

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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VOL. XXXVI, No. 18. [NEW SERIES.] Thirty-second Year.

NEW YORK, SATURDAY, MAY 5, 1877.

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THE EUROPEAN WAR AS AFFECTING AMERICAN INVENTORS AND FARMERS.

The latest advices report that a war between Russia and Turkey is almost inevitable. Much as such a calamity is to be deplored, especially in these days when many have hoped that peaceful arbitration of national differences would permanently supplant the appeal to the sword, it cannot be doubted but that the conflict, if prolonged, will prove of material benefit to the people of the United States. And in no instance is this so apparent as in the great impetus which will be given to agriculture and to invention.

The two great grain-producing countries of the world are South Russia and the valley of the Mississippi; and between these sections there exists active competition for the supplying of the nine to fourteen million quarters of foreign wheat required by England, and the large additional amount needed by other European nations. Already in this rivalry our Western farmers are far ahead; and statistics, recently gathered by the Odessa (Russia) Committee on Trade and Manufactures for the information of the Russian Government, show with what remarkable rapidity this advance has been accomplished. The proportions of wheat supplied by Russia and the United States to England during the seven years from 1867 to the close of 1873, the period over which statistics have thus far been compiled, are as follows:

Table with 3 columns: Year, Russia, per cent., United States, per cent. Rows: 1867, 1868, 1869, 1870, 1871, 1872, 1873.

The committee say that they have reason to believe that the result for 1874 will be found even less favorable for Russia. It will be seen that within seven years the two countries have relatively changed places; and the Odessa committee frankly admit that in the near future the United States will be "so absolutely the controller of the prices of the London market that we shall be utterly unable to compete with them." Nor is this due to any decrease in the Russian supply, which the foregoing figures might seem to indicate had fallen off from 44 to 21 per cent in the period mentioned. Notwithstanding the increase from the new ports of export, Sebastopol and Königsberg, the Odessa export shows a constant increase in quantity as well as in value; and Mr. Arthur Arnold, from whose recent work relating to Russia we take the above facts, adds that "the conviction is forced upon us that Russian agriculture is stationary in comparison with the boundless and successful activity of the United States."

There are obviously two great events, either one of which, apart from the natural progress indicated by the foregoing, will tend to secure to us the supremacy of the grain trade. First, the magnificent success of Captain Eads' opening of the Mississippi, through which loaded vessels will be able to proceed directly from their river points of loading to Europe, and thus the export costs will, it is stated, be reduced fully 50 per cent; and second, the coming war, which bids fair to paralyze Russian agricultural activity, especially in the grain-producing country which is nearest to the territory of her enemy.

Already the market reports in this city show that, in view of the conflict, prices have been affected. Corn has advanced ten cents a bushel within a week, and the same increase has taken place in Chicago, doubtless through the same being held for further advance. If other nations become involved in the conflict, as appears possible, a wonderful effect on our market is anticipated by the Produce Exchange dealers, who are watching events. The closing of the Black Sea and Danube would send much of the shipping interest of Europe here, and low ocean rates would result; while this country would be called upon to make up the deficiency in the grain supply thus cut off. At the present time, owing to last year's short crop, we have little corn to spare; but next year, should the war continue and the crop prove good, the demand for both wheat and corn will, it is believed, produce one of the most exciting markets known for many years, and give large additions to the wealth of the country.

Another result of the war will probably be the requirement of the belligerents of improved weapons; and, indeed, for some time past New England factories have been filling Turkish orders for arms and munitions. We need hardly point out that the inventors will be by no means the class least benefited by the probable turn of affairs. The increased demand for grain will necessitate improved means for cultivating and harvesting, as well as for developing, the great fertile plains of the West, which will be converted into new grain-yielding territory. New means of clearing land, new draining implements, new plows and cultivators, new harvesters, new applications of steam power to agricultural machines, which will enable farmers to deal with immense fields and immense crops more rapidly and with greater economy of time and labor, will be needed. New grain-carrying vessels, new means of loading, new elevators, storage warehouses and granaries, new means of transportation—notably light, portable farm railroads—will all be called for. Such inventions will be needed at home. From abroad will come the demand for new firearms, torpedoes, cannon, accoutrements, camp equipage, field telegraphs, new signal systems, new projectiles, new adaptations of recently investigated explosives, and so on through the immense category of inventions so prolifically produced by American inventors

during our own war. The merchants are already watching their opportunities; the farmers will do likewise.

HOTEL FIRES.

