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NEW YORK, SATURDAY, SEPTEMBER 12, 1908.

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.

IS THE AEROPLANE PRACTICABLE FOR SCOUTING?

The army tests of aeroplanes at Fort Myer are naturally bringing the question of the military value of the airship into marked prominence. Our esteemed contemporary Engineering News, in the course of a thoughtful article upon this subject, is evidently less enthusiastic over the military possibilities of the airship as a future means of obtaining full information of an enemy's dispositions and movements than we are. It quotes, with an evident reservation of doubt, our statement that if the airship can only fulfill its present promise, the time is not far distant when the art of war as practised to-day will be stripped of its most important element of success (secrecy) and its prosecution, at least along modern lines, will be rendered well-nigh impossible. Our contemporary believes that we, in common with others who believe in the usefulness of the future aeroplane scout, have failed to realize how completely such a large object in the air will be at the mercy of the sharpshooters of the enemy. This is a point well worth consideration.

In the first place, then, let us state our conviction that an aeroplane in motion will be an extremely difficult object to hit. To "wing" it successfully (the dirigible because of its inflammable gas bag and great size is so obviously vulnerable as to be out of the discussion) it will be necessary to use a gun of considerable caliber; for the perforation of the canvas wings by the tiny, clean-cut holes of a modern rifle bullet, would amount to nothing at all. Now, for a modern field gun to do any accurate shooting, it is absolutely necessary to have the exact range. To get the range, even with the best range finders, is a difficult matter either ashore or afloat, and when the object is in motion the difficulties are increased; but both on sea and land the gunner has the advantage that he can mark the fall of his shots and make corrections until he has found the exact range. Moreover, he has the advantage, particularly on the sea, of knowing that the change of direction of the object takes place only in one, or approximately in one plane. Furthermore, the speed of the moving object is usually not more than 15 miles an hour at sea, and less than a fifth of that speed on land. But the perfected aeroplane, moving through the air at 40 to 60 miles an hour, at an elevation of, say, from 2,000 to 3,000 feet, will be a totally different proposition. At these high speeds it will change its position at the rate of from 60 to 80 feet a second. Unlike the army or navy target, instead of being confined to movement in one plane, it can move in as many planes as the operator may choose. It is certain that, if he finds himself under fire, he will follow an undulating or wave-line course, varying from a direct line both vertically and laterally. Nor could an object, sweeping through the air at high speed on a sinuous line of flight at the height named, be hit by point-blank fire with the heavy field guns, which alone would possess sufficient disabling power to bring it down. In spite of the great improvements that have been made in the training mechanism of field guns, it would be impossible to hold the piece on such an object a sufficient length of time to secure a point-blank hit. Perhaps something might be accomplished with time-fuse shells; but even with these, the firing, for the reasons stated above, would be largely of the "pot-luck" kind.

An important advantage in favor of the immunity of the aeroplane scout from hostile fire is that, in order to make a reconnoissance, it would not be by any means necessary to sail directly over the enemy's camp, fortifications, or line of march. Anyone who has done topographical work is well aware of the great advantage of observation afforded by each additional 50 or 100 feet of elevation. It would be possible to make a fairly good map of Manhattan Island and its environs, even from the 600 or 700 feet elevation of the Singer or Metropolitan tower, and to include in the map quite a wide radius of country. Hence the aeroplane, if subjected to hostile fire, could draw off to the outskirts of the locality to be observed and mapped, and still have a sufficiently detailed view of the country for all practical purposes. Now at this greater distance, the machine would have the advantage that its planes would be directed fairly tangential to the curve of the trajectory, or curve of flight of the projectiles; and should the aeroplane be reached by the shells of the enemy, the chances are that a large majority of them, even if they fell within the area of the cross section of the machine, would pass harmlessly between the planes, rudders, etc., without making a hit.

MANUFACTURING UNDER THE REQUIREMENTS OF THE BRITISH PATENT ACT.

For some months articles have been published in the leading American periodicals on the question of the necessity of manufacturing patented articles in Great Britain to preserve the validity of patent grants, but most of the information furnished is misleading, and most of the conclusions drawn show only too clearly that many of those who have undertaken to inform the public concerning the requirements are deficient in a knowledge of British or general patent practice, and in the rules of statutory construction.

