our constant respect for the dental art was greatly stimulated by attending the first commencement of the New York College of Dentistry, which took place at Steinway Hall on the 6th inst. The venerable Dr. Eleazar Parmly presided, and Mayor Hoffman, Dr. Frank H. Hamilton, and Dr. Allport took prominent parts in the exercises. Those who witnessed the dignified proceedings of the occasion cannot doubt that this college is one of the most worthy and successful of our educational institutions.

GLEANINGS FROM THE POLYTECHNIC ASSOCIATION.

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

NOVELTIES.

After the reading of the usual scientific summary by the President and an opportunity being given for bringing forward new inventions for the inspection of the Club, Dr. Fitch presented a sample of white lead prepared directly from litharge by dissolving it in nitric acid, precipitating by sulphuric acid, and boiling in oxalic acid, the whole process being completed within two hours. A hand shoe-pegging machine of ingenious construction was exhibited and operated to the satisfaction of the members. The inventor claims that by its use he can peg a pair of boots per minute, the work consisting of cutting the pegs from long strips of birch wood, punching the holes and driving a double row of pegs. The machine is designed to enable small manufacturers to successfully compete with the large establishments. Mr. Maynard showed a piece of copper tubing, the ends of which were quite intricately entwined, the flexures showing no crack or edge. The hollow ingot from which this tube was formed, he stated, had been rolled until it had acquired a laminated structure and great flexibility.

THE HYDROGRAPHIC BASINS OF THE UNITED STATES.

Dr. Stephens read a long and able article on this subject, describing first the geological formation of this continent, and entering at some length into statements respecting the agricultural and mineral wealth of each of the resulting hydrographic basins, showing the capacity of each for supporting an immense population, and closed by drawing a glowing picture as to the future history of this nation.

At the conclusion of Dr. Stephen's paper, Prof. Van der Weyde was introduced and explained the construction of a new

SPECTROSCOPE.

It is more especially to the labors of the physicists Kirchhoff and Bunsen that we are indebted for the discovery of the spectral analysis. They ascertained that the salts of the same metal, when introduced even in the minutest quantity in a flame always produce lines in the spectrum identical in color, position, and number. In toxicology it is no longer necessary to test successively for all the known poisons, but by the lines in the spectrum, given by burning a small quantity of the suspected compound, the presence or absence is instantly seen.

The spectroscope exhibited by the Professor has some marked advantages over the ordinary instrument, which, in the form usually employed, consists of three telescopes mounted on a common foot whose axes converge towards a prism of flint glass. The new instrument, is a simple teleoscopic tube having within, two triangular, and two rectangular prisms so that the tube being directed toward the flame, the light enters through a narrow crevice, and is twice reflected and twice refracted before reaching the eye. In this improved form the spectroscope can be used in connection with the magic lantern and the spectra from various flames may thereby be shown to a large audience.

Trial of Horse Hay Forks.

A series of interesting competitive trials to determine the merits of the various horse forks now in market, took place on Monday and Tuesday the 5th and 6th inst. at Rye village in Westchester county, on the premises of Mr. Josiah Macy. The trials were conducted under the auspices of the American Institute, and sixteen forks were entered for competition. A tabulated statement of the general results is given below:—

	Where manufactured.	*Lbs. removed.*	*Time*
Blodgett's cats-claw fork	Watertown, N. Y.	1,500	9:30
Davidson's hay knife and fork	Troy, Pa.	1,607	9:45
Sprout's hay fork and knife	Muncy, Pa.	1,850	5:50
Chapman's grappling fork	Utica, N. Y.	2,180	12:00
Reynolds' Union fork	Stockport, N. Y.	2,050	21:00
Excelsior Palmer fork	Hudson, N. Y.	1,830	8:05
Rodgers' harpoon fork	Pittsburg, Pa.	1,382	8:30

A fork manufactured by the Ames' plow company of this city, failed to operate satisfactorily and was removed from the field: a similar fate befel the forks entered by J. S. Brown of Washington, by M. E. Plumm of Munson, Ct., and by L. L. Johnson of Chatham, N. J. Our data are defective respecting the work performed by the Halsted fork made in this city, the Case harpoon fork, entered by E. Sharkley of Lewisburg, Pa; Walker's harpoon fork, Buckman's grappling fork, and the Farmer's Friend entered by C. N. Culver, Bowling Green, Ohio. Of the sixteen, forks exhibited, eleven were of the harpoon pattern: of the remainder, two were grappling and three were claw forks. The several trials were witnessed by a large assemblage of practical farmers and general satisfaction was expressed at the admirable manner in which nearly every machine did the work assigned. The decision of the committee appointed by the American Institute, has not yet been made public.

