testing and also allows the water gradually to escape after a test by water.

Existing drains which have become defective and require to be made good must be exposed, taken up and relaid with new pipes, unless advantage be taken of a method which, it is claimed, renders it possible to make them permanently watertight so as to withstand the water test under pressure, and at the same time to disinfect them and the surrounding subsoil. This end is accomplished with the aid of patent machines which on being passed through the drain-pipe first remove all obstructions and accumulations of foul matter and then thoroughly cleanse and disinfect it, saturating the outside con- crete and contaminated soil adjacent to any leak with strong dis- infectants. Subsequently, loaded with the best Portland cement, another machine is passed through the drain, and, by powerful evenly-distributed circular compression, forces the cement into every hole, crack or crevice in the pipes and joints. This work leaves the inner surface of the pipes perfectly clean and smooth. After the usual time has been allowed for the cement to set the air test is applied, and the drain is claimed to be equal to, if not better than, a new drain, because the foundation is not dis­turbed by the process, and the risk of settlement, which is often the cause of leaky drains, is

remote.

Every sanitary fitting should be trapped by a bend on the waste-pipe; this is generally made separately and fixed up near to the sink,

closet or basin, as the case may be. The traps of small wastes such as those of sinks and lavatories should be fitted with a brass screw cap to facilitate clearing when a stoppage occurs. Their object is to hold a quantity of water suffi- cient to prevent the access of foul air through the waste-pipe into the house. The depth of the water “ seal" should not be less than 2 in., or it may become easily unsealed in hot weather through the evaporation of the water. Unsealing may be caused, too, by “ siphonage,” when a number of fittings are attached to the same main waste without the branches being properly ven­tilated just below each trap. The discharge from one fitting in this case would create a partial vacuum in the other branches and probably suck the sealing water from one or more of the traps. To obviate such an occurrence an “ anti-siphon- age ” pipe is fixed having its upper end open to the air and provided with branches tapping such waste-pipe just below the trap. Then, with this contrivance, a discharge from any fitting, instead of causing air to be sucked in through the trap of another fitting, thereby breaking the seal and allowing foul drain air to enter the house, merely

draws the necessary air through the anti-siphonage pipe, leaving the other traps with their seals intact (fig. 12). There are many forms of traps for use in different positions although the principle and purposes of all are identical. Two forms commonly used are known as the S and the P trap. The bell trap and the D trap are obsolete.

To collect the rain and waste water from areas, yards, laundry and other floors and similar positions an open trapped gulley is used.

It is usually of stoneware and fitted with an open iron

grating which admits the water (fig. 13). Many of these gulleys are made too shallow and speedily get choked if the water they receive is charged with mud or sand. To obviate this difficulty

the gulleys arc made with a deep container and are often fitted with a perforated basket of galvanized iron which catches the solid matter and has a handle which allows for its easy removal when necessary. Gulleys with slipper or channel heads as shown in fig. 14 are required to be fitted in some districts to receive the waste from sinks. The warm waste water from scullery and pantry sinks contains much grease, and should discharge into a trapped gulley specially con­structed to prevent the passage of the grease into the drain (fig. 15). It should be of ample size to contain sufficient cold water to solidify the fat which enters it. This forms in cakes on the top of the water and should be frequently broken up and removed.

Great attention has been directed to the design of sanitary fittings, with the object of making them as nearly self-cleansing as possible. In the fixing of closets the wood

casings which used to be fixed

around every water-closet are going

steadily out of use, their place

being taken by a hinged seat sup-

ported on metal brackets—an

arrangement which allows every

part of the appliance to be readily

cleaned with a cloth. In hospitals

and similar institutions a form of

closet is made fitted with lugs which

are built into the wall; in this way

support is obtained without any

assistance from the floor, which is

left quite dear for sweeping.

Lavatory basins and sinks are also supported on cantilevers in the same way, and the wood enclosures which were formerly often fixed around these appliances are now generally omitted.

There are several distinct types of water-closets. Each type is made in many different patterns, both good and bad from a sanitary point of view, and, whatever the type decided upon, care is necessary in selecting to obtain one efficient and hygienic in shape and working. The principal kinds of 'closets now in use are the washdown, siphonic, valve, washout and hopper.

*Washdown closets* (fig. 16) are most commonly used. They are inexpensive to buy and to fix, and being made in one piece and simple in construction without any mechanical working parts are not liable to get out of order. When strongly made or protected by brick or concrete work they will stand very rough usage. The ob­jection is sometimes raised with regard to washdown closets that they are noisy in action. This must be allowed with many patterns, but some of the latest designs have been greatly improved in this respect, and when fitted with a silent flushing cistern are not open to this objection.

*Siphonic closets* (fig. 17) are a type of washdown in which the con­tents of the pan are removed by siphonic action, an after flush arrangement providing for the resealing of the trap. They are practically silent in action and with a flush of three gallons work very satisfactorily. Where the restrictions of the water company require the usual two gallon flush the ordinary washdown pan should be used.

*Valve closets* (fig. 18) are considered by many authorities on sanita­tion to be preferable to all other types. For domestic buildings,

hotels, and where not subjected to the hardest wear, they are un- doubtedly of great value. They should have a three gallon flush, and on this account they cannot be used in many districts owing to the water companies’ regulations stipulating that a flush of not more than two gallons may be used.

The *washout closet* (fig. 19) is a type that never attained much popularity as it has been found by practical experience to be unsanitary and objec­tionable. The standing water is too shallow, and the receiving basin checks the force of the flush and the trap is therefore frequently imperfectly cleared.

*Hopper closets* are of two kinds—the long hopper and the short hopper. These are the forerunners of the washdown ςloset which the short hopper pan resembles, but instead of pan and trap being made in one piece the fitting consists of a fireclay or stoneware hopper, with straight sloping sides and central outlet jointed to a trap of lead or other material. The joint should be placed so as to be always kept under water by