culation need. Many times, probably, it would be better to use no circulatory drug rather than to use a wrong one.

Better to understand when a drug should be used and which drug should be used, it may be well to classify circulatory drugs in a way that will better show what to expect of them. It is absurd to use a slow-acting drug like digitalis when a quick stimulation of a heart is desired. It is also wrong to believe that alcohol will cause any more than a momentary stimulation of the heart; in other words, in cardiac weakness which lasts more than a very short time alcohol for this purpose is contra-indicated. It is also generally inadvisable to give a drug that raises the blood-pressure when a heart is laboring against high pressure.

The drugs used to act on the circulation may be subdivided as follows:

1. Drugs to stimulate the heart: alcohol, ammonia, and camphor.
2. Drugs to depress the heart: aconite (veratrum).
3. Drugs to strengthen the heart: caffein, digitalis, strophanthus, strychnin.
4. Drugs to contract the blood-vessels: atropin, ergot, epinephrin.
5. Drugs to dilate the blood-vessels: alcohol, nitrites.

As just stated, alcohol is a cardiac stimulant only for a short time and really acts for good in some abnormal circulatory conditions by dilating the blood-vessels.

Aconite is now rarely needed to depress the heart, as, if there is fever, a coal-tar product not only lowers the high temperature, but also depresses and quiets the heart.

Caffein and strychnin are both stimulants and tonics to the heart.

A cardiac stimulant may be defined as something that will stimulate the heart to greater activity but which, after its action is over, leaves the heart worse than it found it, unless the indication for such stimulation was a momentary one. In other words, such drugs are cardiac whips, and do not strengthen the heart.

A cardiac tonic may be defined as something that braces the heart and at the same time strengthens it; in other words, leaves it better than it found it. Such drugs are indicated in more or less continued cardiac weakness, and are not indicated in sudden emergencies.

As digitalis is one of the most important of the drugs above mentioned, and is a much misused drug, it seems well to describe its action first. The plan used in its description is the plan or scheme that seems the best for presenting the activities of a drug to the man who is to use the drug in actual practice, and the same scheme will be followed when other important drugs are described in this department.

DIGITALIS

Description.—Digitalis (genitive digitalis, Latin feminine noun, third declension). This drug was named by Fuchs, in 1542, after the German *Fingerhut*, a thimble. The United States Pharmacopeia recommends as official the dried leaves of *Digitalis purpurea*, the purple fox-glove, gathered during the second year of the growth of the plant while it is in flower. The *Digitalis purpurea* grows wild in Southern and Central Europe and England, and is cultivated in the United States, but the leaves of the cultivated plants are believed to have less medicinal value than those gathered from the wild plants. The so-called English leaves are preferable to the German leaves because they are cleaner and have been separated from the stalks on which they grow. Digitalis has rather a disagreeable, bitterish taste, but the infusion, which is made with cinnamon water, is less unpleasant.

The first investigator to obtain a crystalline active principle from this drug was Nativelle, in 1871, but as yet no active or alkaloidal principle has been separated that is so efficient in its action as preparations made from the crude drug by reliable chemists.

The exact chemical constitution of digitalis is not definitely established, but from the leaves by extraction with water and alcohol have been obtained the following:

DIGITALIS: A crystalline glucosid which is often prepared from the seeds and may, therefore, be an impure product containing active principles not found in the leaves. There are probably on the market to-day about four different substances under the name of digitalin some of which contain digitoxin and are therefore much more active and poisonous. Hence a given preparation of digitalin should be carefully tested by small doses before large doses are given. It is fairly soluble in water.

DIGITALEIN: A glucosid obtained from the leaves.

DIGITOXIN: A third glucosid obtained from the leaves.

DIGITOPHYLLIN: A fourth glucosid, resembling digitoxin, recently obtained by Kiliani.

DIGITOXIN: A toxic principle more actively poisonous than the above glucosids.

Besides these active principles there are a resin, an acid, and a fixed oil.

There has been a good deal of discussion and difference of opinion as to the relative physiologic activity of a watery preparation of the leaves (the official infusion) and an alcoholic preparation of the leaves (the official tincture). An infusion should represent pretty much the whole activity of the digitalis, as water seems to extract the digitoxin and digitophyllin in the presence of digitonin glucosids. On the other hand, an alcoholic preparation of the leaves represents the best active principles, except the digitonins. The digitalins offered are prepared mostly from the seeds of digitalis. These probably are rarely one glucosid, but represent both digitalin and digitalein, with a small amount of digitoxin and probably some digitonins.

The most active part of digitalis is probably the digitoxin, and as these crystallin preparations represent less digitoxin than do the fluid preparations of the Pharmacopeia prepared from the leaves, these crystalline substances are not as active nor satisfactory medicaments.

Digitalis was first recommended to the medical profession by Dr. W. Withering, who wrote, in 1785, under the title of "An Account of the Fox-Glove," of the results of using this drug in two hundred cases of dropsy and allied conditions during the previous ten years. In this article he strongly advises the use of digitalis as a diuretic, and also noted that it had good action on the heart.

Local Action.—This drug has no action on the skin, but has a slightly irritant action on the mucous membranes and, hence, when swallowed in strong preparation, or undiluted, or on an empty stomach, or when large doses are long repeated, will cause loss of appetite, nausea, perhaps vomiting, and even diarrhea. Preparations that do not contain digitoxin would not irritate the stomach as much, but such preparations are not so valuable therapeutically. Preparations injected subcutaneously may cause considerable irritation and perhaps inflammation, and even abscesses, though the latter