

APPARATUS FOR CLARIFYING CANE JUICE.

The production of sugar is the foundation of the greatest social problem which is engaging the attention of the world at the present day—the supply of labor for the tropics—for it is mainly for this production that the supply is demanded. At this time, long-tailed Chinese are yawning away the monotonous hours of a sea-voyage on their long journey from China to Cuba; natives of India, who have emigrated from their own country, where wages are two cents and a half per day, are rejoicing in their increased pay on the plantations of Mauritius; and the ship-carpenters at the Brooklyn navy-yard are busy on the propellers for our African squadron, all in connection with this great question.

The whole labor problem has been greatly modified in the last few years, by the improvements which have been made in the manufacture of sugar. There is not probably one of the arts which has occupied a larger share of the attention of the highest class of inventors, men of science, than this manufacture. The evaporation of the juice has enlisted an amount of study and ingenuity which is almost inconceivable; but the clarifying department has been the greatest field for investigation and contrivance. After all the complicated and costly methods which have been adopted or proposed, Richard A. Stewart, of Louisiana, has produced a process (which was patented August 23, 1859) so simple and efficient that it is rapidly going into general use. His plan consists in forcing the vapor of sulphuric acid into the cane juice. He does this by an exceedingly simple apparatus. Sulphuric acid is one of

the six combinations of sulphur and oxygen (S. O.₂), and is the product of the combustion of sulphur in atmospheric air. To produce this sulphuric acid, therefore, Mr. S. has simply to burn roll-brimstone, which he does in a close vessel, admitting the air slowly to regulate the rapidity of the combustion.

An end view of this vessel is represented at *r*, in the annexed cut; *a* representing the small adjustable hole, about an inch in diameter, through which the air is admitted. The cylinder, *v*, is 12 feet in length and three in diameter, made of iron, and lined with some substance which sulphuric acid will not corrode. A pipe, *P*, four inches in diameter, leads from the cylinder or retort, *r*, into the top of the tight iron vessel, *W*, of the size of a barrel, which is partly filled with water, the pipe, *P*, extending down below the surface of the water. Another pipe, *P*², leads from the vessel, *W*, into the top of a tight iron cylinder, *V*, 10 feet in length and three in diameter, called the vacuum cylinder. A third pipe, *P*³, conducts the steam from the boilers, *B B*, to the bottom of the vacuum cylinder. A fourth pipe, *P*⁴, communicates with the top of the vacuum cylinder, and a series of tubes coiled in the bottom of the cane-juice receiver.

The operation is as follows: The brimstone (pulverized) is spread from end to end along the bottom of the retort, *r*, and ignited at the end nearest the pipe, *P*, the admission of air being very slow. Sulphuric acid gas is constantly produced, with, perhaps, a small quantity of sulphuric acid, all of which remains in the retort un-

til allowed to pass forward. When it is allowed to pass forward to the vacuum cylinder, it first goes through the water vessel, when any sulphuric acid which may have been formed in the retort will be principally absorbed; the juice-receiver is filled with cane juice, and the stop-cocks, *c* and *c'*, are opened, whereby the steam passes into the vacuum cylinder, expelling the air therefrom. The cocks, *c* and *c'*, are then closed, and the condensation of the steam in the vacuum cylinder produces a partial vacuum therein; the stop-cock, *c*², is then opened, and the sulphurous gas presses forward to fill the vacuum cylinder. The stop-cock, *c*², is then closed, and *c* and *c'* are opened, when the steam rushes into the vacuum cylinder, forces the sulphurous gas therein through the pipe, *P*⁴, and perforated pipes throughout the cane juice in

cane. Hundreds of these have been sent from this city to the West. But the active minds of the western people, coming into actual contact with the matter, are busy trying to make improvements over everything imported from elsewhere. The annexed engraving represents a mill for crushing cane for which a patent was granted to Daniel Bassett, of Whitewater, Wis., August 2, 1859.

A simple inspection of our illustration will give a very good idea of the machine without any description whatever. The principal feature of the invention is the combination of the tongues and grooves of the crushing rollers. The upper rollers, *A A*, are either provided with projections or tongues to fit loosely into the lower rollers, or they are made of the proper thickness to constitute these tongues themselves without any projection.

The cog-wheels, *C C*, mesh into each other, and being of equal size, secure a uniform motion to the rollers in opposite directions. The shaft of the upper rollers is so placed in boxes at either end as to permit a vertical movement; and is pressed down by levers at each end, on which levers are placed weights, *W W*, by means of which the pressure upon the rollers is adjusted at the pleasure of the operator.

A second feature of the invention is the packing or wiper, to prevent the expressed juice from spreading. This consists of two separate portions of leather, india-rubber, or any similar elastic substance, attached by metal plates to the inside of the bar, *V*, at each side of the interior aperture, and is placed closely in contact with that portion of the sides of the tongued roller which runs in the channel of its opposite roller, and also closely in

