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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

JAPANESE DARING ON LAND AND CAUTION ON THE SEA.

During the past few months of the struggle in the Far East, there has been a marked difference in the spirit with which the land and sea operations have been carried on by the Japanese. On land they have consisted of a succession of fiery onslaughts and almost reckless sacrifices of men, which is in marked contrast to the extreme caution with which Admiral Togo has handled of late the vessels of his fleet—a caution which is very different from the recklessness with which he sent his ships in under the very guns of Port Arthur in the earlier stages of the war. From the first, the operations of the Japanese army have been distinguished by the daring with which officers and men have made operative the masterful strategy of Gen. Kuroki—a combination of skill and courage that has resulted in an unbroken chain of successes for the Japanese arms. The difference just now between army and naval methods is to be attributed to a change in the conduct of naval operations that dates from the day on which the Japanese lost one of their finest battleships, the "Hatsuse." As we pointed out at the time, the sinking of this vessel by contact with a mine reduced the battleship strength of the Japanese fleet by fully twenty per cent; and this irreparable loss seemed to have brought home most forcibly to Admiral Togo the truth already well known to him, no doubt, that while losses to the army could be made good, and the gaps filled up by willing and brave recruits, losses in the battle line of the Japanese navy were absolutely irreparable so long as the war lasted.

For the wide field of operations, and the extremely difficult character of the work to be accomplished, the navy of Japan was pitifully small. Not only was it necessary to contain the crippled but still powerful fleet of Russia within Port Arthur, but the swift and powerful cruisers at Vladivostock had to be watched, and adequate convoy provided for the troops and supply ships by which the great armies of Japan in Manchuria were to be supplied with recruits, ammunition, and food-stuffs. These duties would task the resources of a fleet much larger than that of Japan; and when back of this there loomed the possibility of a second Russian fleet, embodying five of the newest and most approved pattern of battleships, arriving in eastern waters, for co-operation with the Port Arthur squadron, the task might well have daunted a greater maritime nation than Japan. Not only must Admiral Togo sink or destroy the eastern fleet of Russia; but he must do so, if possible, without the loss of a single battleship or armored cruiser; for should the Japanese admiral have to face the freshly-arrived Baltic fleet with two or three of his battleships sunk and the rest of his fleet heavily crippled, the command of the sea, as far as human foresight could forecast events, would pass to Russia, and the capitulation of the Japanese armies in Manchuria, cut off from their base of supplies, would be but a matter of time. It is considerations such as these, no doubt, that have caused the Japanese admiral to conduct his operations at longer ranges than he did in the earlier stages of the war. He has been content to hold the Port Arthur fleet of Russia securely within the harbor. Even when sorties have been made, it has seemed as though he preferred to fight long-range engagements rather than place himself within reach of the submerged torpedo tube or the ram of Russian battleships. Admiral Togo has a double task to perform. He must not only sink the enemy's ships, but he must do so and come out of the fight with his own vessels afloat and, as far as may be, intact. Should he steam into close quarters and succeed in sinking the six battleships of Russia at the cost of the loss of three of his own, the ultimate failure of Japanese arms on land and sea would be rendered all but certain by that victory; for with but two battleships afloat, the command of the sea would pass immediately to the powerful Baltic fleet upon its arrival in the Far East. Admiral Togo does not forget that this reserve fleet will include, as we have said, five of the most effective battleships ever built for a naval power.

The question is frequently being asked as to why the Japanese, with their evident superiority in seamanship and gunnery, do not close in and finish the Russian fleet at the first opportunity. The answer is to be found in the considerations which we have discussed above. The destruction of the Russian fleet, if Japanese strategy and tactics can have their way, will be accomplished either by long-range gun fire, or by torpedo-boat destroyer attack. Exact details of the results of the recent sortie of the Russian fleet from Port Arthur are not available at the time we go to press; but it is likely that in spite of the general engagement which is reported to have occurred, few, if any, of the Russian ships have been sunk, and what damage they sustained has been entirely from Japanese gun fire. It is the same necessity of fighting with a view to as little disablement to his fleet as possible, that has caused Admiral Togo to leave the Vladivostock squadron to an unmolested raiding of the high seas. It would be futile and disastrous to send his protected cruisers against the armored ships from Vladivostock, and Togo can ill spare any of his own armored cruisers from the important work of containing the Russian fleet within Port Arthur and destroying it, should it come out.

RADIO-ACTIVITY INDUCED BY THE EMANATIONS OF INCANDESCENT METAL WIRES.

