

bitter experience that a summer temperature which is comfortable when the percentage of humidity is low, becomes insufferable when that percentage is high. This is explained by the fact that when the air is dry, evaporation from the body is rapid, and the latent heat of evaporation, being drawn from the body, cools it off proportionately. When the atmospheric humidity is high, the air is less able to receive fresh moisture, evaporation from the body is slow, and its temperature is correspondingly high. Applying this to the low temperature of the winter season, we find that the very dry air of many houses conduces to a rapid evaporation from the human body, and a corresponding lowering of its temperature. Hence the interior of a house in which the air is abnormally dry must be at a higher temperature to be comfortable than an interior in which the percentage of humidity is high.

Speaking upon this question, Dr. W. M. Wilson, of the United States Weather Bureau, who has given the subject careful study, says: "It is safe to assume that during the winter months the normal relative humidity in lake cities is 72 per cent. From observations with respect to moisture in business offices and living rooms heated by steam, hot water and hot air, it is safe to assume that the average relative humidity in artificially heated dwellings and offices in the winter months is about 30 per cent, or about 42 per cent less than the average outside humidity, and drier than the driest climate known."

As the evaporative power of the air at a relative humidity of 30 deg. is very great, the tissues and delicate membranes of the respiratory tract are subjected to a drying process and a great increase of work is placed upon the mucous glands in the effort to compensate for the lack of moisture in the air. This increase of activity, and the frequent unnatural stimulation induced by the changing conditions of humidity from the moisture-laden air outside to the dry temperature inside of our dwellings, result in an enlargement of the gland tissues and a thickening of the membrane itself. It is only a question of time when the surface is prepared for the reception of germs of disease which tend to develop under exposure to the constantly changing conditions referred to. It has been stated by engineers who have given careful study to the subject that by holding the temperature of our school rooms, living rooms and offices at 60 deg. and raising the humidity to 70 per cent, about 25 per cent of the cost of heating might be saved. It is suggested by Dr. Wilson that to avoid the possibility of unpleasant results from condensation, our dwellings could be heated to 65 deg. with a relative humidity of 50 per cent and a saving of from 12½ to 15 per cent secured over the present cost of heating.

This interesting paper naturally raises the question as to whether humidity can be brought under proper mechanical control. That is to say, can atmospheric moisture be supplied artificially and accurately to the extent that may be desired? This is a field of research and experimentation in which some good results have been achieved, but which is yet open for considerable improvement. If the public could be brought to understand how intimately the question of humidity is associated with that of temperature in the matter of heating, there would be a demand for artificial control of humidity, which would react with a beneficial effect on the whole of the steam-heating industry.

#### THE PROPOSED HISTORY OF THE PATENT OFFICE.

The Patent Office of the United States has now been in existence one hundred and eleven years. During that time it has ever been one of the most efficiently conducted branches of the governmental service. Perhaps because it has so admirably met the requirements of the public, and perhaps because it has been protected as far as possible from baneful political influence, the Patent Office is rarely mentioned in the daily press and is, consequently, the one department of our government about which least is known. For the purpose of enlightening the general public on the work which the office has conscientiously performed during its existence, and of placing in the hands of inventors a book which will explain the method of procedure in obtaining patents and which will give such general information as may be valuable, the Commissioner of Patents has authorized the publication of "a complete history of the Patent Office, with useful miscellany." In the Official Gazette a letter has been published inviting all persons to furnish the chief clerk of the office with rare documents, printed articles, or material not readily obtainable that may prove of value in compiling the work.

The literary labor of preparing this history for publication has been entrusted by the Commissioner to five principal examiners, the chief of the Issue and Gazette division, and the chief clerk. This publication commission has already outlined the general plan of the history. From information which we have received the work will be a reference book of vast scope.