The new law in Great Britain authorizes any person, after the fourth year of the term of a patent, to apply to the comptroller for the revocation of the patent if the patented article or process is manufactured or carried on exclusively or mainly outside of Great Britain. Under this provision, all British patentees have been advised to commence at once the manufacture of their patented articles in Great Britain, whether or not the patentee has any trade in that country or whether or not there is any real demand for the goods. Undoubtedly, it is true that when a British patent is dated more than four years ago, the articles which are sold under the patent in Great Britain should be manufactured in that country, or at least the manufacture should mainly be carried on there. Such a case comes directly within the wording of the statute; and while the comptroller has discretionary power to grant an extension of time, it would be foolhardy for a patentee to jeopardize his British trade by a failure to comply with the requirements. In other cases, such as when the patentee for one reason or another has not commenced the sale of the patented articles in Great Britain, no necessity can be seen for the taking of precautionary measures, although those interested should make certain that the goods are at least mainly manufactured in Great Britain when the industry is introduced there after the fourth year of the term of the patent.

There has been a great agitation in diplomatic fields in an effort to secure exemptions in favor of citizens of particular countries; but when it is understood that all the principal countries are either directly or indirectly accomplishing the purpose sought to be attained by the new British act, it will be realized that there is little prospect of Great Britain's relinquishing her rights. In many countries manufacture must be commenced within a stated time; and when the provisions of the laws are compared, Great Britain will be found to be much more lenient than some countries which take the matter as a personal grievance. In other countries, the manufacture at home of the patented as well as a great many other goods, is indirectly accomplished by tariff laws. Our high tariff, for example, accomplishes exactly the same purpose as the new British patent act; and our copyright law, exacting as it does the requirement that foreign books enjoying copyright privileges here, must be set and printed in the United States, places us much in the same self-protective position with regard to literary works.

When the whole matter is carefully considered, the growth of the underlying principle of the protection of home industries is perceived in the recent enactment.

PROPOSALS FOR COOLING THE SUBWAY.

The latest of the series of admirable reports made by Bion J. Arnold to the Public Service Commission deals with the question of cooling the New York Subway during the summer months. The expectations of the builders of the system that it would present a cellar-like coolness in hot weather were doomed, as the New York public realizes to its sorrow, to disappointment. The optimists forgot that each one of the thousands of motors on the cars would be constantly throwing off heat in such quantities as to more than offset the natural coolness of an underground chamber. It will be remembered that, as the result of the recommendations of Mr. George S. Rice, chief engineer of the Rapid Transit Board, made in March, 1906, grated openings were made in the Subway at the stations; twenty-five exhaust fans in conjunction with fourteen ventilating chambers were installed between 59th Street and Fulton Street; automatic shutters for the discharge of the heated air were placed in roof openings between Fifty-ninth and Ninety-sixth Streets; and an air-cooling plant was built at the Brooklyn Bridge station. Although this installation has tended to relieve the heated condition and improve the ventilation, the Subway is still too hot for comfortable travel.

The method of cooling recommended by Mr. Arnold is as follows:

First. Block the present louvres open during the day and allow them to operate at night when the fans are being run.

Second. Construct as many protected openings as practicable between the Subway and the street.

Third. At the Fourteenth Street and Grand Central stations install large disk fans located in such a way as to draw air from the street through the kiosks and force this air in large volumes down upon and among the persons waiting for trains upon the platforms.

Fourth. Construct a solid continuous division wall between the downtown and uptown express tracks extending from the north end of Ninety-sixth Street station to and including Brooklyn Bridge station. For the purpose of demonstrating the feasibility of such a wall it is suggested that the section extending south from the center wall now at Thirty-third Street station be constructed first far enough south to include the Fourteenth Street station. At stations the upper half of the wall to have vertically sliding counterweighted windows between columns.

The advantages of this scheme are that by constructing division walls between the tracks, the air can be made to travel in the same direction as the train. Each train, as it approached a free opening, would push out a large quantity of air and draw in by suction a considerable amount of air as it passed the opening, thus producing what might be called "piston" ventilation. It is estimated that at the present time there is a change of air in the Subway twice per hour. With the division walls in place it is estimated that the air would be changed at least six times per hour during the day. The deductions in Mr. Arnold's report as to the benefit to be secured seem to be conservative; and when it is learned that the cost of a division wall between Ninety-sixth Street and the Brooklyn Bridge would not be more than $76,000, if it were built of terra cotta, or more than $130,000 if it were built of concrete, the arguments in favor of making this change would seem to be strongly conclusive.

IMPROVEMENT OF NEW JERSEY-NEW YORK SUBURBAN SERVICE.—III.

PENNSYLVANIA RAILROAD.

In recent issues we have dealt with the extensive improvements which are being made in the suburban service between New York and New Jersey on the Lackawanna and the Erie railroads. The present article, the third of the series, describes the costly and important work done by the Pennsylvania Railroad in the improvement of its lines from Harrison, N. J., to the new terminal station at Thirty-third Street and Seventh and Ninth Avenues, New York, over a total distance of 8.6 miles, and in the construction of the vast terminal itself.

