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(Illustrated articles are marked with an asterisk.)

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 245,

For the Week ending September 11, 1880.

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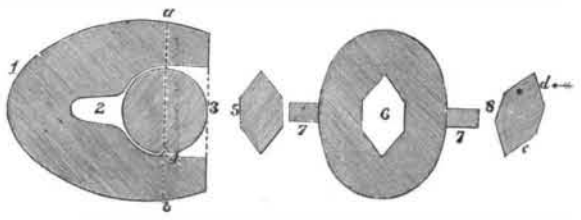
A NOVEL PROJECTILE.

A radically new type of cannon shot has been proposed by a general in the British army, to meet the novel conditions of penetration necessitated by the monitor-type of war vessels. However modified in details of construction the war ship of the present conforms more and more to the monitor principle, in the submergence of the hull and its protection by means of armored sides sloping at an angle calculated to send projectiles glancing off harmlessly; and the indications are that the war ship of the future will always present a turtle back to the enemy's guns, rather than the high vertical sides of the old style of ships.

Against armor of this sort but little is gained by increasing the weight of projectiles and the range of guns. The cylindrical bolts, spirally rotating, may be irresistible when fired against a vertical target; but they are hurled in vain against a ship with no sides to batter. Accordingly, General Hutchinson proposes, in the current issue of *Macmillan's Magazine*, a projectile having a disk-like form and a vertical rotation. Instead of glancing from a flat-armored ship, or from water, such a shot must of necessity maintain its line of motion; and with heavy shot no slope however slight given to armored decks or bottoms could save them from penetration. With the rotation of an advancing carriage-wheel the upper edge of the projectile, on striking a ship's bottom, would receive an impulse upward and crash through any double bottom or cellular compartments. With the reverse rotation the lower edge would receive an impulse downward, and the whole momentum of the projectile would be brought to bear like a heavy circular saw upon the deck impinged upon.

The rotation to be given to the projectile is determined by the position of the catch in the muzzle of the gun, as shown at 4 in the accompanying engraving. No rifling of the gun is required for such a projectile, and all the surfaces of the disk are therefore smooth, so that there is nothing to check rotation in the longest flights. Another advantage claimed arises from the shortness and corresponding lightness of the gun required for this projectile. The disk rolls out of the gun unretarded by rifling; there is little or no recoil of the gun; the initial velocity of the shot is great, since it does not have to drive out a column of air packed before it; and with its sharp edge, and little or no vacuum in its rear, the shot is calculated to have long-sustained velocity. That the rotatory motion must be preserved is shown by results obtained by a small experimental gun.

For land use General Hutchinson proposes a projectile of any shape having the rotation of an advancing wheel—"a projected mitrailleur, effective at an immense distance, discharging its bolts with a horizontal trajectory without destroying its efficiency as a rapidly rolling shot"—to be composed of "many laminæ loosely hung on an axle (coned from the center), which, separating during their vertical flight and whirling rapidly along the ground, would prove most destructive to cavalry and infantry."



The construction of the gun and the projectile will be made clear by the engravings. The reference figures indicate:

(1.) Vertical longitudinal section of gun. (2.) Powder chamber. (3.) Section of disk projectile through major axis. (4.) Notch in circumference of disk, and catch in muzzle. (5.) Section of disk through minor axis. (6.) Transverse section of gun through *a b*. (7.) Trunnion. (8.) Section of disk through minor axis inclined from a horizontal plane. A side wind blowing in the direction of the arrow acts more forcibly against *d* than *e*, and therefore tends to make the disk travel more vertically. The influence of a side wind on a flat-sided, round-edged disk (the central section of a sphere) would be just the reverse, as could be exemplified by throwing a flat stone with a spin.

STRIKING FIGURES ABOUT COTTON.

A prominent New England manufacturer, and the foremost authority on cotton statistics in the country, has recently written a letter giving some figures as to the growth and probable future development of the cotton industry, which are almost startling, and, coming from any less trustworthy source, would seem rather the dreams of a visionary than the sober conclusions of a well-informed business man. The writer first points out the increased product with free as against the former slave labor, and says: "The very habit of the cotton plant itself has been altered; it has been forced to mature earlier, and been made more prolific, and stronger to resist its insect enemies," so that, with probably a less number of laborers in the cotton fields now, the production is greatly in excess of what it formerly was, that of the present year being estimated as "at least 25 per cent in excess of the largest crop ever raised by slaves." The writer then says that from 6,000,000 bales of cotton fiber, after deducting enough seed for the next year's planting, there will remain 3,000,000 tons of seed, which, "if treated as a small portion is now treated," will yield about 90,000,000 gallons of oil, about 1,300,000 tons of oil-cake or meal, and hulls which it is thought may be profitably worked into "750,000 tons of paper," although, if these hulls be worked into the meal, they will serve as so much food for stock. The writer then figures out the possible proceeds, as an actual addition to the wealth of the country, of "the almost unrealized portion" of our present cotton crop in figures which seem almost startling, and says that "there never was so great a field suddenly opened for the introduction of new tools, new cotton gins, new presses, and for every variety of implements and processes."