The historical chapters will begin with a discussion

of mediæval royal monopolies and will show how they differ from the present patents. Besides narrating the history of patents in the United States, the work will describe the organization and administration of the Office, discuss the aims and advantages of the present system, compare that system with the methods followed in foreign countries, and briefly analyze our present laws. The commercial benefits to be derived from a well-conducted patent system will likewise form the subject of a chapter which should prove of unusual interest. One of the most important parts of the history will comprise a careful financial study of the value of patented inventions to the country at large. Statistics will be given to show how enormously the national wealth has been increased by the invention of such devices as the trolley, the telephone, the telegraph, the bicycle, Bessemer steel, the cotton gin, the steam engine, fireproof buildings, and labor-saving machinery. Abstracts from the reports of the Bureau of Labor will demonstrate what the patent system has done to cheapen the price of commodities by fostering inventions. Among the miscellaneous matter which will be included may be mentioned the articles on negro, Indian and women inventors; on the inventive genius of various races; and on the relation of environment to invention, as well as studies of certain prolific inventors, and a brief history of some principal arts.

That so ambitious a work, if successfully completed, will prove of inestimable value cannot be doubted. The office has received innumerable calls from legislators for specific reports on various topics, communications from all parts of the world requesting information not readily obtainable, and, indeed, has itself felt the need of a text-book which could be used by the examiners and their assistants. Hitherto it has been almost impossible to obtain accurate information upon certain subjects pertaining to the work of the Patent Office. Official reports, most meager in their details; the "fire issue" of the Official Gazette which bears the date of October 9, 1877; a handful of congressional documents bearing only upon certain points; Campbell's "The Patent System of the United States," various periodicals, containing scattered articles comprise the entire information on the patent system at present readily available to the public. To issue a work which would exhaustively treat of the origin, development, and present condition of our Patent Office would be a task which no single person could successfully hope to perform. Only by setting all the machinery of the government in motion and by gathering from official as well as private sources the facts which have accumulated in a hundred years is it possible to bring forth a work in which the United States Patent Office of the past and of the present will be adequately described. From the present indications it seems reasonably certain that the history will be ready for distribution at the opening of the St. Louis Exposition of 1903.

#### WATER-TUBE VS. FIRE-TUBE BOILERS FOR NAVAL USE.

As our engineering readers are aware, recent experiments were instituted by the English government to determine the relative advantages of two types of boilers, fire-tube and water-tube, the test being made with two naval ships of nearly equal powers and displacements in a race of 1,000 miles, more or less, the vessel arriving first being considered the victor. It seems scarcely possible that such a trial as this has the countenance and support of English engineers generally, for it is in no sense conclusive or satisfactory as to the relative values of either type for naval work, being a sort of go-as-you-please contest, depending largely upon extraneous conditions as to the result, wholly unconnected with the boilers or their management. In this particular "race," as it was called, the fire-tube boiler arrived first, but the weather was so bad, by reason of fog, that the vessel it was in might just as easily have been the last.

Speed in a war vessel is, of course, of the first importance to catch enemies who are trying to escape, but there are other qualities equally necessary, and one of these is that the boilers of such vessels shall be able to keep the sea for a long time without needing repairs that cannot be made on board, also that the boilers shall be capable of being brought into full power quickly, and be easily managed during action. No one type combines all these qualifications, and it is not surprising that naval boards are puzzled as to a choice; there is much to be said for both fire-tube and water-tube boilers, but one of the greatest objections to the fire-tube type, as exemplified in the Scotch boiler, so called, is its extreme weight. The shell-plates of these boilers are from one inch and one-quarter to nearly one and one-half inches thick, or about 56 pounds per square foot; as the boilers are about fifteen feet long by the same diameter, it is easy to see that the shells alone are exceedingly heavy. In addition to this the tubes, furnaces and fixtures generally add a great deal more weight. The Scotch boiler is objectionable from the great difference of temperature between the top and bottom of the shell, and

is subjected to enormous strains from this cause alone, aside from that of the steam pressure. The combustion chamber at the end, and the circular furnaces as well, give a great deal of trouble, and the fire-tube boiler requires a lot of watching—with modern steam pressures—to keep it up to its work. But the water-tube has troubles of its own also. Although it is lighter for a given power, and a quick steamer and 200 pounds per square inch can be generated from cold water in thirty minutes without injury, while it takes less space than a fire-tube boiler of the same evaporative power, the tubes, both small and large types, are a constant source of anxiety. With anything like fair treatment, however, the water-tube marine boiler does good work, and is capable of long-continued action.