REPORT OF THE COMMISSIONER OF PATENTS.

UNITED STATES PATENT OFFICE,
January 30, 1867.

SIR:—I have the honor to submit the following report of the business of this office during the year 1866:—

The receipts and expenditures of the office for the year, and the condition of the Patent Fund at its close, are shown by the following statements:—

No. 1.

Number of applications for patents during the year	15,269
Number of patents issued, including reissues and designs	9,450
Number of caveats filed	2,723
Number of applications for extensions of patents	67
Number of patents extended	58
Number of patents expired	1,042
Of the patents granted there were—	
To citizens of the United States	9,210
To subjects of Great Britain	127
To subjects of the French Empire	48
To subjects of other foreign governments	65

No. 2.

Statement of money received during the year, namely:

On applications for patents, reissues, etc.	$460,798 20
For copies and recording assignments, etc.	34,867 18
Total	$495,665 38

No. 3.

Statement of Expenditures.

For salaries, including $29.107·48, additional pay as per act of June 18, 1866	$149,623 17
For contingent expenses	95,006 60
For temporary clerks	115,381 76
For withdrawals	540 00
For refunding money paid by mistake	924 00
For fees to judges in appeal cases	248 75
Total expended	$361,724 28

No. 4.

Statement of the Condition of the Patent Fund.

Amount to the credit of said fund Jan. 1, 1866	$180,184 78
Amount of receipts during the year	495,665 38
Total	$625,850 16
From which deduct the amount of expenditures	361,724 28
Leaving to the credit of the Patent Fund, Jan. 1, 1867	$264,125 88
Surplus of receipts over expenditures during the year	$133,941 10

TABLE *showing the business of the office for thirty years ending December* 31, 1866.

Years.	Applications filed.	Caveats filed.	Patents issued.	Cash received.	Cash expended.
1837	....	....	435	$29,289 08	$33,636 98
1838	....	....	420	42,123 54	37,402 10
1839	....	....	425	37,260 00	34,543 51
1840	765	228	473	38,056 51	39,020 67
1841	847	312	495	40,413 01	52,666 87
1842	761	281	517	86,505 68	31,241 48
1843	819	315	531	35,315 81	30,766 96
1844	1,045	380	502	42,509 26	36,344 73
1845	1,246	452	502	51,076 14	39,395 65
1846	1,272	448	619	50,264 16	46,158 71
1847	1,531	553	572	68,111 19	41,878 35
1848	1,628	607	660	67,576 69	58,905 34
1849	1,955	595	1,070	80,752 78	77,716 44
1850	2,193	602	995	86,927 05	80,100 95
1851	2,258	760	869	95,738 61	86,916 93
1852	2,639	996	1,020	112,056 34	95,916 91
1853	2,673	901	958	121,527 45	132,869 83
1854	3,324	868	1,902	163,789 84	167,146 32
1855	4,435	906	2,024	216,459 35	179,540 33
1856	4,960	1,024	1,502	192,588 02	199,931 02
1857	4,771	1,010	2,910	196,132 01	211,582 09
1858	5,364	943	3,710	203,716 16	193,183 74
1859	6,225	1,097	4,538	245,942 15	210,278 41
1860	7,653	1,084	4,819	256,352 59	252,820 80
1861	4,643	700	3,340	137,354 44	221,491 91
1862	5,038	824	3,521	215,754 99	182,810 39
1863	6,014	787	4,170	195,593 29	189,414 14
1864	6,972	1,063	5,020	240,919 98	229,868 00
1865	10,664	1,062	6,616	348,791 84	274,199 34
1866	15,269	2,723	9,450	495,665 38	361,724 28

The foregoing shows that the number of applications for patents received in 1866 exceeded that of 1865, by nearly fifty per cent, and that of 1864 by more than one hundred per cent; and the number of caveats filed exceeded that of 1865, by nearly two hundred per cent. The number of patents issued exceeded that of 1865 by nearly fifty per cent, while that of 1865 exceeded any previous year by more than thirty per cent.