The Southern Hotel, one of the largest and finest hotels in St. Louis, Mo., was recently burned. The fire broke out at a little after midnight. The house was filled with guests, many of whom were roused from sleep only to find all avenue of escape cut off. About a score of people, it is estimated, have lost their lives, and the building is wholly destroyed.

So long as the law permits the construction of edifices which are not fireproof, the public have a right to insist that such structures shall contain ample means for preventing fires and for the safety of the inmates. The recent Brooklyn Theatre conflagration has been the means of directing attention to the condition of auditoriums all over the world; and it has probably resulted in a great many precautions being taken which otherwise would not have been suggested. Hotels are nearly as inflammable as theaters, and they should be as carefully protected. The St. Louis building, although it is reported to have had an elaborate fire alarm system, with hose and taps on every floor, proved, by the rapidity with which it was consumed, that means supposed to be adequate were not so; and further showed that, for such edifices, not merely ordinary but extraordinary safeguards are required. Lofty hotels should have a fire escape at every window, besides bridges, wherever possible, leading from both roof and windows to adjacent buildings. It would cost very little also to place in every room about 60 feet of stout chain, firmly attached to the wall near the window. There should be huge tanks of water on the roofs, holding a supply sufficient to drench the building. The gas pipes also should have a water connection, so that every gas burner could be transformed into a fountain at will. Again, both in theatres and hotels, it has been found that shortly after the outbreak of the fire the gas has gone out, probably owing to the products of combustion cutting off the necessary supply of oxygen, or a pressure being generated which forces the gas back in the pipes. The remedy for this is the provision of separate lights, such as candles inclosed in tight glass lanterns connected with a ventilating tube or flue—or electric illumination might be used. There are few large hotels in the long halls of which a stranger might not easily mistake his way, and so, in case of danger, waste precious time. A hand balustrade along the wall leading to the stairways would in this respect be of the greatest use, even in the dark; and the walls besides might have directions painted on them in prominent characters for daytime use.

We have illustrated and described a number of simple fire alarms which give warning automatically. We published one quite recently, which was especially invented for hotels, it taking the place of the ordinary electric bell press button. This can be set to any temperature; and when the dangerous degree of heat is attained in the apartment, electric connection is instantly established, and an alarm, situated in any prominent locality, is sounded. It might be a good plan, also, in constructing hotels, to follow the compartment system, that is, to carry two or three principal partitions of solid brick clear through the house; and wherever there are openings, to provide them with heavy fireproof doors. In this way, one part of a building might be sufficiently isolated from the adjoining portion to allow of the prevention of the spread of fire to the whole structure. Mr. R. G. Hatfield, a well known architect of this city, says that iron beams and ties in flooring are not to be commended. The experience of Chicago and Boston shows that these beams are not to be trusted, since a moderate degree of heat deprives the metal of its power of resistance; and softened by heat, they yield by bending, and fall. Instead of iron beams and intervening brick arches, it is proposed to use wooden beams laid close, thus forming a solid floor of timber. Wooden beams are ordinarily set apart with spaces between them, and thus constitute, with the flooring and ceiling, an excellent arrangement for kindling or extending a fire. Setting the beams in contact with each other fills up the air-spaces and prevents the fire acting upon the beams, except in charring the surface to a small depth. There is reason for believing that a floor of this construction would resist fire better than one of iron beams and brick arches, while its cost at present prices would be but four sevenths of the cost of the latter.

If travelers and others who patronize hotels would take a few simple precautions for their own safety, there would be less of the loss of life that is now common. Hotel keepers will run their edifices skyward, as high as can be made to pay; but people should realize the risk incurred in accepting such quarters. By the aid of the elevator, the most aerial garret is perfectly easy of access; but it is well to remember that that elevator shaft in time of fire becomes a chimney to create draft, and generates a column of flame, which speedily attacks the lighter-built upper portion of the edifice. We know several cautious people with whom a coil of rope is as much a part of their luggage as their satchels. The rope takes up little room, and it may save life. A light wire ladder, which can be compactly folded, is even better. Some inventions of this kind are already in the market; but there is plenty of room for improvements. A wire gauze respirator, which can be tied over the nose and mouth, is another convenient article to have at hand when it becomes necessary to venture through smoke; or a wet towel similarly applied is equally good—especially if the wearer will keep on his hands and knees, close to the floor, where the least smoke is present. There is an excellent opportunity for inventors

to devise convenient and suitable devices of the kinds mentioned. Let us have some new ways of permanent protection for buildings; and meanwhile, who will be the first to put up a light ladder, a coil of stout rope, treated with tungstate of soda or other fireproof wash, so as to be uninflam- mable, a respirator, and a self-lighting lantern, all in a case, which will take up less room than a Patent Office model? In- ventors might contrive a trunk, satchel, or portmanteau, with these arrangements stowed away in a special receptacle, and containing besides a box for holding valuables, made of asbestos pasteboard, which will withstand even the heat of a fierce furnace fire for some time. Pocketbooks of this material might be made, which, if lost in a burning building, would stand a good chance of being found in the ruins; perhaps, however, with the contents destroyed, unless they contained coin.

