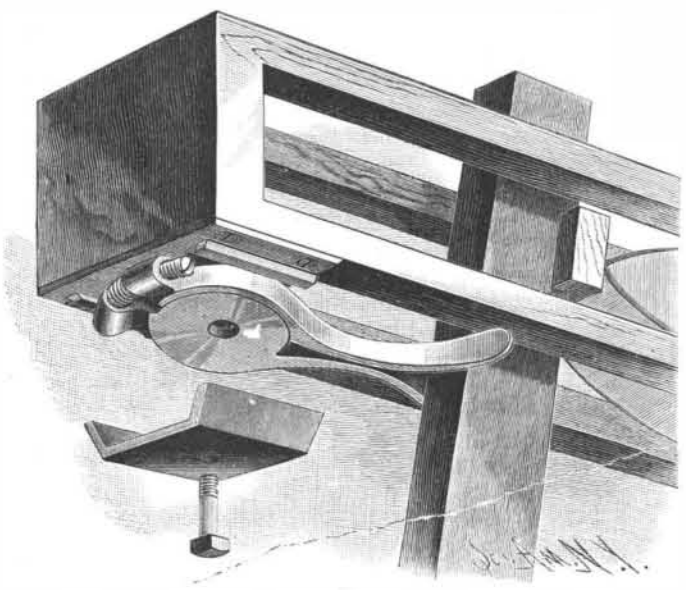
IMPROVED SHUTTLE CUSHIONER FOR POWER LOOMS.

Various appliances have heretofore been proposed for avoiding the waste of filling, and sometimes imperfect work, on account of the picker stick resting in a dead or solid manner against the "lathe block" as the shuttle comes upon it. The illustration herewith shows an improved device of this character, differing essentially from anything heretofore contrived, but yet so simple that its operation will be at once understood. The cushioner, which is made of metal, is secured to the under side of the shuttle box, one cushioner for each shuttle box. It is composed in part of a finger carrier or stand—a box or strap forming a cover for which is shown to the left at the bottom of the illustration—two working fingers, and a spring. The fingers are held in the position wished for by the



PAIGE'S SHUTTLE CUSHIONER AND PICKER STICK.

spring, which is adjusted by a screw and follower to the tension desired. When the picker stick comes back, after throwing the shuttle, it rests against or within the mouth or flaring front end portions of the fingers, and the shuttle upon its return forces the picker stick gently back between the fingers against the pressure of the spring, the fingers holding the picker stick until the next beat of the loom. This prevents any recoil of the shuttle, and obviates slack filling, which might make kinks in the cloth.

This invention has been patented by Mr. James H. Paige, of Leadville, Col.

BEET SUGAR MANUFACTURING PROCESSES.

Lime and carbonic acid are manufactured at the same time.

The shape of lime kilns varies with the engineer who designs them.

The most common form is a truncated cone, and to calcinize 10 tons lime per 24 hours, the kiln should be about 21 feet in height, 9 feet at the bottom, and 3 feet diameter at top. The interior is lined with refractory bricks, and at regular intervals, externally, are bands of iron. They should be tightened when the kiln is working and loosened when the operation has ceased. To prevent injurious action of the weather, it may frequently be desirable to surround the kiln with a light structure.

The limestone is introduced in pieces of moderate size, mixed with one-fifth its weight of coke. Filling and emptying occur every two hours, and the furnace doors should be easily worked, as upon them depends the amount of draught.

As about three days are required for the comple calcination of limestone, it is evident that the capacity of the kiln should be about three times greater than the lime required for use per 24 hours.

A kiln of the dimensions above described will furnish about 12,000 kgs. of carbonic acid, but only one-half of this actually combines with the lime during defecation.

The *Sugar Beet*, to which we are indebted for these particulars and the engraving, says that it is estimated that 100 kgs. coke are sufficient to calcinize 1,100 of limestone. Frequently lime kilns are fired with wood charcoal, under which circumstances very large quantities are needed. Coke and charcoal are the only kinds of fuel advisable to use when producing lime and carbonic acid for sugar factories.

If, instead of these, ordinary coal were employed, there would result sulphureous gases, forming objectionable sulphate of lime during the carbonatation. Humidity of the limestone is also a cause of considerable loss through the surplus fuel necessary for its evaporation before the ordinary calcination can commence.