The United States gunboat "Marietta," having water-tube boilers, went around the world, made quick time, and needed no repairs except renewal of a few tubes in her boilers, but naval officers are by no means a unit for their adoption, each type having its partisans. In our own navy we have vessels fitted with both kinds, fire-tube and water-tube boilers, in one ship, for the purpose of instituting comparison side by side, but neither type has been declared wholly unobjectionable, and the probabilities are that the battle of the boilers will be something like that between guns and armor—as much may be said upon one side as the other.

#### SCIENCE NOTES.

In 1900 in the Punjab, a section of India, where about one-half a million persons die annually, only 893 were killed by snake bites. Their bite is more often inflicted in houses than either in the fields or in the jungle. During the year in question 1,374 wild animals were slaughtered, including 11 tigers, 186 bears, 184 leopards and 99 wolves; 13,272 snakes were killed.

An expedition to Kolynsk, Russia, is being made by Russian scientists in order to bring to St. Petersburg the mammoth which has recently been discovered. It is unique of its kind, its hair, skin and flesh being entirely preserved, and there are remains of undigested food in its stomach.

The Small Art Palace, one of the permanent buildings of the Paris Exposition of 1900, will be used as an Art Museum for the city, and will receive the collections of works of art which are at present scattered in various places, says The Builder. A special architectural gallery will be provided in which drawings and models can be preserved.

An effort is to be made to remove a large red oak tree from the wildest section of Arkansas to Forest Park, St. Louis, for the Louisiana Purchase Exposition. The tree is 160 feet high and 12 feet in diameter at the base. A double tramway will be built from the tree to the river, where it will be floated and towed to St. Louis. It is estimated that this will occupy six months. The tree will be dug up by the roots instead of being cut, and none of its branches will be trimmed, so that it will appear on exhibition just as it now stands in the woods.

Consul-General Hughes writes from Coburg that, according to the German press, fibrolemum, a new artificial leather, has just been invented by a Frenchman. It consists of pieces of refuse skins and hides, cut exceedingly small, which are put into a vat filled with an intensely alkaline solution. After the mass has become pulpy, it is taken out of the vat, placed in a specially constructed machine, and after undergoing treatment therein, is again taken out and put through a paper-making machine. The resulting paper-like substance is cut into large sheets, which are laid one upon another, in piles of from 100 to 1,000, and put into a hydraulic press to remove all moisture. The article is strong and pliable, and can be pressed or molded into all kinds of shapes and patterns. It is said to make the best kind of wall paper. Decorators who have used this article speak of it in the highest terms.

Dr. Alvah H. Doty, Health Officer of the Port of New York, has tried some experiments on the extermination of mosquitoes. His operations were confined to the basin in which is the malaria-infected village of Concord, S. I. Four ponds and a marsh were treated with crude oil donated by an oil company. A 100-barrel tank was run on a railroad siding and the oil was allowed to flow into a portable tank of 10 barrels' capacity. The tank was then taken to the scene of operations. Attached to the small tank was a compressed-air cylinder, and a pressure of 20 pounds to the square inch was used. From the valve of the tank ran a 200-foot hose which connected with a float which carried perforated gas pipes, so that the oil could be forced below the surface of the pond. When the pressure was applied the oil and water were thoroughly mixed. The float was drawn back and forth, so that every foot of the water was covered. The oil as it rose to the surface collected at the edges of the pond, thus destroying any matured larvæ. The experiment is watched with the greatest interest.