Indeed, the principal object of the writer is to urge upon manufacturers and the public the importance of holding a great international exhibition, exclusively devoted to cotton. But why may not such an exhibition be held in connection with the great Fair which we are to have in New York in 1883? This city many years ago drew the great bulk of the cotton business from Boston, and is now the great mart of the country for productions in that line. It would probably require as large a building as we had in Machinery Hall at the Centennial to make a complete display of cotton machinery alone, but if the cotton manufacturers were all to enter earnestly into such a plan we cannot imagine any other one object to which so much space might profitably be devoted, and no one which would so readily command liberal contributions from New York merchants. Such an exhibition, if it gave, in the machinery shown, a sort of history of the growth of improvement in the cotton manufacture, would afford at once a help and a powerful incentive to further inventions and discoveries, whereby this large and at present "almost unrealized portion" of our cotton crop might be turned to profitable account, and nowhere else could the judgment of experts and the help of capitalists be so surely depended upon. We therefore earnestly commend this subject to the careful consideration of the Board of Commissioners who are now making the preliminary arrangements for the Exhibition of 1883.

The proposer of this plan of a comprehensive cotton exhibition puts his argument briefly as follows: "One or two men in agriculture (cotton raising), one in preparing and transporting, one or two women in spinning and weaving, are equal to the production of cotton cloth to meet the need of 1,000 to 3,000 inhabitants of the various parts of the world; yet this great force, this factor in commerce almost as potent as gold, and more so than silver, at the present day has had but the most meager attention. It needs now a place in which all new inventions may be concentrated." Inventors may know from the above something of the extended field which is before them as connected with this branch of business, and, although many very important improvements in the cotton manufacture have been made by American mechanics, the opportunities for a careful examination of machinery are not sufficiently general to promote that wide emulation which such an exhibition would invite and encourage. "The air is full of new efforts, new devices," says our author, to meet the needs of this industry, so let us by all means have such an exhibition, so that inventors can learn what has been done, and all join in the effort to bring out what is wanted.

A CURIOUS PHYSICAL PHENOMENON.

A curious physical phenomenon has, says *Nature*, been lately described by Dr. Grassi in the Proceedings of the Royal Institute of Lombardy. An apparatus is formed of three concentric vessels with an annular space of about two centimeters between the first and the second, and the second and the third. The outer space is filled with oil, and the next with water. The oil is heated by a gas furnace to a little over 100°, and the water boils. Then hot oil at, for example, 150°, is poured into the central space. This quickly cools to a temperature close to 100°. Dr. Grassi found that the central oil cooled more rapidly the higher the temperature of the outer oil; and with more delicate apparatus (in which the vaporized water was conducted and returned, and the outer oil kept at any requred constant temperature) he arrived at definite numerical results, which he tabulates. With the outer oil at a mean temperature of 129·9°, for instance, the time of cooling of the inner oil from 130° to 110° was 49 seconds; when the former was 105·1°, the latter was 57 seconds. Alcohol and ether gave more decided results. The maximum difference was obtained with ether; the outer oil being at 57·5°, the inner took 25 seconds to cool from 57° to 50° (7°); whereas the former being 39·3°, the latter became 39·5 seconds. In all the experiments the cooling of the inner oil commenced at a temperature little above the maximum of the external oil. When the outer oil is at a higher temperature, at a certain point the heat begins to prevail, which is transmitted directly from the outer to the inner oil. An analogous phenomenon (to which Dr. Grassi refers) was that of some members of the Accademia del Cimento, who found that the water in a vessel surrounded by ice cools more rapidly if the ice be heated to accelerate fusion.

DO PATENTS PAY?

