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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.

STREET VENTILATION.

The solution of the problem of the purification of sub-surface and the lower stratum of surface atmosphere known as ground-air must sooner or later become vital to a city's inhabitants. That the state of the public health may be set forth as the chief asset of a community's prosperity is shown in the presence of an epidemic. Thanks to the high development which sanitary engineering has reached, sewage and ground water drainage is well nigh perfected. The question of surface and ground drainage, while backward in its development, becomes of none the less importance to the engineer, and though dealing with mixtures of gases they are as subject to governing laws of flow and diffusion as is the more stable liquid. In New York city, owing to the great concentration of inhabitants combined with the spirit of progress of our times, manifested by blocks of high buildings which change streets into narrow lanes, the many systems of pipe-galleries and tunnels for water, gas, steam, sewerage, telephone, telegraph, and light and heat electric wires, besides the rapid transit passenger tunnel soon to be installed, all tend for the most extreme conditions for an impressive exhibition of the evil. Street-tunnels, basements and buildings having an intimate connection, the free circulation of all that is harmful is unhindered.

The deleterious substances which are the chief sources of ground air contamination comprise, besides dry, dust-borne particles and matter held in suspension in water vapor, the effluvia arising from decomposition of organic matter and the more demonstrable poisons found in leaking illuminating gas mains. According to the statement of one sanitary expert, it is generally acknowledged by the gas companies of our city that fully one-third of the whole quantity of gas manufactured by them leaks away, before delivery through the house meters occurs. They recognize that it is far cheaper to manufacture this large excess of gas and allowing it thus unheeded to contaminate the lower atmosphere of streets and buildings than to attempt to make tight mains or house connections. Furthermore, as it has been demonstrated that the water gas, now so largely employed for lighting and heating, which is principally composed of carbon monoxide, is injurious and indeed becomes deadly when present in a quantity equal to one per cent of mixture. The custom of street dissemination of what might be called gas sewerage is proportionately as injurious to healthy living as though water sewerage was left to decompose in the city's gutters.

Carbon monoxide being odorless, it becomes doubly dangerous; for it not only suffocates mechanically, but acts directly as a true poison to the human system. Collections of mixed gases take place to such an extent that manhole explosions are not of infrequent occurrence, and the several companies occupying tunnel space in the streets are forced to secure conduit covers against gas pressure by bolting.

The plan to be submitted for the carrying off of contaminated ground air consists of a system of flues connected at sufficient intervals with sub-cellar and tunnel chamber compartments. When practical, chimneys constructed of metal piping or of brick may be built in connection with buildings. In districts where this is impossible they may take the form of ornamental columns. According to the observations of Dr. Draper, Director of the New York State Weather Bureau, the average yearly wind velocity over New York city is seven miles an hour. This speed being apparent at a mean height of seventy feet above ground level, it becomes thus entirely practical to employ the means which have been suggested for the removal of an insidious present and growing evil.

THE STEAM TURBINE FROM THE COMMERCIAL STANDPOINT.

In judging any new form of mechanical construction, it is the commercial considerations which, after all is said and done, decide whether it is to enjoy a temporary popularity, or be included among the useful and lasting improvements of its day. During the past four or five years the steam turbine has received more attention than perhaps any other device in the world of steam engineering; unless it be the water-tube boiler that can claim that distinction. It is not the fault of technical literature in general that the public is not pretty well familiar with the good points of the steam turbine; its compact form, great power in proportion to its weight, its general handiness, and its economy of operation. The many advantages of the turbine would lead one to expect that, commercially considered, it is a device upon which the capitalist would be sure to look with favor, as being from every point of view of installation, maintenance and operation, a decided "money-saver." This commercial aspect of the subject has been treated at considerable length in a paper read at the Detroit Convention of the American Street Railway Association, by Edward H. Sniffin, whose intimate connection with the development of the steam turbine in this country entitles him to speak with authority.

It has been found by actual tests on units as small as 400 kilowatts that only 14.47 pounds of steam was consumed per brake horse power per hour, which corresponds to something less than 13¾ pounds per indicated horse power per hour. In the larger units the turbine shows a uniform efficiency as compared with the best reciprocating engine practice; and only recently a rate of steam consumption corresponding to about 10.17 pounds per indicated horse power was guaranteed on a turbine of 750 kilowatts capacity. This is a performance of which only a very few engines of any size or type have been capable.

The question of the commercial value of the turbine, however, is a far wider and deeper one than that of mere steam consumption, for it must take note of the relative size of power-house required, the relative area and depth of foundations, and everything affecting the first cost of the plant itself. Into these elements of cost, the paper enters in full details. The paper, which is too lengthy for these columns, is published in the current issue of the SUPPLEMENT. It may be stated here, however, in brief, that the turbine requires about 80 per cent as much space as is necessary for a vertical engine of the same power and only 40 per cent of that needed for the horizontal engine. The most striking comparison in favor of the turbine is that which shows the cubic yards of foundation material required for the two types. In all three cases the foundations were estimated at a uniform depth of 15 feet, this depth being necessary to provide space beneath the engine room floor for condensers, etc., although for large reciprocating engines it is usually inadequate. The turbine has the great advantage that the only foundation which it requires is that necessary to carry its weight, as though it were simply a tank or some other stationary structure. It does not even call for foundation bolts, since there are no vertical or horizontal thrusts to be resisted. In a comparison of 1,000-kilowatt units, it was found that the volume of masonry foundation required for the turbine would be only one-ninth as great as for the vertical engine and one-fifteenth as great as that necessary for the horizontal engine. In a comparison of the building cost on a basis of fifteen cents per cubic foot of space inside the walls, the cost for the turbine is about one-half that for the horizontal or vertical engine. Among several actual cases given in the paper to show the saving in cost, we select that of a plant which was recently laid out to contain three 1,000-kilowatt units driven by vertical Corliss engines. Subsequent to the completion of the power house three more 1,000-kilowatt units were contracted for, steam turbines being ordered; and it was found that the use of the turbines saved 900 square feet of engine room floor space and about 38,000 cubic feet of space. Had the whole plant been originally designed for turbines, the cost of the land, building, foundations, etc., would have been reduced about $50,000. Perhaps the most striking proof of the economy of the installation of a turbine plant is that of a power house of 8,100 kilowatts capacity designed for the employment of vertical engines. In a consideration of the enlargement of the plant, it was found that there was no space for additional engine power, and that any increase would require encroachment upon valuable land. An estimate of what could be done by the employment of turbines proved that within the four present building walls, and without disturbing existing machinery, the total power of the plant might be doubled, by installing turbines in the space below the engine room level and by adding another floor of boilers—an arrangement which would reduce the interest charge over $3.00 per kilowatt per annum.