In a paper recently read before the French Academy of Sciences, Mr. T. Tommasina records some recent experiments made by himself on monopolar electric dispersion, produced by a metal wire heated to redness by the electric current and placed either in parallel with the vertical disk of an electroscope or between two plates of a condenser, one terminal of which is connected with the ground and the other with the electroscope.

The discharging effect, according to Tommasina, is not necessarily unilateral, as had hitherto been supposed. On the contrary, even with the lowest active temperatures any metal is found to act on both electricities, though there is a considerable difference between the two effects. This difference depends on the sign of the charge, increasing as the current continues to pass in the case of metals and producing a more rapid decay of negative charges, as for instance iron and copper. On the other hand, this difference is found to decrease with metals for which the maximum activity has an opposite sign, as for instance silver and zinc.

A zinc-plated iron wire, after producing for some time a more rapid decay of positive charges, will gradually show smaller differences, until both effects become equal, when a difference in the opposite direction begins to manifest itself, the decay becoming finally the same as that of pure iron, as the zinc has entirely disappeared.

The difference between the two decays as characteristic of the various metals will gradually decrease for augmenting current intensities. In fact, with a very strong incandescence or a partial melting of the wire, the two decays will become practically equivalent, while the radio-activity assumes the maximum value. If the wire be cut the explosive discharge passing at the rupture will result in the same decay, no matter whether the electroscope be charged positively or negatively, and regardless of the nature of the metal wire. Hence it is inferred that these results are not due to ultra-violet rays, which, as is well known, produce immediately only the discharge of polished negatively electrified metals.

The radio-activity of any metal wires heated to redness by the electric current will decrease according to an asymptotical curve. It is merely necessary to rub the wire slightly between two fingers, or else to leave it to itself for some time, to restore its maximum activity. In the case of platinum, the maximum decay of which is observed with negative charges, a similar fall of the radio-activity is observed, while only the positive decay seems to show a decrease with time.

If the radio-activity of the wire has become very small, the wire is found to remain radio-active for a long time when the circuit is broken. This phenomenon is made to disappear nearly completely by rubbing the wire, or else spontaneously after an interval varying according to the nature of the wire and the duration and intensity of the current used. If the wire be surrounded by a jacket of glass or aluminium (the latter being grounded) the cover will assume a radio-activity of its own.

These phenomena must necessarily be due to a radio-activity induced by the emanation of the incandescent wires. Tommasina has made further investigation in this direction, in the course of which he has stated the presence and studied the action of the typical alpha, beta, and gamma radiations.

The alpha radiation is arrested by any, even the thinnest, screen while seeming to diffuse in the open air with a very marked tendency to following the electric flux, and always bearing a positive charge.

The beta radiation will traverse very thin paper and aluminium screens, which absorb a large portion of it, and become negatively electrified.

The "pyro-rays" will produce a strong ionization of the air, resulting always in the same discharge, independently of the charge of the electroscope. Although capable of penetrating an hermetically closed pasteboard box, they will undergo a strong damping effect. On barium-platinum-cyanide screens they will induce a fluorescence, though of very low intensity. The gamma rays are given off in greatest amounts from incandescent platinum wires and from explosive discharges between any metal wires.

DEDUCTIONS FROM THE BALTIMORE FIRE.

In adjusting the losses made by the great Baltimore fire, the various insurance companies interested were enabled to analyze the efficiency of material used in the so-called fireproof buildings and the manner in which they were constructed. The disaster afforded the best opportunity which has yet been given to study the effect of a conflagration upon modern structures intended to resist the action of heat, and experts were employed who have made a very exhaustive investigation covering a period of several months. This investigation was in connection with the appraisal of damages, and, as a result, statistics are available which show percentages of loss that may be considered approximately accurate. In previous articles a description of the principal office buildings which were in the burned area has been given, and in articles published immediately after the conflagration statements were made to the effect that brick and terra cotta were far better for resisting heat than any kind of natural stone. These conclusions are borne out in the several reports of the experts referred to.