The Washington correspondent of the Chicago *Times* has been making inquiries with respect to the benefits derived by inventors from patents, being incited thereto by a statement to the effect that not two patents in the hundred ever return to the applicant the amount of the government fees. On the authority of Mr. Arthur W. Crossley, chief of the issue division of the Patent Office, who for the past two years has made a special study of the value of patents, the statement above quoted is pronounced wholly unjustified by

facts; and Mr. Crossley's testimony will be abundantly substantiated by all who have had much to do with patent rights. Mr. Crossley refers to the weekly list of patents issued for evidence that a large part of them are assigned wholly or partly to manufacturing companies. In other words, the practical worth of the patents has been demonstrated, and Mr. Crossley has found, upon inquiry, that in nearly all cases the assignors obtain a good price for their inventions. He adds:

"Whenever I have had an opportunity to inquire of inventors as to the success they have had with their patents, the general testimony has been that the inventors have made something satisfactory out of their patents. A number of years ago, Secretary of the Interior Thompson caused an inquiry to be made in this same matter, and it was reported that the value of patents issued would average about $10,000 each."

When it is borne in mind that to a large extent patents are taken out to cover and protect devices and processes which are, so to speak, stepping stones to final inventions which alone are to be practically applied, this high average value is very significant. Then there must be taken into account the large number of inventions which the makers do not develop, not because of inherent worthlessness, but because the inventor's attention is turned to something else. In all such cases the patents pay indirectly in securing the registration and accurate description of the inventions, by which means they become a permanent part of the common stock of practical knowledge.

THE CONCORD SCHOOL OF PHILOSOPHY.

The *Christian at Work*, alluding to the closing of the recent session of the Concord School of Philosophy, rather sneeringly suggests that no new problems were solved nor any new impulse given likely to lift the moral world out of its orbit. The editor further says that he believes it was Mr. Joseph Cook who pronounced Mr. A. Bronson Alcott "the modern Plato." Perhaps he meant the Concord Plato. Every New England village is supposed to have a Plato, and, for all we know, a Socrates as well. But hemlock is not drunk now as freely as it was, and the modern Socrates is not as anxious as his ancient prototype was to be rid of the prison house of his body. It must be a very happy thought to a New England philosopher to imagine himself going down to his grave a nineteenth century Plato. Still, we fear the Phædo will be read when the Concordia is forgotten; and if a modern Plato usurps the olden one in public regard, it will be when English is a dead language, when the theories of its pronunciation are as many as the stones of Trinity spire, and when that New Zealand itinerant shall wander among the ruins of the New York Post Office and puzzle over the lost order of American architecture, or, mayhap, some antiquarian shall puzzle over a translation of a poem of Emerson's, and search in vain for the key to the unsolvable enigma.

TIN IN MAINE.

Among the mining interests just now showing signs of early and profitable development in Maine, not the least in importance is that connected with tin. The country has no lack of mines of gold, silver, copper, and lead; and if any failure should occur in those now opening in Maine, it is not likely that many besides their particular owners would be conscious of the deficiency. Nor is it likely that any great or radical effect would be wrought upon the general industries of the country, should the yield of these metals in Maine prove as generous as the most enthusiastic miners there anticipate.

With tin the case is different. For that metal we are obliged to go abroad, chiefly to England, and so long as England controls the market for tin, there is little hope of our wresting from her the larger traffic in tin plate. The development of tin mining at home to a degree sufficient to secure the practical independence of our vast industries employing tin and tinned iron would be worth much more to the country, indirectly if not directly, than any mine of gold or silver. Accordingly it may be safely said that the announcement of the discovery of extremely promising deposits of tin ore in Maine is likely to awaken a heartier interest throughout the country than any other mining reports from that land of mining booms. If any of Maine's mineral products fail, it is sincerely to be hoped that the failure will not be in tin.

Indications of tin were discovered in Maine some ten years ago; but then it was the popular belief that Maine was not nor ever could be a mining State. Recent explorations in the town of Winslow, on the Kennebec, a few miles above the State capital, have discovered half a dozen metallic veins of rich tin ore, in a rock formation precisely like those in which tin is found in Cornwall, Germany, and New South Wales.

As described by Professor C. H. Hitchcock, the rock which incloses the tin ores of Winslow is a mica schist or killas, associated with somewhat calcareous layers, and adjacent to a hard quartzite band, called an *elvan* by miners. Thirty feet width of vertical sheets of killas show twelve granite veins from half of one inch to three inches width, crossed, occasionally, by stragglers. These veins are full of crystals of tin ore (cassiterite) with the associated minerals fluorspar, margarite, mispickel, beryl, lepidolite, etc. The mineral, geological, and physical feature of the Winslow mine are, Professor Hitchcock adds, "identical with those common to the stanniferous districts of Europe," and "the ore seems to be sufficiently abundant to remunerate quite extensive outlays for mining operations."

