which surrounds the valve seat. The result of this action is that the steam obtains a leverage, and the valve acts with thorough efficiency. The valve may be moved while under pressure to test its condition, the handle shown being used for testing its blowing off power and for ascertaining that it does not stick. The "pop" valve lifts higher from its seat than any other valve, and its discharge is stated to be equal to that of five valves of the ordinary construction; the 7-in. valve lifting ⅜ in. from its seat. The two circles in the engraving form a comparative diagram, showing the area of the common valve when open and of the "pop" valve; the size of the valve being 3 in. The valve is shown without a dome and it can be locked up without or with that addition, so that it cannot be tampered with. The apparatus is very simple in construction, and its efficiency is proved by the fact that it is in use on more than 4000 locomotives in America, and that the Government of that country have recently adopted it. It is equally applicable to locomotive, marine, and land boilers, and gives promise of very general adoption.

BEE PROTECTOR.

The ingenious inventor of this device, before putting his ideas into practical shape, doubtless became convinced of the immutable truth of these facts: First, the busy bee improves only "shining hours," and gathers honey from opening flowers only by day; Second, the bee moth has a predilection for stealing honey under cover of the night; and third, chickens retire to their roosts at twilight, and are aroused by the "shrill clarions" of the masculine portion of their population at an excessively early matutinal hour. To utilize these propositions to compass the desired end, was the problem: how it has been solved, we proceed to show. The bees are expected to enter their domiciles a little before dark. After they are all in, the period for the roosting of the chickens arrives. The latter, alighting on their perches, operate machinery which closes the hive gates and shuts the bees in. The bee moth, on attempting his burglarious operation, finds himself barred out, and as the mechanism of the device is beyond his comprehension, it is to be inferred that he retires in disgust. Meanwhile the chickens repose until the early village cock proclaims the morn, when they abandon their perches to resume their geological investigations into the surface of the adjacent soil, and thus return the bees, their honey all safe, to the airs of heaven and flowers of earth. For the benefit of all who may be interested in this strikingly novel application of the force of gravity through the medium of chickens, we append the following detailed description of the mechanism.

A is a horizontal rock shaft, secured in suitable bearings and provided with three arms, B, C, and D. The arm, B, within the house supports a vertical sliding post which is held in guides, and bears the perches. The arm, C, carries an adjustable weight, sufficiently heavy to overbalance the post and keep it elevated when the roosts are unoccupied. The upright arm, D, is connected as shown by the dotted line with the rods, E E, attached to the gates of the hives. Suitable weights, F, are arranged in connection with the rods, E, so as to hold the gates open.

As the fowls mount upon the roost their weight depresses the post, and it, in turn, presses down the arm, B, and thereby rocks shaft, B, and its arm, D. The latter, operating the rods, E, closes all the hives. As soon as the roost is vacated, the weights bring the parts to the original positions. The advantages claimed are the regularity and certainty with which the hives will be closed and opened, and the fact that any number of hives may be connected with the device and simultaneously operated.—*Scientific American.*

PRESERVING GRINDSTONES.—A grindstone should not be exposed to the weather, as it not only injures the wood work, but the sun's rays harden the stone so much as, in time, to render it useless. Neither should it stand in the water in which it runs, as the part remaining in water softens so much that it wears unequally, and this is a common cause of grindstones becoming "out of true."

We give on page 109 illustrations from the *Builder* of a house designed by an English architect for a Norwegian gentleman, the owner of several timber farms. The house was to be erected on one of these farms for his own use. The drawings were made under his personal superintendence as to details; and the arrangements of plan are therefore similar to what would be necessary ordinarily in a similar situation. But the architect is chiefly responsible for the double height of verandah and the top room, or belvedere, and other architectural features. The construction was to be of local materials,—that is, the timber of the estate and the chimneys of brick; but as it was to be carried out by local workmen entirely, the cost is not known.

The conditions of climate and of timber supply being somewhat similar, the plan may supply a useful hint or two to prosperous Canadian farmers and others.

As our illustrations do not include a scale, we add the dimensions of some of the rooms:—Drawing-room (*Dagligstue*), about 18 ft. 6 in. by 16 ft. in clear; sitting-room (*Daglickamer*), about 16 ft. by 14 ft.; dining-room (*Spisekamer*) about 16 ft. by 14 ft.; kitchen (*Kiokken*), about 16 ft. by 14 ft.; hall (gallery over), about 25 ft. by 20 ft.

QUALITATIVE ANALYSIS FOR AMATEURS.—II.

By E. J. HALLOCH, A. M., in the *Boston Journal of Chemistry*.

SECOND GROUP.

This includes those metals which are precipitated by hydrosulphuric acid from acid solutions; namely, mercury, lead, bismuth, copper, cadmium, gold, platinum, tin, arsenic, and antimony. Hydrosulphuric acid (hydric, sulphide, or sulphuretted hydrogen, H S) is a poisonous gas with a very disagreeable odour which resembles rotten eggs; breathed in small quantities it produces headache; is very soluble in water, so that its solution is often employed instead of the gas itself; is combustible, and, when mixed with air explosive. The usual method of preparing it is from sulphide of iron and sulphuric acid. The sulphide of iron for this purpose can be purchased of the dealers in chemicals in large cities, or prepared by carefully fusing together iron-filings and sulphur. The sulphide of iron is broken up in small pieces and put in a bottle fitted with a good cork (soaked in paraffine) through which passes a tube twice the length of the bottle, the lower end reaching almost to the bottom of the bottle, a funnel being attached by a rubber tube to the upper end. Another tube 4in. long, bent at right angles, also passes through the cork. To the end of this is attached a glass tube long enough to reach to the bottom of the test-tube or other vessel in which the precipitation is to take place. The bottle being tightly corked, dilute acid is poured into the longer tube, when gas at once begins to issue from the shorter tube. No heat is required. Another method that I have often found more convenient on a small scale, is by melting together paraffine and sulphur. Some sulphur is first placed in a test-tube, then several pieces of paraffine thrown in, and the test-tube closed with a cork through which passes a single tube bent twice at right angles. After applying heat for some time, hydrosulphuric acid gas is given off; as soon as the heat is removed the gas ceases to be generated, but begins again whenever heat is applied. The gas should always be generated under a flue or in the open air. If prepared in or near a building painted with white lead, it blackens the paint, from the formation of sulphide of lead.

Group second is divided into two divisions: the first including mercury, lead, bismuth, copper, and cadmium, whose sulphides are insoluble in ammonic sulphide; the second including arsenic, antimony, tin, gold, and platinum, whose sulphides are soluble in ammonic sulphide.

REACTION OF METALS OF GROUP SECOND, FIRST DIVISION.

Dissolve a little corrosive sublimate, called by modern chemists mercuric chloride ($HgCl_2$) in a little water in a test-tube. Pour a few drops of this into a second test-tube and dilute, then pass hydrosulphuric acid gas (H_2S) into it; a white precipitate forms, which immediately passes through yellow and red to black. Filter and try to dissolve the precipitate in ammonic sulphide, also in nitric acid; it will be found insoluble in both. Dissolve it in aqua regia, a mixture