#### OUR IRON SHIPBUILDING INDUSTRY.

Messrs. David Brown & Co., a London shipping house, has recently issued a circular, practically addressed to Amer- ican shipowners, on the substitution of iron for wooden ves- sels, and on the supposed superior advantages existing in England for the construction of the former. After setting forth the advantages of the iron ships, the circular says: "It behoves American shipowners, therefore, to consider their disadvantageous position, in not being allowed to compete with those of all other countries by buying their ships in the cheapest market. The protective laws of the United States might serve the interests of shipbuilders if any builders pure and simple existed; but it does appear a hardship that the owners who, for the most part, now build their own ships, should be hampered by such restrictions, and have their shipping property confined to such ships as are built only in the United States. Iron ships in this country can now be built at about £13 10s. to £14 per ton, and with most profuse outfit."

It is true that American owners have not adopted iron sailing vessels to any such extent as have their English com- petitors; but there are reasons, notably the cheapness and abundance of wood in this country, the skill of our con- structors in producing fast and durable vessels of that ma- terial, besides others, which tend to account for the slowness of the substitution. The assertion in the foregoing circular which calls, however, for an exposition of the facts, which carry with them its denial; is that relative to the absence of builders in the United States, and the further inference that England is the cheapest market. The *New York Tribune* has recently published a valuable review of our iron ship- building industry; and this, in connection with the elaborate report which *Engineering* has lately given of shipbuilding on the Clyde during the past year, forms the basis of the fol- lowing:

Five years ago, in all the items that go to make up the cost of a ship, England possessed an incontestable advantage. Raw materials and labor were much cheaper than in the United States, while the facilities for shipbuilding were greatly superior. But in this short interval material changes have been accomplished. Shipbuilders in this country have erected rolling mills, furnaces, and shops; and a remarkably large amount of the best labor-saving machinery known has been invented and put in operation. One single builder, Mr. John Roach, has spent, including his original capital in- vested, some \$2,000,000 in supplying his yards and shops; and other builders have not fallen behind in proportionate outlay. Again, the price of iron has been reduced. Five years ago, pig iron ranged from \$45 to \$70 per ton in the United States. Since then, our imports, in view of the pro- gress made in the development of mines, have fallen from 800,000 to 165,000 tons, and the price is reduced to \$18 per ton—as cheap as anywhere in the world. Copper has fallen so in price that we are now exporting it. The great item, however, is labor, the cost of which constitutes fully 60 per cent. of that of a steamer, and at least 50 per cent. of that of a sailing vessel; or, starting with the pig iron and sawn lum- ber, it is estimated to amount to 80 per cent. of the cost of a steam vessel. This we have reduced by the invention of new labor-saving machinery, which the English do not em- ploy; and a reduction has also taken place owing to the gen- eral shrinkage in values, so that the price of labor here and in Europe is more nearly equalized. Mr. Laird, the great English shipbuilder, during his recent visit to this country, admitted that, with the appliances in use in American ship- yards, it might be possible, all other things being the same, for Americans to produce as cheap a ship as the English, and even pay the men better wages. It is not a question of "might," however, for our builders are now standing ready to furnish the class of vessels, specified in Messrs. Brown's circular, at Clyde prices; and Mr. Roach offers within the present year to complete any number of iron sailing ships, from one to six, for the same price (\$67.50 to \$70 per ton), referred to, and in currency, and to deliver the vessels on the other side, provided he has the privilege of taking a cargo in them. He guarantees them further to receive the best ratings from European and American insurance com- panies.