The receipts into the patent fund exceeded that of 1865 by more than forty-two per cent, while the expenditures were increased less than thirty-three per cent, and 1865 exceeded that of any previous year in receipts by more than thirty-six per cent.

If the business of the Office continues to increase as now, and as it has for several months last past, it is not unreasonable to suppose that the number of applications during the present year will amount to nearly, if not quite twenty thousand. This very great increase of the business of the Office renders it absolutely necessary, that the clerical and examining force be correspondingly augmented, and this cannot be done without providing more room than we now have, as every room we have is filled far beyond its utmost reasonable capacity. In some of the rooms the clerks are so crowded that they cannot comfortably do their work, and of necessity they very often and very greatly interrupt each other, which seriously retards the business of the Office, and which cannot be remedied in any other way than by furnishing us with additional rooms.

The Examiners have suffered great inconvenience and the public interests great detriment, from the necessity that has existed for several years past of conducting the examination of several classes of subjects in the same room, for instance, steam engines and all cognate subjects under one principal Examiner with his several assistants; and Hydraulics, Pneumatics, and Wearing Apparel, under another with his several assistants, are all crowded into one room. The inconvenience named arises, to a great extent, from the limitation as to space; but in a far greater degree from the diverse character of the inventions under examination, the exposure to the many applicants of inventions that should be kept private; the discussion in the hearing of both the principal Examiners, their several assistants, and of the various attorneys and applicants, of matters which should be known only to the parties in interest, often, doubtless, to the prejudice of justice, and always to the embarrassment of the business of those not engaged in the particular case in controversy.

The draftsmen who prepare the small drawings from which the engravings for the illustrations to accompany the Patent Office reports are made, are greatly in need of more room. Six are now employed, and they are at present located in one of the model saloons, between the model cases, with merely a temporary curtain suspended across from one case to another to shut them out from the view of the many visitors who are daily traversing the saloons. They are thus located because there is no other place to put them, and this difficulty must very soon be increased, as it is absolutely necessary to double the number of the draftsman in order to keep up with the increasing business of the Office.

In the room in which the drawings of inventions are kept, there are about 100,000 sheets of said drawings in a space originally designed for the reception of about 25,000, and the consequent damage resulting to these drawings from the crowded condition in which they are kept in this room, is a matter of very serious consideration.

Should the business of this Office continue to increase, (and it doubtless will do so), it will soon be entirely impossible to take proper care of the drawings unless more room be furnished for that purpose.

The library of this Office has vastly grown in importance within the last few years. It is not only needed and used as an absolute necessity by the Examiners in the performance of their duties, but it is now so much consulted by inventors and those engaged in their interests, by whose money

the Office has been built up, and who exclusively sustain it, that the want of room and books is now signally felt. It is not an uncommon thing for persons to come from distant parts of the United States to consult books which can only be found here. A careful examination of the catalogues of other libraries shows that the Patent Office collection is now one of the best technical libraries in the world, if not the very best. The high price of gold and the limited means of the Office during the war prevented the purchase of many volumes which are much needed. Gold has very much depreciated and the means of the Office are now ample, and there are needed many volumes of necessary works to complete series heretofore kept up, which must soon be purchased or be hereafter bought at a much greater cost, if they can be procured on any terms, and there is really no room for any additional volumes, if such were now on hand. The works consulted in this library are very many of them of large size and require corresponding space for their examination. It often happens that every table in the room now occupied by the library is more than covered with volumes for examination and this too in places which should not be open to the public at large.

The want of room for the mere deposit of books is so great that many of them are, of necessity, stowed in the halls, in other rooms, and even piled on the floors. This is an every-day inconvenience; add to this the want of room for consulting the volumes as above mentioned, and there will be found a very valuable public institution which is deprived of much of its real means of usefulness for want of proper space for the use of its advantages.

Deeming it to be my duty to call the attention of Congress to the matter of the indispensable necessity that exists for much more room in order to properly carry on the now great and rapidly-increasing business of this Office, I have, as briefly as I could, made the foregoing representations, in the confident hope that your honorable body will, at no very distant day, take measures to afford the relief which is so much needed.

All of which is most respectfully submitted.

(Signed) T. C. THEAKER.
Commissioner of Patents.

Important Astronomical Discovery.