Professor Forrest Shepherd describes the mineralized belt at Winslow as from thirty to forty or more feet in width. In a shallow pit where it has been uncovered five or more veins appear within a space of eight feet, a promise unequaled in any Cornwall or Saxony mine. And what is particularly encouraging, the Winslow deposits are, at the surface, equal in quality, Professor Shepherd says, to the best in Cornwall, and in a series of veins most favorably situated, while in Cornwall and elsewhere the veins are rarely remunerative except at great depths.

A company has been formed to develop the Winslow mine and to extend the exploration for tin in other parts of the State. The prospect of success is, to say the least, very encouraging. Should the yield prove abundant a particularly favorable opportunity would seem to offer for the manufacture of tin plate in that State, owing to the abundance of suitable iron ore and the proximity of forests for supplying the charcoal required to smelt it.

THE AMERICAN SCIENCE ASSOCIATION.

The twenty-ninth meeting of the American Association for the Advancement of Science began in Boston, August 25. The meeting was called to order by the retiring President, Prof. Geo. F. Barker, of Philadelphia, who immediately resigned the chair to the President-elect, the Hon. Lewis H. Morgan, of Rochester. President Rogers, of the Massachusetts Institute of Technology, delivered an introductory address, which was followed by addresses of welcome by Mayor Prince and Governor Long.

The secretary reported the deaths for the past year as follows: George W. Abbe, New York; E. B. Andrews, Lancaster, Ohio; Homer C. Blake, New York; F. A. Cairns, New York; Caleb Cooke, Salem, Mass.; Benjamin F. Mudge, Manhattan, Kan.; Thomas Nicholson, New Orleans; Louis Francis de Pourtales, Cambridge, Mass.

A committee was appointed to draft resolutions on the death of Gen. Albert J. Myer, and another to send by cable the cordial greetings of the Association to the British Association at Swansea, on the occasion of its fiftieth meeting.

The general session was then adjourned, and the various sections and sub-sections organized. In the afternoon, Section A was addressed by Prof. Asaph Hall, of Washington, who reviewed the recent advances in the science of astronomy, and the services rendered by men who, like Fraunhofer, have aided the work by optical and mechanical skill.

In the sub-section of chemistry, Prof. John M. Ordway reviewed the recent achievements of practical chemistry, and discussed its methods. The sub-section of anthropology was addressed by Major J. W. Powell, on the social organization and government of the Wyandotte Indians. In the evening the retiring President, Prof. Barker, delivered the customary address, his subject being, "Some Modern Aspects of the Life Question." He took the ground that every action of the living body is, sooner or later, to be recognized as purely chemical or physical, the life that science has to deal with having no existence apart from matter.

The second day's meetings were held in Harvard College, Cambridge. The appointed eulogy on the late Prof. Henry was delivered by Prof. Alfred M. Thayer, who dwelt especially on Prof. Henry's work as a discoverer in science. The practical side of that work was touched in connection with the experiments which proved so beneficial to the light-house and fog-signal service. One discovery—that lard oil, when subjected to a heat of 280° Fahr., is superior to sperm oil in fluidity and illuminating power—saves the Government $100,000 a year.

Prof. Alexander Agassiz, Vice-President of Section B, followed with an address on "Paleontological and Embryological Development," choosing his illustrations from a limited group of marine animals—*zaurchins*—having less than 300 living species, and more than 2,000 known fossil species.

The rest of the day was spent in the museums, laboratories, libraries, the observatory, and other buildings of Harvard College.

The reading of the 218 papers comprised in the programme was to begin on the third day, Friday, and continues until the final adjournment on Wednesday, Sept. 1. Nearly 600 members were registered the first day, and fully 500 new members have been elected during the two days completed at this writing.

MINING DEBRIS IN CALIFORNIA.

The California Mining Debris Commission, with Capt. J. B. Eads as consulting engineer, have lately gone over the Yuba River country to consider the plans proposed for the disposal of mining debris. If correctly reported, Capt. Eads favors the construction of brush dams rather than those of stone, as originally recommended by the commission. In his opinion, a series of brush dams across the river would entirely arrest the flow of sand and clay; and as fast as the brush is buried other layers might be added from time to time, gradually raising the height of the dam until the catchment basin is full.