Our iron shipbuilding industry began in 1868; and since that time there have been built for American owners 251 iron vessels of all sizes, having a total tonnage of 197,500. The annual aggregate of iron vessels now built in this country is over 30, worth from \$12,000,000 to \$15,000,000; and the business is rapidly expanding. These figures are of course small beside the immense totals of the Clyde industry, at present; but for the four years beginning with 1872, the re-

turns shown by the latter are phenomenal, and the 1876 re- port indicates notable diminution. Vessels aggregating 224,000 tons were built in 1872; in 1874 the figures showed 266,000 tons; in 1876, 204,770 tons. It is suggestive to note that since 1873 the number of iron screw steamers built on the Clyde has steadily fallen off. Thus, in 1873, 125 were built; in 1874, 120; in 1875, 113; and last year but 83. Paddlewheel steamers show a slight increase, as follows: 1873, 14; 1874, 10; 1875, 13; and 1876, 16. Now in the face of this decline abroad, Roach alone reports the construction of 33 iron steamers, aggregating 68,150 tons, since 1872. This is an average of 13,630 tons per year for this builder, on these vessels alone (not counting all kinds, "from the tiniest yachts to ironclad ships of war," such as are included in the English reckoning); and this average, compared with the figures of individual English builders for 1876, would place the American concern third on the list—above John Elder & Co., and far ahead of the Napiers, whose total ton- nage for 1876 was but 9,111.

It needs but a brief examination of Mr. Roach's tabular statement, showing how he has invested nearly \$15,000,000 in iron shipbuilding within five years, to perceive how vastly profitable to the country this industry promises to become. Here, for instance, is the list of items of material and of nec- essary expenditures: Plate iron, angle iron, deck beams, rivets, bar iron and forgings, pig iron, steel, ingot copper, sheet copper and brass, tin, spelter, brass tubes and condenser tubes, iron boiler tubes, brass boiler tubes, lumber, paints, files, hardware, bolts, nuts, rubber, oil waste, etc., steam pumps, windlasses, boats, wire and manilla rope, sails, blocks, steam and gas pipe and fittings, anchors and chains, lead, plumb- ing, coal, improved facilities for manufacture, new inven- tions in machinery, sundries, lamps, glass, masts, cap- stans, etc., and wages. Of Mr. Roach's \$15,000,000, over \$7,000,000, or about 50 per cent, have gone for wages alone; plate iron takes about 17 per cent, and wood, cotton, hemp, etc., costs about 5 per cent of the whole. Sifted down to the crude raw material, it will be found that 80 per cent of the total cost of a vessel for skilled labor is a low estimate, and that 90 per cent would be nearer. Inspection of the list also shows at once what a large number of trades are directly benefited.

It may be added that our iron ships are not merely a source of national prosperity, but an important addition to our naval strength. All are constructed so as to be adapta- ble as men-of-war in case of necessity. Should such need ever arise, the government has at its disposal, free of cost, 50 iron screw steamers capable of steaming at the rate of from 10 to 14 knots per hour. In ten days, in other words, a fleet of better and stronger vessels than the famous Ala- bama could be gathered and equipped for predatory warfare on an enemy's commerce.

#### THE ADVANCEMENT IN MICROSCOPY IN THE UNITED STATES.

To all who take interest in the progress of scientific in- vestigation, it is a cheering sign that, in different parts of this country, the use of the microscope—that powerful appliance for investigating the secrets of Nature—is spreading rapidly by the establishment of microscopical societies in most of our large cities. At the late annual meeting of the American Association for the Advancement of Science, the members became acquainted with the Microscopical Society in New York city, which is in a very prosperous condition; and from time to time we notice, in various journals, reports of meet- ings of such societies which show that few of them are in- ferior in status to the Microscopical Society of this metropo- lis, of whose annual exhibition we gave an account in our issue of April 7. The accounts of the recent meetings in San Francisco deserve a place in our columns.

The San Francisco Microscopical Society has fifty resident and forty corresponding members; it holds semi-monthly meetings; and at the annual reception, twenty members ex- hibited their instruments before three hundred visitors. It has a library of two hundred and fifty volumes, and a cabi- net of six hundred slides, besides much valuable apparatus—acquired by purchase and donation. It appears that the new Tolles objectives had previously not answered the ex- pectations of the members, as a failure in resolving the de- tails of some difficult diatoms was reported. Now, how- ever, the President stated that, in justice to Mr. Tolles, it should be acknowledged that the fault did not lay in his ob- jective, but in the members' inexperience, and that intercourse with experts in this special branch of work had rendered the solution so simple and easy that it caused wonder that it had ever appeared difficult. The one-tenth inch objective of Tolles most satisfactorily accomplishes all that was claimed for it; while the one-sixth immersion objective, by the same maker, gave a clearness of definition that was wonderful, and far surpassed anything which the President had ever witnessed. Not only this, but this glass possesses such ample working distance and such great penetration that it is ad- mirably adapted for investigation upon animal and vegetable tissues, for which these qualifications, especially distance, are so necessary.

The President reported the formation of a class for in- struction in microscopy, under the tuition of the librarian, Mr. Clark. The formation of such classes is of great im- portance, and was impossible a few years ago, when the mi- croscope was regarded as a novelty and a toy, rather than as a tool for the acquirement of valuable and important knowl- edge.

