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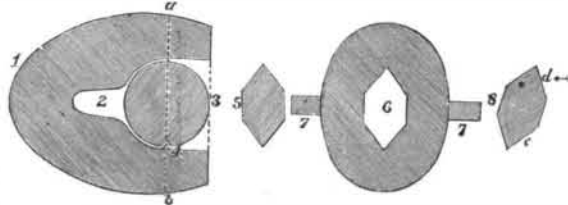
A NOVEL PROJECTILE.

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 laminae 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 required 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