M. Schiaparelli, Director of the Brera Observatory at Milan, has announced the elliptic elements of the orbit of the meteoric shower of last November, in a comparative view with those of the orbits of two late comets—that of 1862 and the first of 1866—pointing out the important coincidence of all their details, to a fraction of a degree in most cases. Thus, the revolution of the comet of 1866 is calculated as 33.18 years, corresponding closely to that of the swarm of shooting stars. Comparing with the great comet of 1862, Schiaparelli gives for the orbits of the shower and the comet respectively the following elements, the co-incidence of which will be found very striking:—longitude of perihelion, 343° 28′ and 344° 41′: longitude of ascending node, 138° 16′ and 137° 27′: inclination of orbit, 64° 3′ and 66° 25′: perihelion distance, 0·9643 and 0·9626: perihelion passage, August 10·75 and 22·9.

Le Verrier ("true to his antecedents," says the Paris correspondent of the *Chemical News*) has done M. Schiaparelli's discovery the honor of adopting it as his own, and reproduced it with some elucidation in a lecture at the Academy of Sciences January 21st. He also addressed a public letter on the subject to Sir John Herschel, which with the reply was published in the *Moniteur*, and all without the least allusion to Schiaparelli, who had published his comparative calculation in the observatory bulletin for Dec. 31st, and a complete mathematical theory of the phenomena in *Les Mondes* of January 25th.

M. Le Verrier is quoted to the effect that the tricennial shower is a swarm of asteroids coming toward us from the depths of space, at regular intervals, and returning toward the superior planets. A body coming from a distance, with great velocity at the moment when it attains the minimum distance of the earth from the sun, could not be fixed in an orbit of one or two years by the feeble action of the inferior planets. This truth finds a physical proof in the fact that the shower of falling stars which repasses the earth every thirty three years is not deranged in the configuration of its orbit, but returns at regular intervals. M. LeVerrier also assumes that the mass of shooting stars could not have been introduced and thrown into its actual orbit but by some energetic disturbance; and remarking that its orbit crosses that of Uranus, concludes that all the phenomena may be explained by the collision of a globular cluster with Uranus at about the year 126 of our era. The latter suggestion meets with doubt, and it is remarked as to the period, that passages quoted by M. Schiaparelli in his article, from the ancient Indian poems, seem to show that the November meteoric shower had been observed long before A. D. 126.

New French Telegraphic Machines.

One of the latest inventions in use, that of M. Neel, consists of a dial on an axis, lettered with the proper alphabet in a circle, moved by clockwork, and stopped at will by means of the electric current. The dial being covered by a screen with a single perforation, each letter is brought to the aperture as it is wanted, and read off at the receiving station. This instrument is so simple and requires so little practice, that it has been adopted in France for railway and postal purposes. A simple form of battery said to be very effective and economical, is in use on French telegraphs. It consists of a rod of zinc forming one pole, in a porous vessel which is enclosed by a carbon cylinder covered with crushed carbon and peroxide of manganese, constituting the other pole. Only one liquid—a solution of chlorhydrate of ammonia in water—is used. The carbon and manganese last a long time and are cheaply renewed. A curious device designed to utilize the whole velocity of the electric current, has been invented by MM. J. Vavin and G. Fribourg. As we gather it from an obscure description in a Paris letter, the system is about the following. The main wire is ramified at each end into eleven short isolated small wires. The elemental parts, eleven in number, of all the letters, are cut out from plate metal and ingeniously arranged (each in connection with one of the small wires) in a group in which any letter may be seen by suppressing the parts foreign to it. The prepared or conductive paper for sending dispatches is stamped with rows of this composite figure, and the letters of the despatch are formed by tracing the proper elements in each successive figure with insulating ink. The machinery at each end of the line (we infer) brings each of the eleven wires into and out of circuit in rapid succession and invariable order, conveying from each part of the traced character on paper at the sending station to the correspondent type in the group at the receiving station, a magnetic action or interruption, as such part is traced or untraced with the insulating ink, and thus automatically printing one letter at each revolution of the series. Another French machine invented by M. Alphonse Joly, "special agent of the administration of telegraphs," prints the despatch at both ends of the line at once, thus verifying, includes among its characters the figures and points, and transmits 120 to 180 letters per minute.

Editorial Summary.

THE number of vessels reported lost during the year 1866, was 554, valued at $13,975,000.