The engraving shows a most interesting type of lime-kiln, differing from any other in that its fire grate can receive a rotary movement; and its internal cylindrical shape causes a considerable saving in the first cost of the plant. There is also a very large production of carbonic acid and lime, together with a methodical system of working and economy in fuel and annual repairs.

It is desirable that lime kilns be not too high, as the resulting carbonic acid would frequently be changed into carbonic mono-oxide in passing through the burning coals. The gas engine should, as far as possible, be worked to satisfy these conditions, viz., keep the zone of combustion always at about the same height. Regularity of working is essential for the success of the lime kiln.

Many German manufacturers use quicklime for defecation, but this is a mistake, as it introduces impurities which may offer considerable trouble in the various processes. In France, on the other hand, slaked lime, or milk of lime, seems to have preference. Doubtless this has the advantage of presenting no lumps, stones, etc., and of allowing more thorough mixture of the lime with the juice on leaving any apparatus. A few remarks respecting the preparation of milk of lime will not be out of place here. For this purpose two vats are used, in one of which the quicklime is slaked with excess of water.

The milk of lime thus produced is strained before being run into the second vat—thus depriving the liquid of small stones, etc.; and homogeneity is preserved by suitable agitators. The limed water either flows into a *monte jus* or pumps, and from thence into defecating tanks or into a special storage tank at convenient distance.

On leaving the lime kiln the carbonic acid is hot, and contains a certain amount of impurities. The temperature should be lowered and impurities separated. For this purpose the gas is run through an apparatus known as the washer.

It is composed of a vertical cylinder with several horizontal layers of water separated by perforated metallic sheets. The gas enters the apparatus from below, and meets a current of water moving in opposite direction; sometimes also a filtering substance, such as sand or boneblack, is placed in the diaphragms.

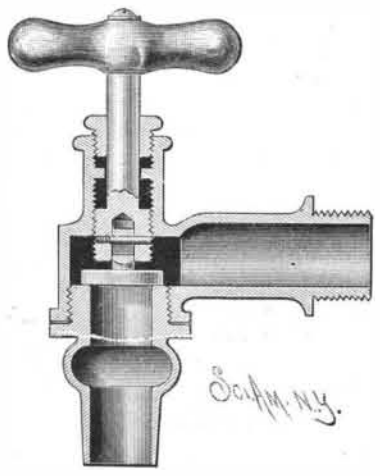
The gas engine in connection with the lime kiln is a double-acting suction and force pump, capacity calculated to suit the requirement in length of stroke and diameter of piston, which are usually equal.

The pump most generally used is without *clapet* (hinged valve), and the movement is given by a steam engine mounted on the same frame.

It may be interesting to call attention to the fact that frequently the pumps draw from the kiln more carbonic acid gas than is necessary for defecating. Under these circumstances a valve on the connecting pipe opens, and permits escape into a pipe conducting outside the factory.

The juice, after being defecated, still retains certain coloring substances most difficult to eradicate, but the decolorizing property of boneblack has aided greatly in this process.

The boneblack filters are large cylinders, of diameter much less than their height. There are two modes of working them: (1) under pressure, (2) without pressure. In the first case the filters are closed, and filled from tanks placed on the upper floor. In the second method



SMITH'S METAL VALVE OR TAP.