The commencement of this great work is found at Harrison, N. J., where a large yard and station is being constructed on a plot of land which measures approximately 3,500 feet in length by 2,500 feet in width. In addition to the commodious station, with separate express and local tracks, the yard will include extensive storage capacity for the rapid-transit cars and motors of the local service, and for the standard passenger cars and steam engines of the steam service. At this point the change of motive power will be made from steam to electric on all trains entering and leaving the zone of electric service. Immediately beyond the easterly end of the station the tracks rise on a 0.5 per cent grade to a level of 31.5 feet above the general ground surface, at which level they are carried on two skew bridges over the west-bound passenger and Newark freight tracks of the company and over the Morris & Essex Division of the D., L. & W. Railway. The whole of the new line, except at the various crossings of public roads, the Hackensack River, and the tracks of other railways, is carried on an embankment, which varies in height from 26 feet to 32½ feet above the surface of the Jersey meadows, the elevation of the latter being generally from 2 to 3 feet above mean tide level.

The bridging is exceptionally heavy and costly. In addition to the crossing of the Morris & Essex Division, which is over 600 feet in length, and the bridge over the west-bound passenger tracks and Newark freight tracks, over 400 feet in length, there are bridges over the N. & P. branch of the Erie Railroad;

the Greenwood Lake Railroad; the Boonton branch of the D., L. & W. Railway; and two bridges over the Erie Railroad track, the larger of which is about 500 feet in length; and, finally, near the western portal of the Bergen tunnel, the tracks of the New York, Susquehanna & Western, and the Northern Railroad of New Jersey have to be bridged. Bridges have also been constructed over several public roads. The most important structure of all is the bridge across the Hackensack River, over 1,000 feet in length, which includes a draw span some 300 feet in length. The whole of this work is of that solid and costly character which everywhere marks the engineering construction of this, America's greatest railroad. About 800 feet beyond the crossing of the Northern Railroad of New Jersey, the tracks enter the Bergen Hill tunnel on a 1.3 per cent down grade. They are carried in two separate tubes beneath the East River to the terminal station between Thirty-first and Thirty-third Streets and Seventh and Eighth Avenues, New York city. The length of the run from Harrison to the terminal station is 8.6 miles. From the station the tunnels are continued beneath Manhattan Island and the East River to a station near the Long Island shore, where connection is made with the present electric system of the Long Island Railroad.

Although the terminal station building will cover only that part of the station ground extending from Seventh to Eighth Avenues, the area actually excavated extends from Tenth Avenue to beyond Seventh Avenue; and its whole area amounts to 28 acres. The total length of trackage of the station and yard is 16 miles, and in the station there will be a total of twenty-one standing tracks, and eleven passenger platforms. In clearing the ground for the terminal it was necessary to remove five hundred buildings, practically all of them dwelling houses. The 28 acres of ground was excavated to an average depth of from 45 to 50 feet, and the amount of material, mostly rock, taken out reached the huge total of 3,000,000 cubic yards. Around the whole of the space as thus excavated runs a massive concrete retaining wall 7,800 feet in length, and for this wall, the foundation, the street bridging, and sub-structures, 150,000 cubic yards of concrete was required.

The passenger station building will be 774 feet long, 433 feet wide, and its average height above the street will be 69 feet. It will contain a waiting room 277 feet long, 103 feet wide, and 150 feet in height. The fact that the whole of the station building must be supported above the tracks calls for no less than 650 massive supporting columns, the weight on the individual columns reaching as high as 1,658 tons. The total length of river tube tunnels under the Hudson and East Rivers is 6.8 miles, which is the total length, also, of the tunnels under the land. The total length of the tunnel from the Bergen portal to the Long Island portal is 5.3 miles, and the total length of track in tunnels, exclusive of yard tracks in the station, is 16.5 miles.

The service of this vast system, extending for 20 miles from Harrison in New Jersey to Jamaica on Long Island, will be entirely electrical. The express trains will be hauled by heavy electric motors, weighing over 100 tons each, and the suburban service will in all probability be operated on the multiple-unit system, with the motors applied directly on the axes of the passenger cars. It is estimated that the total cost of the whole system, by the time it is completed and put in operation, will reach $100,000,000.

ACETYLENE GAS FOR ISOLATED STREET LAMPS.

BY ALTON D. ADAMS.

A large demand exists for street lighting in villages and the suburbs of cities, where there are neither gas pipes nor electric wires, and this demand should be met by acetylene gas.