This San Francisco society is likely to cause some rivalry

and emulation among other associations; and the New York society must actively push the science of microscopy for- ward or it will be overshadowed by the growing institution on the Pacific side of this continent.

In Harvard University it has been concluded to establish classes for laboratory work with the microscope, with special instructions in its use for botanical study, the preparation of anatomical and other objects, etc. Professor Goodale has charge of the course on phenogamic botany, and Professor Farlow of that on cryptogamic botany. Their names are an ample guarantee of the excellence of this newly estab- lished department.

The microscopic societies in the United States are attract- ing attention in Europe; and in a microscopic journal pub- lished in London, England, we find accounts of meetings in some of our large towns. From Dunkirk, N. Y., it is re- ported that Professor J. Edward Smith, of Ohio, read a most interesting paper on "The Use and Abuse of the Microscope as an Instrument of Precision." He propounded several new ideas, such as the use of lenses of the widest angle of aperture for all kinds of work, and demonstrated practical- ly his proposition by an exhibition of various objects, some of them illuminated by oblique light thrown at an angle of 75° from the axis of the instrument, and some by a dia- phragm plate perforated with an aperture of  $\frac{1}{100}$  of an inch in diameter, and with various amplifications from 500 to 2,000 diameters. Professor Smith also exhibited Tolles'  $\frac{1}{10}$  and  $\frac{1}{20}$  inch duplex objectives, of 180° air angle, and the President, G. E. Blackburn, M.D., a  $\frac{1}{2}$  inch Tolles' immersion objective of 95° balsam angle. In view of the importance and value of some of the tests exhibited, a resolution of acknowledg- ment and commendation was drawn up and urged by the members and guests present. The report of the meeting is a very creditable indication of scientific progress in the young city of Dunkirk, which twenty-five years ago, when it was the first terminus of the Erie railroad, was a most in- significant country town. Had its growth and intellectual society, now realized, been predicted, the statement would have been deemed incredible.

For the benefit of those readers not conversant with the latest improvements in microscopic objectives, and therefore perhaps ignorant of the expressions "immersion objectives," "angle of aperture," "balsam angle," and "air angle," we will explain these terms.

The immersion objectives are lenses of which the extrem- ity has to be used immersed in a minute drop of water, placed upon the slide. The advantages are that loss of light by two reflections, namely, from the upper surface of the slide and the lower surface of the lens, is done away with, as the water drop unites their two surfaces and makes the lower lens of the combination and the covering glass of the slide practically one body. Next, the distance is increased, and a powerful lens, of which otherwise the focal length would be too short to be used with a covering glass, may, by the immersion system, be used at a more convenient distance without changing the magnifying power. As a result of the short focal distance, the working distance is considerably in- creased; but the great advantage of these lenses is their wonderful clearness and definition, which are of the utmost importance in examining minute objects accurately, so as to obtain a correct idea of their structure and not to be misled by deceptive appearances to which ordinary lenses of short focus frequently give rise.

In regard to angle of aperture, we ought to state that ex- perience has shown that central illumination often drowns minute details in a flood of light, and that objects can be better seen by oblique illumination; but with the latter, with ordinary lenses, the visible field is darkened. The makers of lenses have in some instances contracted them so that, even by very oblique illumination, the light reaches the eye, and the field remains bright. The extreme positions in which the light may be placed sideways from the axis of the instru- ment, and still be thrown in the axis, give us what is called the aperture; and the angle formed by the lines of these positions is the angle of aperture. The air angle is that ob- tained when the light passes through air only; the balsam angle is that obtained when the light passes through a slide of which the object is preserved in Canada balsam. As different fluids have different angles of refraction, they of course influence the angle of aperture.

We shall keep watch for news of further proceedings of these valuable societies, and hope to hear of the formation of new ones in all parts of this country.

TRIALS have been made in Rome of a solution of chloride of calcium as a substitute for water in laying dust in streets, and the results are said to have been highly satisfactory. The dampness communicated to the road remains for a whole week. The road remains damp without being muddy, presenting a hard surface, on which neither the wind nor the passing of pedestrians or horses has any effect.

C. M. writes to point out that minute objects photographed in large size by the help of a microscope are properly termed photo-micrographs; and that the minute photographs which require a microscope for their explanation are called micro- photographs.

E. N. L. writes to point out that a cracker-packing ma- chine is needed, and a successful appliance of the kind would amply reward the inventor, especially as it would be useful in many trades in which similar articles have to be pre- pared for shipping.