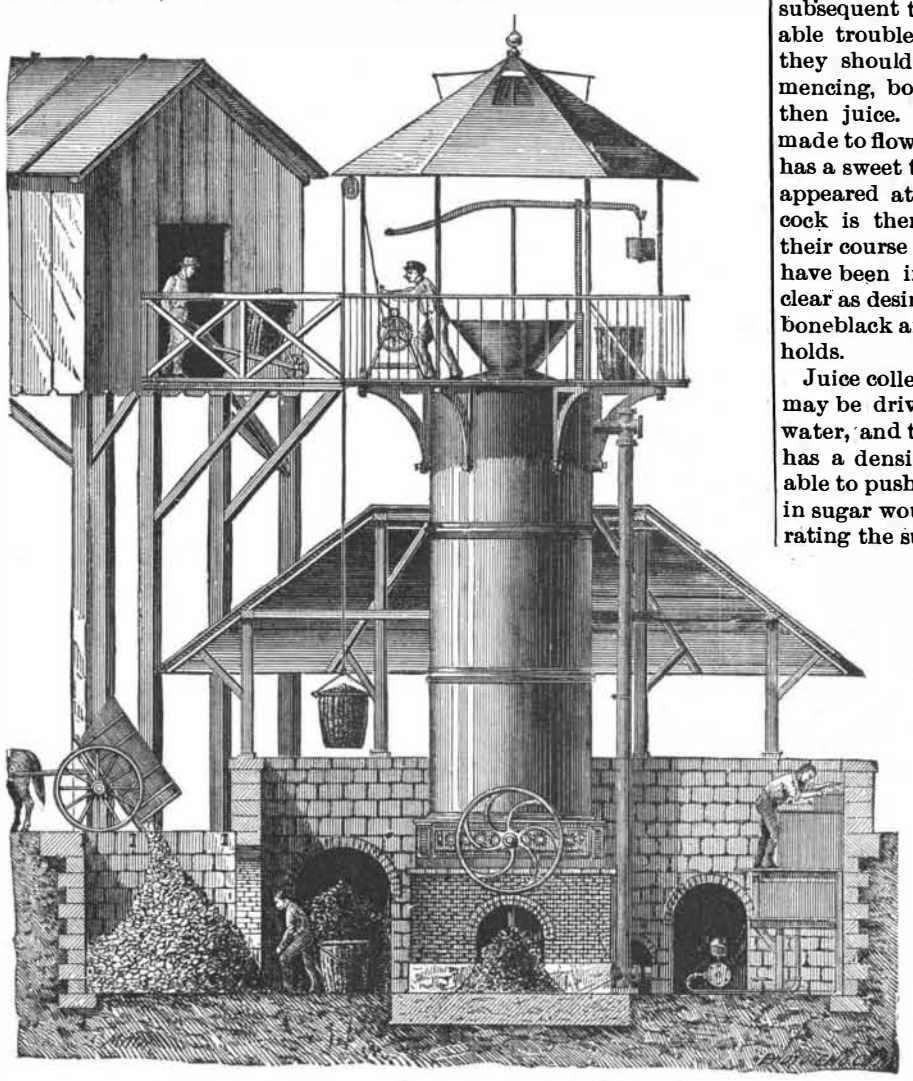
[FOR DESCRIPTION SEE PAGE 325.]

the juice falls directly into the filter through a suitably arranged valve, by which the flow of juice may be regulated.

The closed filters have a greater popularity than those in use without pressure, and are the most used in large factories. They are cylinders of about 2 feet diameter and 12 feet in height, and their general arrangement is much the same as that of the old type. The upper part of the apparatus is closed within a dome, which can be opened or closed by means of a screw. From the dome runs a distributing pipe, connecting with the hot water, sirups, etc. As the filter before filling contains a certain amount of air, a small pipe and valve should be provided to permit the air to escape. These closed filters may be made to connect one with the other, and in this manner juices can be filtered several times—representing the decolorizing effect of a filter of very great height.

While bone filters may be used for juices, sirups, molasses, etc., it is advisable to have a special filter for molasses, as the impurities remaining in the boneblack subsequent to filtration might be the cause of considerable trouble. Whatever be the kind of filters used, they should be kept as clean as possible. On commencing, boiling water should be run through, and then juice. The water contained in filters may be made to flow out from below, and as soon as this water has a sweet taste, it is an indication that the juice has appeared at the lower part of the filter. The waste cock is then closed, and the filtered juices continue their course as previously described. When the filters have been in use for some time, the juices are not as clear as desirable, and it is needful to empty them of boneblack and cleanse the last from the impurities it holds.

Juice collected in the pores of the filtering substance may be driven out. This can be done by pressure of water, and the operation is ended when the exit liquid has a density corresponding to 1° B. It is not advisable to push the washing beyond this limit, for the gain in sugar would not compensate for the cost of evaporating the surplus water. Great care should be given to the thorough cleanliness of the filters. Hence the importance of washing them with steam, after the exhausted boneblack has been removed. Bone filters should be covered with some non-conducting material, to prevent sudden cooling.



LIME KILN FOR CARBONIC ACID PRODUCTION.

BEFORE the Berlin Physical Society, Prof. Vogel recently produced three fluids in three flat phials—one yellow and two blue fluids—which he made use of in demonstrations regarding color mixture, in order to dispel the belief which prevailed very largely among the public that yellow and blue when mixed yielded only green. Phial 1 contained "acid yellow" (*Sauregelb*); phial 2, solution of ammoniacal copper; phial 3, aniline blue. 1 and 2 superimposed on each other gave green; 1 and 3, a fiery red.