and consequent higher temperature, can be given to the gas which has passed into the second receiver by the portions which subsequently enter it. This is due to the fact that he ignores the motion of translation which the entering gas possesses. A mass of gas in motion as a whole, will act on another mass of gas in the same way as a moving piston, namely, increase the velocity of the molecules which collide with it.

Detailed criticism of Mr. Fireman's paper will have to be suspended until its publication. The statements in the abstract are very vague, and the author certainly does not show how the molecules with slow velocities force their way back against the rushing stream, and congregate in the first receiver.

We sometimes find the statement in textbooks that a gas expanding under such conditions that no work is done experiences no cooling, for example, when expanding into an infinite vacuum. It appears questionable, however, whether a gas can expand without doing work. Leaving out of consideration the internal work, *i. e.*, the overcoming of the forces of cohesion, we still have the gas in the receiver doing work in giving a motion of translation to the mass of gas thrown out into the vacuum.

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BITTER ROT OF APPLES.

IN the article upon this subject in SCIENCE for October 24, 1902, page 669, there is no reference to similar investigations with like results previously published. There is, however, an intimation that earlier knowledge was insufficient to justify publication.

There is sent herewith a 'circular' and a 'bulletin' issued by the Agricultural Experiment Station of the University of Illinois, which were put into the mails on respectively the fourteenth and twenty-ninth days of July of this year. Of the first there were sent out 1,200, and of the second 20,000 copies. They have each been referred to or copied entire in at least one hundred different periodicals throughout the country. Copies were mailed direct on the days indicated to the author whose name is signed first to the article now in question, and he may easily have first learned by this means of Mr. Simpson's discovery. At all events the publication of July 14 was in the possession of the general public before these special studies were begun in Illinois by the authors of this later paper.

Field studies made on July 11, 12 and 13 in orchards near Parkersburg, Olney, Clay City, Salem and Tonti, Illinois, by Professor J. C. Blair and myself, left no room for doubt that the early infection of the fruit was mainly from the limb cankers. These cankers were found, after we learned how to look for them, as sources of such infection in hundreds of instances with not five per cent. of failures. Then two hours with the compound microscope on the evening of July 12, at our laboratory at Salem, demonstrated beyond cavil the protrusion of the spores of this specific *Gleosporium* from the cankers. Such spores positively so produced were at this time inoculated into fresh apples, and the resultant spots, which showed on the 14th, were clearly identified as those of bitter rot on the 15th—three days after the inoculations—while check punctures remained sterile. These tests were often repeated during following days, with the same results.

This disease of the apple has annually caused serious losses, amounting to over $1,500,000 in the same region of Illinois two years ago. Here was evidently a new and presumably an efficient method of combating the scourge if prompt action should be taken. Surely delay in making the facts known would have been reprehensible. As a matter of pure science the subject was sufficiently ripe for publication on the 29th of July as the bulletin fairly shows.

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A PECULIAR HAILSTORM.

DURING the past summer, while on a reconnaissance survey in southern Keewatin, for the Geological Survey of Canada, the writer's party encountered an unusual number of electric storms, particularly during the months of June and July. Quite frequently these storms were accompanied by heavy rain and hail. The heaviest of these commenced about