For the purpose of comparing the percentage of loss on different materials, three of the larger office buildings have been selected from the eight structures which were reported on—the Continental, the Equitable building, and the Maryland building. The Continental was considered the best constructed of the series, comprising sixteen stories and a basement. It was somewhat isolated from the others, and, owing to its height was more exposed to the action of the fire. The Equitable was but ten stories high and protected on two sides, including the direction from which the fire approached, by other structures. The Maryland, which was ten stories high, had practically no protection on one side and on the rear from the flames. The three buildings contained every kind of supposed fireproof material utilized in Baltimore, and in estimating the percentages of damage the experts calculated upon the value of the different substances as they were left in the burned structures, allowing for all which could be utilized in making repairs. The following table shows comparative percentages of loss:

	Equitable	Continental	Maryland
Masonry	51	49	58
Granite	61	58 total (cut stone)	
External marble..	64	—	—
Steel	43	9	6
Ornamental iron ..	62	77	21
Fireproofing	94	54	76
Internal marble ..	90	94	total
Terra cotta	69	73	76

In the above calculations the examiners considered all brickwork in the Equitable Building under the head of masonry. With the steelwork was included the cast-iron columns and other portions of the frame which are noted hereafter. The ironwork in all the buildings classed under the head of ornamental, refers to staircases, railings, etc. In the Continental Building, the brickwork is also classified under the head of masonry, while the marble was exclusively for interior decoration. The cut stone referred to in the Maryland Building was also for exterior use, while all of the marble work was utilized for interior finish.

In planning the Continental Building, the first three stories were veneered with granite and reinforced with brick. Above, they were of ordinary and pressed brick with terra-cotta trimmings, the pressed brick being anchored to the common brick with strips of galvanized iron. All of the steel was covered with fireproofing throughout, except a portion of the roof girders. The marble was used principally in wainscoting and in the halls, corridors and on the floors. The marble work cost $108,000, which will give an idea of the great loss which was sustained in this material alone. The galvanized-iron strips between the brickwork gave way, allowing much of the brickwork to fall out. Had it been set more firmly and reinforced with brick the terra cotta would have sustained less loss. The experts considered that the partitions and wall tiling in the building were too light for the purpose and poorly constructed, which accounted for their total loss. They attributed the small percentage of damage to the steelwork to the fireproof covering. The offices in this building were equipped with vaults built into the walls. In quite a number, the contents of the vaults were destroyed, and it was decided that nearly all of the doors must be replaced.

The Equitable Building was of the "cage" formation, the columns being of cast-iron bolted together with cast-iron lugs to receive the girders, which were of 20-inch steel. The beams used in the framework were of light 9-inch steel bolted to the girders at right angles with spaces of about 8 feet apart. The framework formed a structure by itself independent of the walls, while the walls of the outside area and rear were also independent, resting on their own foundations. The three lower stories of the building were faced with granite, pressed brick being used above the third story with terra-cotta trimmings and granite sills. The rear and area walls were faced with the enameled brick with granite sills. The cornices were also terra cotta and covered with a marble coping. The four arches were of 6-inch hollow tile and the partitions were made of what is known as limeotile, as well as the ceiling under the roof. The experts are of the opinion that the percentage of masonry loss was caused largely by the facing of glazed brick used in the area and light shaft. The damage to the granite was partly due to the construction of a number of bay windows of wood on the lower portion of the exterior. All of the so-called fireproof material was a total loss where reached by the heat. Office vaults were also set into the walls of this building. The total damage to these is estimated at 73 per cent, many of them being wrecked because the floors were too weak to support their weight after the building had been fire-swept, and they fell through to the cellar, causing considerable damage to the structural steel.

The Equitable Building was one of the first supposed fireproof structures to be erected in Baltimore, and the Calvert, which adjoined it, among the last. The steel framework of the latter building was faced on the outside with common brick, and it is due to this fact that the percentage of damage to the steel erection was but 1 1-3 per cent. The loss on ornamental ironwork was 37 per cent, common brick 5½ per cent, enameled brick 7 per cent, and terra cotta 74 per cent. Here, as in the Equitable Building, the partitions were a total loss. The damage to the terra cotta was largely due to the manner in which it was set, according to the appraisers.

As a result of the examination of the Equitable Building, the conclusion was reached that the total loss upon it would have been but 50 per cent had more care been taken in its construction. The principal criticisms were that the floor beams were too light and spaced too far apart considering the weight they had to sustain. The fireproofing was not properly cemented. In the case of the Continental Building much of the loss is also attributed to faulty construction of the same character. The reports relative to the Continental and Equitable buildings are cited because the statements they contain apply to nearly all of the other structures which were appraised. In determining the heat-resisting qualities of the various materials, the experts placed brick first, then terra cotta, with porous tile third. The material known as limeotile was a total loss. Granite and marble were most seriously affected by the contact with heat, while structural steel, where properly fireproofed, demonstrated its thorough efficiency.