Street lighting beyond the limits of electric wires and gas pipes is now commonly done, either with kerosene oil lamps or with mantle burners using gasoline, but acetylene would be a welcome substitute in many cases.

As an example of kerosene street lighting, a small Massachusetts town lights about seven miles of streets in this way, until midnight, on a moon schedule, at a total annual cost of about $1,400, or $200 per mile, but the illumination leaves much to be desired.

A proposition has just been made to run an electric line into this town and light this same length of streets with 120 incandescent lamps of 40 nominal candle-power each, at a total annual rate of $2,160 per year, or $18 per lamp, this being the rate paid in a nearby town. These lamps are to operate a little less than 2,200 hours per year.

In one of the larger cities of Massachusetts, there are 792 gasoline mantle lamps that burned 1,857 hours, at a total cost of $17,476.17, or $22.32 per lamp, and there are also 491 gasoline mantles that burned 3,960 hours, at a total cost of $14,317.11, or $29.16 for each lamp, during 1907.

These figures amount to $31,793.28, paid by this city in one year for gasoline mantle burners, beyond the limits of the gas and electric systems.

In Boston, during a recent year, the number of gasoline or naphtha single-mantle burners in use on suburban streets was 1,943, burning 3,828 hours, and the total payment for this service was $56,735.60, or $29.20 per lamp.

Taking the country over, the sums annually paid for kerosene and gasoline street lighting must run well into the millions of dollars, and this volume of business, at the rates paid for the present service, warrants a strong effort to apply acetylene gas to the work.

As the above street lighting is much scattered, and along streets where there is little prospect of commercial business, to say nothing of the difficulty of securing franchises to lay pipes in the streets, it seems that acetylene gas can only be applied to it by means of a generator at each lamp, or else in compression cylinders.

If a small acetylene generator, or a cylinder of the compressed gas, can be located in each lamp-post, so as to give satisfactory results, at a practical expense, a wide field is open to street lighting with acetylene gas.

A small acetylene generator in the post of each street lamp corresponds, roughly, to the idea of the acetylene portable lamp now in use for house lighting, and there appears to be no serious technical objection to such an arrangement, except the freezing of the water in the generator.

With a 30 per cent solution of alcohol, water does not freeze until a temperature of more than two degrees F. below zero is reached, and a 50 per cent solution of glycerine carries the freezing temperature down to 24 deg. below zero. Some heat is developed when acetylene gas is generated, and it may be practicable to so insulate a small generator in a lamp-post that this heat will keep the water, with a moderate percentage of alcohol or glycerine, above the freezing point, even in very cold weather.

Compressed acetylene gas in a small cylinder at each lamp-post appears to offer a satisfactory plan for isolated street lighting, except perhaps as to the cost of installation—this being the method in general use on marine buoys.

Lighting in suburban districts and small villages permits only a very modest investment at each lamp, so that the cylinder used to contain the compressed gas must be small, and accessory connections must be avoided as much as possible.

A design on this line might locate the pressure regulator in one end of the gas cylinder, and attach the burner directly to this regulator, so as to avoid all piping. The size of the gas cylinder at each lamp-post would depend on the number of houses that the stored gas was required to operate, the burner, and on the rate of consumption.

It may be assumed that for general use in street lighting a burner without a mantle should consume one cubic foot of acetylene gas per hour, thus giving a light of more than 40 candle-power. For all-night lighting, from April 1 to September 30, on the basis of one cubic foot of gas per hour, a maximum of about 20.25 cubic feet of gas per night would be required. During the remaining six months of the year, the maximum requirement of gas per night would run up to about 13.5 cubic feet.

If a cylinder for compressed acetylene gas were given a capacity of 24 cubic feet of gas at normal air pressure, then on the system of one company that makes such cylinders and fills them with asbestos saturated with acetone, which latter absorbs the gas, the cylinder might be made 4 x 36 inches, at 150 pounds gas pressure.

This cylinder with 24 cubic feet of gas at normal air pressure would a little more than supply a one-foot burner during two nights, for six months of each year, and would have a surplus over the requirement for any one night, for the remaining six months. Such a cylinder is perhaps better suited to all-night lighting than a larger size because the investment at each lamp must be kept at a moderate figure.

For half-night lighting, the above cylinder would supply a one-foot burner during three lighting periods, in the shortest days of the year, and during five lighting periods, when the daylight hours are longest. If a capacity for only the longest half-night period is desired, a cylinder containing only eight cubic feet of gas at normal air pressure will be large enough.

There is an advantage in the use of cylinders during only a single night or lighting period, before they are recharged with gas, because in this way the pressure of the charge, and consequently the amount of gas, can be regulated according to the time of the year, so that all the gas will be consumed, and the burner will go out at the end of the lighting period. In this way the labor of turning out the burners may be saved.