A dam of this sort is proposed about eight miles above Marysville, where there is tolerably high ground on opposite sides of the valley. The plan contemplates the building of a brush dam nearly two miles long and seven or eight feet high to begin with. This dam would catch and hold a large quantity of debris, and become buried and strengthened by the deposit. From time to time additions would be placed upon top of the new foundation thus formed Proceeding up the river, the banks become higher, forming a broad and deep area between them for storage of matter to be checked by the dams. From this lower dam to the foot of the dumps from the mines there is an area of seven square miles to be filled by the debris, and were it filled to the depth of forty feet at the upper end it would not interfere with mining operations. Two miles higher is Point Du Guerre, a rocky point about sixty feet high, and extending into the canon or valley some distance. From this point to a higher one across the river it is proposed to extend the second dam, the length of which will be nearly a mile. Beginning with brush loaded with rock, and adding new material as it may be needed, a dam forty feet in height can safely and cheaply be built up. An abundance of willows can be cut for the dams along the river side, and Capt. Eads has great confidence in their efficiency for the work required. Below the dams, where the river banks are defective, brush wing dams will easily keep the current in place; and, with the stoppage of dams above, the concentrated water will quickly cut out a single deep channel.

Albert J. Myer.

Brigadier-General Albert J. Myer, Chief Signal Officer, Unites States Army, familiarly known as "Old Probabilities," died at Buffalo, N. Y., August 24.

General Myer was born in Newburg, N. Y., Sept. 20, 1828. He was graduated at Geneva College in 1847, and in 1851 received the degree of doctor of medicine from the University of Buffalo. In 1854 he was appointed assistant surgeon in the army. While on duty on the Texan frontier, where a clear atmosphere and broad reaches of plain offered superior facilities for signaling by vision, his attention was drawn to the possible advantages of a system of sight signals in military and naval operations. The result was the preparation of a "Manual of Signals for the United States Army and Navy," which was published in 1858. During the next two years he was engaged in developing a special signal service for the army, becoming Chief Signal Officer in 1860. His service during the war was brilliant and vitally important, and his advancement was correspondingly rapid. One of the most dramatic episodes of the war was the saving of Allatoona, Ga., in 1864, by bringing up troops by signals in time to relieve and defend that valuable post, the messages being sent over the heads of the enemy.

After the war General Myer introduced a course of signals at the naval and military schools at Annapolis and West Point, and was largely instrumental in establishing telegraphic communication with military posts on the extreme frontier, 5,000 miles of telegraph lines having been built under his supervision. In the spring of 1870 he was, by Act of Congress, charged with the special duty of developing a national system of meteorological service, which was accomplished within a year. The success of this system under his admirable management has led to the establishment of a uniform international system of simultaneous meteorological observation over nearly all the northern hemisphere; arrangements being made at the International Meteorological Congress at Vienna in 1873, for the exchange of one report of observations taken daily at the same instant over all the United States, nearly all of Europe, Northern Asia, and Northern Africa. It is seldom that a work begun by one man grows under his own supervision into a service of such far-reaching and comprehensive usefulness.

The Kelley Run Colliery Fire.

The attempt to quench the fire in the new slope of the Thomas Coal Company, near Shenandoah, Pa., by sealing the outlets and forcing in steam, has failed. The mine caved in August 24, and to all appearances the fire is beyond control. The alternative plan for quenching the fire with carbonic acid gas and nitrogen, undertaken by a Pittsburg firm, has also been abandoned, the flames having secured so large an opening to the outer air that there seems no possibility of cutting off the supply of oxygen.

A Rude Tramway.

Seven miles of log track are being laid at Essex Center, Ontario, connecting four saw mills with timber cuttings in the woods. The road is made of small trees, stripped of their branches, and laid end to end, like rails. Four cars are being built for the road, the rim of the wheels being concave, so as to run on the track, and the axles turned longer than the hubs of the wheels to allow play for any unevenness. The trains will be drawn by a steam locomotive.

Hollow Ground Razors.

It is not long since it was confidently asserted that, even if the required quality of steel could be produced here, the United States could never compete with England in the manufacture of razors and other fine cutlery, owing to the excessive cost of grinding and finishing. Like a good many other "insuperable" obstacles to American success in the arts, this seems to have been pretty well overcome, since large quantities of Sheffield razor "blanks" are now sent here expressly to be finished. It seems that the art of "hollow grinding," German style, requires a degree of skill a little beyond that of the Sheffield workmen. Accordingly Sheffield manufacturers have to pay double freight across the Atlantic to secure the fine finish to their razors that the trade now demands.