The examiners claim that much damage had been caused in many instances by the work of the gas fitter, the plumber, and the electrician. In nearly every building fireproof material had been removed to place wires and pipes and had been replaced so loosely that openings were left where the structural metal was exposed. With the temperature ranging from 1,900 to 2,500 deg., every part of the exposed metal was affected, while many instances were found where the heat had apparently separated the covering from the iron and steel by causing the metal to expand where it reached its surface. A number of the buildings had been erected by dividing the contracts among several builders in order to save time. For example, one company would complete the stone and brick work, another the woodwork, and another the electrical work and plumbing. Consequently after the framework had been finished and fireproofed it was often damaged by the carelessness of employees of other contractors who removed portions which had been done without replacing it properly.

It is only reasonable to suppose that the Baltimore office structures contained as good material and were built with as much care as the average buildings intended for the same purpose in other cities. Consequently the criticism which applies to them will apply to many of those in the metropolis and elsewhere, and in case of being fireswept under similar conditions the percentage of loss would probably average as much. Therefore it is interesting to note the total loss percentage on the "fireproof" group, estimated on their value just prior to the fire and as the appraisers found each. The percentages follow: Continental, 65; Equitable, 74; Merchants' Bank, 54; Calvert, 58; Union Trust, 61; Herald, 59; Maryland Trust, 60.

It will be noted that in every instance over 50 per cent of the original value was destroyed, the average loss per cent for the entire number being 61 4-7. The Equitable, which sustained the greatest damage, was, as already stated, framed partly of cast iron, which accounts for a large part of the percentage. The Continental suffered by reason of its location as well as light construction. The Merchants' Bank, which has the smallest percentage, was one of the lowest structures, had buildings directly adjoining it in the direction from which the fire came, and had very thick exterior walls, faced entirely with granite, but which was heavily reinforced with brick.

ELECTRICITY IN AGRICULTURE.

At a recent meeting of the Belgian Society of Engineers and Manufacturers, E. Guarini delivered a lecture upon the present state of the agricultural applications of electricity. After recalling the fact that certain applications of this kind are now old, he said that it was a pleasure to note that a return was now in progress, a return proved by the number of installations that have recently been made in different countries. This is due to the increasing needs of our civilization and to the incontrovertible fact that savings and other advantages have been realized in the industries into which electricity has entered. What will most contribute toward a still further extension of the applications of electricity will be the creation of great central stations for the cheap distribution of energy to farms. Countries which have extensive deposits of coal are well situated for the distribution of electricity and have no reason to envy countries such as Sweden and Italy that are rich in water power. After asserting that the energy of coal mines really costs half as much when it is transmitted electrically, the lecturer set forth the great advantage that would result to central stations that should find a sufficient daily demand for agricultural applications. Electricity may, on the other hand, be produced upon the farm itself for a single exploitation or for a group. For this purpose, steam engines, gas, gasoline, wind, or sun motors may be employed, according to circumstances.

The current best adapted for the farm is the continuous one, because it permits of certain applications for which the alternating current is not adapted. When the current is produced at a great distance, the best thing to do is to transmit it in a high tension alternating form and convert it into a low tension continuous current on the farm itself.

The applications to the farm, in order to permit of a greater efficiency being attained by the central station and a larger revenue being obtained from the capital invested in it, should be numerous.

For tilling, the plow is placed by preference on the two opposite sides of the field and is drawn first in one direction and then in the other. The motors for the machines are by preference portable, so that they can be placed alongside of the one to be actuated, such for example as a thresher, straw cutter, carrot or beet chopper, pump, mill, shearing machine, churn, skimmer, separator, etc. Dr. Oldenbourg has found that electric churning permits of effecting a saving of 70 centimes (14 cents) per quintal (220 pounds) in comparison with the cost of the work done by hand.

Purification of water by electrolysis with an iron positive (the organic matters being precipitated by oxide of iron); bleaching of oils and fats by electrolysis after the addition of salt water; purification of saccharine juices by electrolysis, more or less complicated, or by ozonization, are a few of the chemical applications.

Luminous applications are electric lighting of the farm and electric lighting of the fields for night work.

Among the calorific applications may be mentioned the De Mare hot-air fan; electric culinary apparatus and incubators; carbonization of peat by electricity in order to convert it into a full equivalent to 50 per cent of coal, in 10 or 20 minutes instead of several hours; the Herrgott electric coverings and clothing representing the most economical electric heating.