When the small cylinders used at street lamps are to be recharged with gas, they may be taken to the generating station, and in such event it will sometimes be necessary to have a duplicate set of cylinders to replace those taken away.

Another plan is to carry several large charged cylinders about with a team, and recharge the lamp cylinders at their locations.

OFFICIAL METEOROLOGICAL SUMMARY, NEW YORK, N. Y., AUGUST, 1908.

Atmospheric pressure: Highest, 30.29; lowest, 29.70; mean, 30.01. Temperature: Highest, 91; date, 4th; lowest, 56; date, 27th; mean of warmest day, 82.5; date, 14th; coolest day, 58; date, 26th; mean of maximum for the month, 79.1; mean of minimum, 65.9; absolute mean, 72.5; normal, 72.7; deficiency compared with mean of 38 years, 0.2. Warmest mean temperature of August, 77, in 1900. Coolest mean, 69, in 1903. Absolute maximum and minimum for this month for 38 years, 96 and 51. Average daily excess since January 1, 1.4. Precipitation: 5.65; greatest in 24 hours, 3.25; date, 25th-26th; average of this month for 38 years, 4.56. Excess, 1.09. Accumulated excess since January 1, 3.56. Greatest August precipitation, 10.42, in 1875; least, 1.18, in 1886. Wind: Prevailing direction, south; total movement, 7,139 miles; average hourly velocity, 9.6 miles; maximum velocity, 37 miles per hour. Weather: Clear days, 12; partly cloudy, 10; cloudy, 9; on which 0.01 inch or more of precipitation occurred, 10. Thunderstorms, 5th, 6th, 7th, and 11th. Mean temperature of the past summer, 73.63; normal, 71.93. Precipitation of the past summer, 11.68; normal, 12.15.

THE CURRENT SUPPLEMENT.

A spirited illustration of the German battleship "Barbarossa" at full speed will be found on the front page of the current SUPPLEMENT, No. 1706. The many uses of zinc oxide are exhaustively given and formulas published. Spun glass is a French novelty which is described. A new type of gasoline-propelled railroad motor carriage, especially designed for the use of officials on inspection work, is in use on an English railroad. The car is very fully described and illustrated by our English correspondent. Marcel Deprez writes on his experiments in mechanically reproducing soaring flight. He designed a small model for the purpose of showing the existence of a horizontal component working in an opposite direction to the wind when the latter has obliquely ascending trajectory. That model he describes very thoroughly. Thomas L. White contributes a splendid discussion of the problem of rating an automobile engine. In a general way everyone knows that our so-called paper money is made at the Bureau of Engraving and Printing, but it is safe to say that very few outside of those directly connected with the industry know anything of the important machines used in banknote engraving. These machines are clearly and instructively described by Mr. Claude E. Holgate. A new and efficient method of room disinfection by means of formaldehyde gas mixed with vapor of carbolic acid is described by Dr. W. B. McLaughlin. The results of his experiments show that the penetration obtained by this method is much greater than with any other. The Paris correspondent describes a new automatic heat regulator. Prof. Florian Cajori contributes an illuminating article on the age of the sun and the earth. The usual science, engineering, and trade notes are also published.

EXCAVATIONS AT ABYDOS.

Prof. J. Garstang, of the Institute of Archæology and the University of Liverpool, has recently returned from Upper Egypt, where he has been following up his previous excavations at the famous early burial ground at Abydos. This last season's work has been the most productive and valuable of his various expeditions. Among his relics he has secured an extensive collection of exquisite examples of pottery and carving, one unique find comprising a small ivory sphinx holding in its clutches the figure of a man which it is about to devour, the expression on the face of the sphinx being strikingly ferocious. The find is of great historical value, the figure of the sphinx, which is an emblem foreign to Egyptian civilization proper, being of a very early date. The professor's chief discovery, however, is that of the only tomb yet brought to light in Egypt of the "Hyskos" period, a temporary supremacy in Egypt of an invading race sometimes described as the Shepherds. The tomb yielded several beautiful specimens of pottery, the first of their kind ever discovered in the land of the Nile and in complete preservation. The ware is beautifully smooth, black in color, and when polished has a surface as brilliant as a mirror, while it is as thin as porcelain. This pottery is quite foreign to Egyptian workmanship and has evidently some connection with early civilization in Asia Minor, since Prof. Garstang found some similar specimens in that area during his excavations there some years ago. In his opinion the discovery of this tomb affords an interesting connecting link in the chain of evidence which he has collected identifying the Hyskos who invaded Egypt with the Hittites of Biblical history.