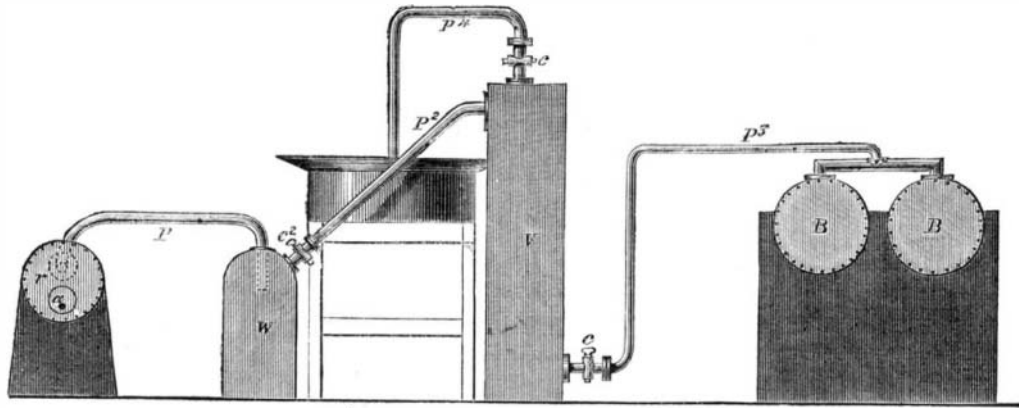
contact with the edges or periphery of the lower channeled roller, its form being such as to adapt it to this position, and to prevent the lateral discharge of the expressed juice.

The manufacturers of this machine say:—"In plain rollers, if a large cane is passing at each extremity, the intermediate space on a plain roller would press a small cane only partially. Now, in our mill, the pairs of rollers are placed near each extremity of their shafts, and so constructed as to press in each channel respectively, according to the pressure of the weighted levers, whether the cane be large or small. The cane is confined in a small space, the pressure localized, and a great velocity may be attained with safety, as there can be no clog-

ging. The speed is only limited by the ability of the feeder to supply the rollers."

For further particulars, address the inventors or Messrs. Winchester, DeWolf & Co., Whitewater, Wis. The latter have an equal interest in the invention with the patentee.

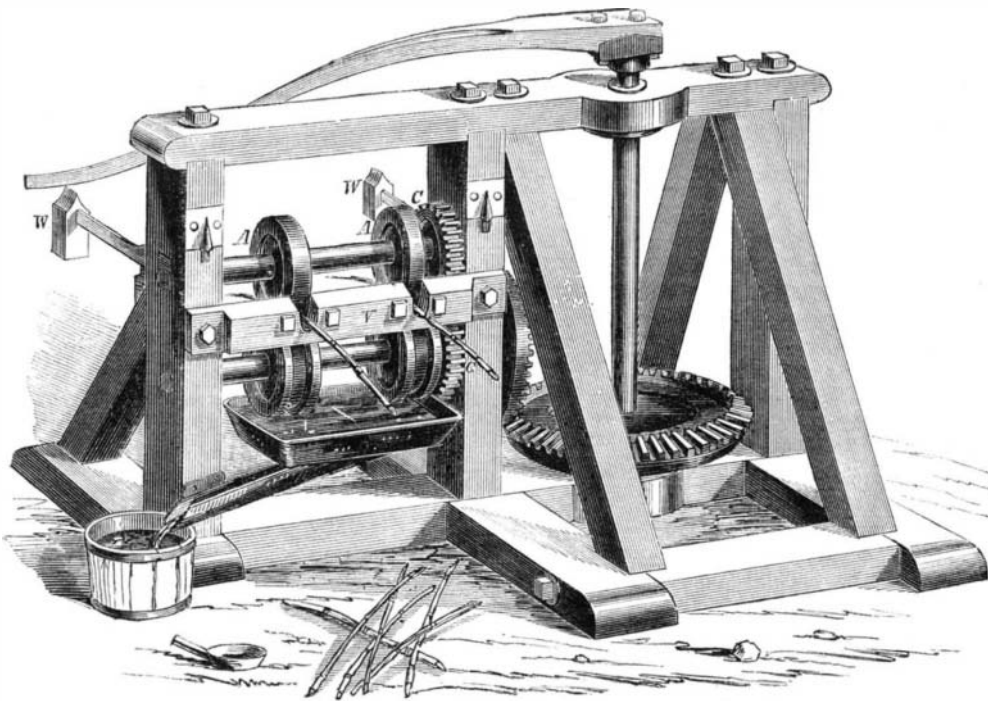
STEAM CARRIAGES FOR COMMON ROADS.—The Newark (N. J.) *Mercury* says, that J. K. Fisher, of Paterson, has constructed his steam carriage, which was tried on the common road to Acquackanock, a few days ago, when it went on the level 15 miles an hour, with 12 passengers. One mile was run in three minutes. This is the engine mentioned in Mr. Fishers' letter published on page 67, this volume of the SCIENTIFIC AMERICAN.



STEWART'S CANE JUICE CLARIFIER.

the receiver.

The inventor states, in his specification, that, if necessary, successive charges of the gas may be passed through the saccharine liquid. The process occupies but a few minutes, and the expense is a few cents to the hoghead of sugar. This improvement entirely dispenses with the necessity of using either bone-black or bi-sul-



BASSETT'S CHALLENGE CANE CRUSHER.

phate of lime. An apparatus of the dimensions here described is sufficient for the largest sugar-house.

The claim of the patentee is to "the defecation and clarification of cane juice, and other liquid or semi-liquid forms of saccharine matter, by disseminating throughout the same sulphurous gas or sulphurous acid gas, for the purposes set forth."

THE CHALLENGE CANE CRUSHER.

Another invention in the manufacture of sugar! It seems that the introduction of the Chinese sugar cane is calling forth a series of contrivances for making sugar from it, adapted to the use of scattered farmers who raise but little of the cane, and who, of course, require an apparatus entirely different from the great mills on our southern plantations. A large business has already grown up in the manufacture and sale of mills for crushing the