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## Siphons.

At a recent meeting of the Polytechnic Association of the American Institute the president, Mr. T. D. Stetson, detailed some experiments which he had recently made.

The ordinary siphon, consisting of a simple bent tube, acts by the difference of length of the two columns of liquid. There is a tendency to form a vacuum at the top of the tube. The superior gravity of the longest raises the shorter column by the atmospheric pressure. The partial vacuum results in the liberation of the small quantity of air always contained in the water, and the formation of what is known as an air trap.

In attempting to avoid this difficulty by the use of a large vessel or air receiver some curious results were obtained.

The first object was to make a self-emptying air chamber. The plan adopted to accomplish this result was to carry both pipes into the air chamber, and take one to the very top, where it was turned over in such a way as to make a fall of water through the air space when the siphon was in operation. This plan would in all probability be successful in a perfectly constructed apparatus. In order, however, to observe the operation, Mr. Stetson had made the air chamber of glass, and he found himself unable to preserve a perfectly tight joint sufficiently long to determine the question definitely.

A siphon having a large chamber at the bend, into which one pipe enters at a much higher level than the other, he found developed, with just sufficient air inclosed, the very unexpected property of acting like a check valve. It opposes a greater resistance to the passage of water in one direction than in the other—the difference in resistance depending on the difference of area between the water surface in the chamber and that in the pipe entering at the highest level. In draining marshes on a large or small scale, in draining any area subject to tidal fluctuations or fluctuations from freshets, especially in connecting a cellar drain with the sewer where the sewer is liable to rise and make a back-flow under extraordinary circumstances, this offers a valuable means for opposing the return flow of the water. By properly propor-

tioning the chamber to the pipe, the excess of head necessary to force the water through the wrong way could be made almost anything we please.

Mr. Sutton said that siphons are very interesting pieces of apparatus and work very curiously. In the early days in California, where capital was abundant but the means limited, siphons were often used to drain mines in the gravel, especially when they came to the bed rock, and tunnels would be necessary to drain the water off in the ordinary way from a rock basin. In such cases the siphons were used to take the water over the "rim of the bed rock."

These siphons almost always stopped working after a little, from an accumulation of air in the bend. They always stopped, in fact, save when they were put in by experienced men. The speaker then detailed an instance where he put in a siphon going over a rim of rock some 150 feet in length. The outside end was of iron pipe, but the inside end was rubber hose. As the works were carried further in, some 250 feet of rubber hose was added; the head being very small, there was but slight tendency to collapse. At each end a stop valve was placed, and at the highest point there was an air chamber. This was formed of an empty whisky cask, which was a thing easily got and adapted to the purpose. The cask and siphon were filled through a tunnel at the top, the valve on the top of the cask was then closed and the others opened, and the siphon would commence to work. It was necessary to have two valves, one at each end of the pipe, because at that time they could not buy in San Francisco a pump capable of filling the pipe. At night the whole was shut off, and in the morning it was started long enough before work began to properly reduce the water level. The air chamber would fill with air in about two hours, but just before it was supposed to be filled the valves were shut and the barrel filled up again with water through the tunnel.

## ATTRACTIVE SUBURBAN RESIDENCES.

Very much has been done by our architects and builders during recent years to develop artistic individuality and home-like attractiveness in the construction and surround-

ings of suburban residences of the more expensive sort. Yet it is still too much the fashion to carry into semi-rural neighborhoods, where ground space is reasonably cheap, the unbroken blocks of houses characteristic of the city, and made necessary there by the high cost of land.

The outskirts of our cities, where garden and lawn spaces are not luxuries beyond the means of the moderately well-to-do, show a serious lack of dwellings intermediate in character between the city block and the detached residence, though the need of such homes must be wide and urgent. When the average business man seeks a home at a distance from the center of traffic, he does not want to find it in a row of houses which might as well have been planned for and set up in the heart of the city. Though unable to own or hire a detached house, he is not unwilling to pay for a reasonable amount of land not built upon, provided it is properly used to enhance the beauty and healthfulness of his home. For such reasons we are inclined to think that there is a large opportunity for capitalists and speculative builders to make good investments in dwellings of the class described, in many suburban localities made accessible to the business men of New York and other cities, by the increasing means of rapid transit everywhere prevailing.

The accompanying illustration, showing the elevation and grounds of a section of three villas, from a block of nine residences in Hanover, Germany, gives a good idea of what the suburban homes we have in mind might look like.

The second engraving shows the plans of the main floors, and the artistic manner in which the grounds are laid out. With such changes of plan as would be required to adapt them to the needs of American households, such dwellings, we believe, would sell readily or rent to desirable tenants at rates that would make them as profitable to the builder or owner as delightful to the occupants. In size the houses are well suited for the majority of well-to-do American families, such for example as make up a large part of the population of Brooklyn; and their architectural beauty speaks for itself. The cost of the houses need not be great;

[Continued on page 402.]



SUGGESTIONS IN ARCHITECTURE.—GROUP OF ORNAMENTAL VILLAS AND GROUNDS.