At the close of the paper the author stated that the 1,500-kilowatt turbine which has been for eighteen months in operation at Hartford, carries a load of from 1,800 to 2,000 kilowatts and has, indeed, carried a load, without any difficulty, of as high as 2,800 kilowatts. The Westinghouse Air Brake Company has four 400-kilowatt machines that have been running satisfactorily for about three years and doing all the work of the factory. The economy is high and there have been practically no repairs. The same company is now building three 4,000-kilowatt turbines for the rapid transit subway of New York, while four 5,000-kilowatt turbines are to be built for the Metropolitan District Road and three 3,500-kilowatt machines for the Metropolitan Road, both of London.

THE TWENTY-FIVE KNOT CUNARD STEAMSHIPS.

The contest for the high-speed transatlantic record has never seen a more interesting phase than that which it is now passing through. With the "Deutschland" carrying a record to her credit of 23.51 knots an hour; with the "Kronprinz Wilhelm" only a fraction behind the "Deutschland" in her average sea speed, and showing with each season a steady improvement; with the great "Kaiser Wilhelm II." launched and well on toward completion, and giving promise of 24 knots an hour and over, and with the plans for the two Cunard giants, designed to restore British prestige on the Atlantic, under consideration by various competing ship-building firms—it must be admitted that there never was a period in the history of high-speed transatlantic navigation more full of interest and promise than the present.

It is not likely that even the officials of the Cunard Company know what the exact dimensions, horse power and speed of the two new vessels will be; but we are reliably informed that, tentatively, the general features of the ships have been placed at 750 feet of length, 75 feet of beam, and a horse power of about 50,000.

Unless the directors change their minds, it is likely that the steam turbine will not be introduced on these vessels, for it is felt that notwithstanding the excellent performance of this type of motor on the "King Edward VII." and the "Queen Alexandra," it is too great a step from an installation of turbines of a few thousand horse power on a river steamer to the equipment of two costly vessels, on which so much is depending as on the new Cunarders, with what is as yet a comparatively new type of motor. Hence, it is probable that the great horse power of these ships will be developed in vertical, quadruple-expansion reciprocating engines; and the question which is now under consideration is whether this power shall be developed upon two or upon three shafts. If twin screws are used the proportions of propellers, shafting and engines would be enormous, since they would have to develop and carry probably not less than 25,000 to 27,000 horse power each. There is absolutely no precedent for such sizes and weights, the largest twin engines at present being those of the "Deutschland," which, when the boilers have been steaming freely, have developed as high as 38,000 horse power, or 19,000 on each shaft. The new "Kaiser Wilhelm II.," it is true, is to have engines of 40,000 horse power, or 20,000 upon each shaft, and in actual service they are likely to develop as much as 44,000, or say 22,000 on a single shaft.

It is natural that the Cunard Company in its endeavor to keep down the sizes of the separate engines should turn to the triple-screw system of propulsion. By so doing each shaft would have to carry only 17,000 or 18,000 horse power, or less than is now carried in the case of the "Deutschland." The objection to triple-screws is the very obvious one that the engine room staff would have to be greater for three engines than for two. But with this exception, it may be said that practically every other argument is favorable to the use of triple-screws. In the first place, judged from the all-important standpoint of safety of travel, there is less risk of total disablement in a triple than in a twin-screw ship. If one engine should be disabled only 33 per cent of the power is lost, and the ship still has 66 per cent with which to make port. The individual parts of the engine are much lighter, and hence it is easier to overhaul the engine in port, or, in the case of a breakdown, to make repairs at sea. Although it might seem at first that more of the ship's space will be taken up by three engine rooms than by two, the difference is not so great as might be supposed, inasmuch as the center engine would be located on the center line of the ship, astern of the wing propeller engines, and would occupy space in the least desirable portion of the ship from the standpoint of passenger accommodation. Admiral Melville, Chief of the Bureau of Steam Engineering of our Navy, is a strong advocate of the use of triple-screws, not merely for the Navy, but for the large transatlantic steamships. Speaking on the important question of economy he has shown that in the case of the fast commerce destroyers "Minneapolis" and "Columbia," which are fitted with triple-screws, there was a very decided economy realized by their use. Moreover, it is a significant fact that the French naval architects, who are among the best, if not the best in the world, and who are considered to have gone more deeply and thoroughly into the question of triple-screw propulsion than any other naval architects, appear to have adopted the triple-screw exclusively for all the large ships of the navy. They claim that, quite apart from their obvious military advantages, triple-screws show a very decided economy over twin screws. There is one other question which