THERE were 2,407,000 of the new five cents coined at the Philadelphia mint in December last.

THE New World still leads the Old in telegraphy. America now has 90,000 miles of telegraph lines; Europe 60,000; India 3,000.

FLATTERY is the oil of the machinery of society. All are susceptible to it; and he that thinks he is not, flatters himself in the outset.

A QUICK PROCESS for getting drying linseed oil is given by Dr. Dullo: boil the raw oil for two hours with binoxide of manganese and hydrochloric acid.

SPAIN AND BRAZIL have abundance of coal, but import the article at heavy cost from England, for want of enterprise to work their own mines. It is believed that a coal field fringes the coast of Brazil from the river Platte to Cape St. Roque.

PUDDLING is performed in a number of English iron works, by an automatic machine driven by steam, closely imitating the movements of the puddling tool as worked by hand, and giving, as claimed, an economy of nearly half in the consumption of coal.

METEORITES—assuming them to be planetary specimens—show by their analysis that peridot, which is found in some of our lowest rocks, is, as Daubree, the investigator of this subject, describes it, the universal scoria, and that oxygen is also a universal element.

LIGHT SUBMARINE CABLES.—An English inventor proposes to give to telegraphic cables a buoyancy which will prevent their parting from strain in paying out, and facilitate raising them, by means of a coating of ground cork mixed with india rubber.

PHOTOGRAPHIC.—The Paris Gas Company has decided to manufacture alkaline sulpho-cyanides and especially the sulpho-cyanide of sodium, on a large scale, at the request of the Photographic Society. The price will be three francs the kilogramme, and sixty tuns can be produced yearly.

A MALLEABLE CAST IRON of great strength, toughness and hardness, is reported to be produced by a secret process by McHaffie, Forsyth & Miller, of Glasgow. It has been used under important contracts for propeller screws, mast tops, hawse pipes, etc., etc. The teeth of pinions cast by this process have been hammered down to the solid boss without cracking.

A HINT FOR THE PATENT OFFICE.—A correspondent complains of the difficulty of finding different models or even classes of models in the Patent Office, and suggests the improvement of having the localities of the several classes marked by conspicuous signs, and the subject, date and grantee of each patent stated in a neat and plain inscription over the model.

PUTTING OUT A FIRE.—During the process of extinguishing the fire in the colliery of Clackmannan, near Stirling, England, in 1851, about 8,000,000 cubic feet of carbonic acid gas were required to fill the mine, and a continuous stream of impure carbonic acid was kept up night and day for about three weeks. The mine extended over a surface of twenty-six acres, and had been thirty years on fire.

THE SILK COLLODION newly invented, has long been obtained, or something like it, by the Chinese, from the contents of the silk worm which has been prevented from spinning. The matter is found in a thickened mass or gum, and is made into a transparent varnish. It is also spun (as the gum is said to have been spun lately by a Frenchman in a still earlier stage of its formation in the mulberry tree) and forms a very strong thread, used for fishing lines and snells.

IMPROVEMENT IN WATCHES.—An English manufacturer has invented an arrangement of watch movements by which the full-sized balance wheel of the English whole-plate watch is carried in the thin flat case so much preferred for convenience, but hitherto excluding the perfection of structure and durability. A Mr. Barlow has patented a simple contrivance by which the only figures of the dial that appear are those of the current hour and minute. A perforated screen is made to revolve instead of hands over the dial.

PATENTS AND PROSPERITY.—The *Scientific Review* (London), commenting on the remarkable exhibit of our Patent Office, makes a suggestion to the effect that the relative commercial prosperity of different countries seems to bear an intimate relation to the encouragement and activity of invention, as indicated by the spirit of their patent laws and the number of patents granted. Witness England, France and America, progressive in laws and arts, in contrast with Switzerland; China and Japan, wedded to the ways of a younger and cruder age, as if the man should look back to boyhood for his model, and glory still to think, to speak, to act as a child.

SOUND AND COLOR VIBRATIONS.—It is calculated that the deepest note which the human ear perceives as a continuous sound, is produced by 16 vibrations in a second: the acutest by 48,000. The extremes of color are red and violet; the former given by 458 billions of vibrations per second, and the latter by 727 billions. The relative velocities of light and sound, and the relative refinement of the media through which their effects are conveyed, are illustrated by this coin parison.