Thirty thousandths of an ampere at 500 volts would kill a man. Insects may be killed in the ground or upon trees by electrifying the surroundings if the current that passes through the insect is sufficient. By this process it is possible to sterilize water and milk. M. Guarini stated that in collaboration with Dr. Samarini, he had succeeded, after numerous experiments, in practically sterilizing milk, and explained why the experiments made in the same direction by his predecessors had failed.

The telegraphic connection of farms with one another and the market is rendered possible. The district of Oceana embraces villages that are connected with the market of Hart by a telephone line 40 miles in length. The telephone and wireless telegraphy present many advantages for the country. Wireless telegraphy is already employed for the simultaneous firing of cannons for breaking up hail storms and also for producing artificial clouds.

It is important for the farmer to consult meteorological apparatus in order that he may know how to conduct his agricultural operations. The Luncotta pluviometer informs him as to the frequency, importance and nature of rains, and the various electrographs allow him to keep himself posted as to the movement, approach, and extent of storms, and to take precautions in consequence.

A PLEA FOR THE ENDOWMENT OF ASTRONOMICAL RESEARCH.

In April, 1903, Prof. Edward C. Pickering, of Harvard University, published a pamphlet showing how a large sum of money could be expended each year for extending astronomical research. It was stated that much better results could be obtained by co-operation and in general by improving the present quality and quantity of work done. It was further proposed that the fund should be administered by a committee of astronomers and that Harvard should act as a trustee of the fund. At the same time a circular of inquiry was sent to the members of the various astronomical and scientific societies. It is believed that few astronomers widely interested in the progress of science, whose opinion would be of much value were thus omitted. Five questions bearing on the subject were contained in the circular. In a second pamphlet, published last month and intended to supplement the first, Dr. Pickering gives a resumé of the first publication and comments on the replies to the five questions contained in the circular. He does not discuss the replies to the first three as it is believed that the writers would prefer a postponement of such action, until the establishment of a fund would enable a part at least of the proposed work to be undertaken. These questions are: How do you think money could be spent most advantageously on astronomy at the present time? Can you recommend any definite plan, in form for presentation to a possible donor? In what way could money be most usefully expended at your Observatory or under your direction? Few definite answers to the second were given, but, doubtless, if a large sum of money were already available many plans would have been presented.

But few answers were given to the request for the names of possible donors. Few improvements or criticisms of the plan were suggested by foreign astronomers, in answer to the fifth question, a request for such suggestions. One or two advised that the committee should be international, but probably the general feeling was that, as it was hoped to collect the funds in the United States, it was only fair that they should be controlled by Americans. Among American astronomers, however, there were some objections for various reasons to the part it was proposed that Harvard should take in the plan.

Dr. Pickering begins the second pamphlet by stating that in order to attain as great an advance in astronomical research during the twentieth century as in the nineteenth, careful plans must be made for its endowment. The same skill in organization, combination of existing appliances and methodical study of detail, which in recent years has revolutionized many commercial industries, should produce as great an advance in the physical sciences. He considers seven methods by which astronomy can be aided. First, fellowships for astronomical students; second, astronomical expeditions; third, new observatories; fourth, publication of investigations and memoirs; fifth, aid to working astronomers; sixth, aid to existing observatories; and seventh, international co-operation.

While a large sum of money would be needed to carry out this plan in full it would seem that a moderate amount would permit a portion of it to be tested. Very different ends would be attained by the different methods. Thus, the first is educational and insures the efficiency of the astronomer of the future, the fifth aids the individual man of genius, while the sixth and especially the seventh undertake to solve the great problems now before us, and to advance the science to a new and higher plane. The seventh method stands on a wholly different basis from the others. Here the work must be done by experts, the greatest specialists in their departments. Many important investigations have been undertaken by international societies, and such work could be greatly increased if large sums of money were at their disposal for this purpose.

Dr. Pickering suggests the appointment of a local committee consisting of men interested in astronomy but not necessarily familiar with its technical details, with proper facilities for collecting the views of experts. The duties of this committee would be, first, absolute fairness. They should spend the income so as to secure the greatest scientific return, and should be wholly independent of all personal considerations and of all local conditions. Secondly, their work should be active, not passive; they should try to spend the income, not to preserve it.

The project of building a ship canal across Florida has again come to the fore, and there is a strong probability of its being carried out. A canal, known as the Florida Coastline Canal, is rapidly nearing completion, and now extends from St. Augustine on the north to Key West on the south, a complete inland way of over 380 miles.