MOUNTAIN ATTRACTION.—The pendulum experiments connected with the great trigonometrical survey in India, have shown that, contrary to previous theory, gravitation is less powerful as we approach the Himalaya mountains; corroborating the Astronomer Royal's opinion that the strata below the mountains are less dense than those beneath the depressed portions of the surface. Nothing could be more probable, than that the upheaved portions of the crust should be the weakest.

THE PONTOON RAILROAD BRIDGE over the Rhine, or that part which rests on pontoons, is 768 feet long. The connecting ends of the shore approaches are adjusted to the rise and fall of the pontoons by a screw gear. The pontoons are coupled in sets of two or three, and each set can be readily removed for the passage of vessels and replaced. They are 65½ feet long, and sustain a roadway of about 40 feet in width, the central portion occupied by the rails, and the space on each side devoted to ordinary traffic. It has been in use about twenty months. The sinking of each pontoon under the locomotive is said to be only one-third of an inch.

ELECTRICITY AND ALTITUDE.—M. Matteucci has found that if the surface of the earth at different altitudes be connected by a conductor, a constant current of electricity will flow from the lower to the higher point; the intensity of the current increasing with the difference of the altitudes. Thus, between Florence and Turin, the deflection of the galvanometer from the current passing through it was from 15 to 20 degrees; between Pontedera and Volterra, from 20 to 25; and between Aoste and Courmayeur, from 40 to 50. Atmospheric changes, however, modify of course the effects, as do also diversities of latitude and geological formation. The aurora borealis and the variations of terrestrial magnetism are supposed to have an intimate relation with this distribution of electrical conditions.

A MONSTER SAW.—At No. 2 Jacob street, this city, we saw, a few days ago, a circular saw intended for the Paris Exhibition, which is said to be the largest ever manufactured. It is 88 inches, or eight feet four inches, in diameter, of one solid plate, from the works of Messrs. W. Jessop & Sons, England, and weighed, before finishing, 590 pounds. The saw is one of Emerson's patent, having movable teeth which are secured in the plate by V-shaped grooves with corresponding tenons and one rivet to each tooth. The thickness of the finished saw at the center is No. 2, Stubbs' wire gage, and at the edge, No. 5. The saw was made by the American Saw Company at their works at Trenton, N. J. It will be a prominent feature of American industry at the Paris Exposition.

A VALUABLE FIRE ESCAPE has been introduced in England in a form convenient for travelers, and as safe and easy to use as a flight of stairs. Within a thin metallic case only 7½ inches in diameter, are coiled on a pulley thirty feet of light, strong and flexible steel-wire rope or tape, passing out between rollers adjusted by a hand screw to any desired pressure, and terminating in a hook for fastening to a window seat. A chair for the body, formed of leather straps, is attached to the case, and the hook being secured to the window seat, the person seated in the chair may regulate or arrest at pleasure his own descent, by means of the screw. By using fine steel wire, woven into a tape, sixty feet might be coiled in a smaller case than that above described, making a perfect fire escape portable in every one's carpet bag.

DOMESTIC ECONOMISTS may try the suggestion of covering the bottom of a fire grate with a plate of boiler iron or the like. Dr. Samuel Warren (author of "Ten Thousand a Year," and now recorder of Hull) asserts from experience that by this means one third of the coal may be saved with an increase of warmth. The iron plate evidently acts as a reservoir and radiator of the heat in the downward direction where it is most useful, and strengthens the combustion above it. The layer of ashes which usually receives the downward heat, absorbs it with avidity and scarcely radiates it perceptibly: as is proved by the fact that a grate is quickly burned out by an accumulation of ashes under and in contact with it, which without contact would be quite harmless. The capacity of ashes for "keeping" fire (*i.e.* heat) also proves that it should never be avoidably left in a position to absorb the heat, where active radiation is wanted. A fire clogged with ashes gives out, for this reason, palpably less warming effect than a clean fire, for the same amount of fuel. If the plated grate above suggested be not kept clear of ashes, the heat in the ashes will be largely withdrawn into the plate by contact, and thus utilized; but the plate or grate, whichever is uppermost, will be rapidly burnt out. The best economy of both heat and apparatus, is to keep the plated grate clear, and probably a further saving would be effected by allowing the hot ashes to be distributed upon a lower plate freely exposed to the atmosphere of the room and frequently cleared: