

find a camera which opens to a considerable length a great advantage.

The grate is globular or spherical in shape, mounted upon a central axis, W, and having projections, X, paralld to the axle. One end of said axis projects, as shown, so as to be readily operated by means of an ordinary key or wrench.

The body of the stove is provided upon its inside near its upper end with a series of projections, A¹, supporting a hollow ball, B¹, which is larger in diameter than the pipe opening C¹, which projects upward from the top of the stove in the usual manner.

The ashes will drop from the grate down into the chute, where they will remain until their weight overbalances that of the ball J, when the door or cover H will partly open, thus causing the lowermost ashes, which have had ample time to become cold and dead, to be shaken out by the motion of the cars, or, when the heater is used in a building, by their own gravity, the door being arranged at a sufficient incline for this purpose.

The advantages of the spherical grate will be readily understood. It can never be tilted, like the ordinary grate, so as to cause the fire to drop out. The live coals always have a tendency to drop down toward the sides, where the heat is most effective. It also presents a much larger surface than the ordinary grate, different parts or sections of which are alternately exposed for use, thus preventing it from being readily burned out.

When this heater is used in a car, and the latter should by any accident be upset, the ball B¹ will roll down and close the pipe opening, thus preventing the coals from escaping and setting fire to the car.

In the yard, when the cars are run in to be cleaned, all that is necessary is to raise the rods. Thus opening the lid and the whole thing is cleaned. No dirt or dust is made in the car, and the time taken to empty it amounts to nothing. When an extra draft is needed the lid can be fastened open, or partly so, as desired, and any amount of draft secured. Any pattern of stove can be used with any desired arrangement of drafts, etc., above the floor. In private houses or business rooms with a cellar, a bin can be arranged below to receive the ashes. In the morning, the ashes can be shaken down, the lid set open and a better draft secured than in any other way, coming from the cellar, and thus affording needed ventilation below. When hot enough the lid can be closed at will.

In the spring, at house cleaning, the ashes can in a short time be carried and hauled away, thus avoiding the annoyance of carrying out hot ash pans several times a day, spilling coals on carpets, burning fingers, filling curtains and furniture with dust and the house with gas, etc., as is the case with any ordinary stove.—*American Inventor.*

WHERE BUTTONS COME FROM.

The button trade of New York is estimated at from \$3,000,000 to \$10,000,000 a year. Last year the importation of buttons exceeded \$3,500,000, the aggregate for the last four years being nearly \$13,000,000. At American rates of wages many of the imported buttons could not be put upon their cards for the price they sell for.

Glass buttons are made mostly in Bohemia, and children are largely employed at the work, which they can do as neatly and cheaply as adults. The children get ten cents a day, men from forty to 50 cents, and women a little less. Pearl buttons are imported from Vienna, where they are almost exclusively manufactured; and the all-important shirt buttons are received mostly from Birmingham, England, where the majority of metal buttons are likewise procured. The most extensive of all the button manufacturing, however, is that of the Parisian and Berlin novelties. In one manufacturing village near Paris, where there are from 5,000 to 6,000 inhabitants, all the working people are engaged in making the agate button, which, even with thirty per cent. duty added to the cost, sell, when imported into this country, at the extremely low figure of thirty-one cents per great gross. The material alone, it is reported, could not be procured here for double that amount.

While American manufacturers make no attempt, and probably have no desire to compete with European producers employing hand processes, they excel in making bone, composition, brass, ivory and gold buttons by machinery, and are able to export considerable quantities of these styles. In Providence, R. I., for example, sleeve buttons and jewelry buttons are largely manufactured expressly for exportation.

Scientific.

ELEMENTARY LESSONS ON DRY PLATE PHOTOGRAPHY.

SELECTION OF APPARATUS.

The first thing the beginner has to do, is to determine what size of "plate" he will work—that is to say, how large his pictures are to be. As a matter of course, he should begin work upon the smallest plates which he can buy, as the first few results are sure to be far from perfect, and the cheaper the plates spoiled the better. That does not, however, bind him to the smallest size. In considering size of plate to be worked, it must be borne in mind that the larger the plate the greater the weight to be carried into the field, the greater the difficulty of manipulation, and the heavier the expense at every turn. This being the case, we would suggest as a good size that known as "half plate"; that is a plate measuring 6 $\frac{1}{2}$ in. by 4 $\frac{1}{2}$ in., which allows of pictures being taken of the popular size, and the apparatus necessary can very easily be manipulated in the field. Having decided the size, the next thing to consider is in what manner to purchase the apparatus; and here we must say emphatically that the only way in which to be sure of getting reliable photographic requisites is to go to a first-rate dealer, and to purchase them new from him. There is a general idea in the mind of the non-photographic public, probably gained from seeing numbers of old cameras and lenses exposed for sale in pawn-shops and such like, that great bargains are to be made in second-hand photographic apparatus, and that the beginner may "pick up" what he wants very cheaply by a little looking about. There can be no greater mistake. The experienced photographer may occasionally pick up an article very cheap; but the man without technical knowledge will be sure, if he attempts to do the like, to find on his hands goods which will be useless to him when he has somewhat advanced in his art. The "sets" made up by most of the chief photographic dealers are most excellent and complete; but the sum charged for them is greater than many are willing to lay out at once. They may buy at first only those articles which are absolutely necessary to begin with, and may add to their store from time to time, as they think fit. We give a list of the articles most necessary for working quarter-plates: a camera, a lens, a tripod stand, three flat dishes or trays of porcelain or other material, a graduated measure, holding a $\frac{1}{2}$ oz., a graduated measure holding 4 oz., a dozen gelatine quarter plates, and a dark-room lamp.

A photographic camera is, as probably everyone knows, a sort of box at one end of which is held the sensitive plate, and at the other end of which is held the "lens"—which latter throws an inverted object in front of it on to the plate—and that there is a means of adjusting the distance between the distance between the lens and the plate, or of "focusing" the camera. Every camera has, besides this, a piece of sound glass, which can be put in the exact place to be afterwards occupied by the plate, and upon which the image can be seen so as to facilitate focusing. It is also fitted with a "dark-slide,"—a sort of case in which a sensitive plate may be fixed. After the camera has been focused, the dark-slide is placed in the position before occupied by the ground glass, which latter is removable. The "shutter" or sliding-door of the dark-slide is then removed, and on taking the cap off the lens, the image falls on the plate. As many dark-slides as are desired may accompany a camera, and thus a number of plates may be carried into the field. Slides are also constructed to hold two plates each, and are called "double dark-slides." These are by far the best and most convenient to use for dry plates. Three slides are a common number to accompany a camera. This enables half-a-dozen plates to be carried out. Each dark-slide should be fitted with a set of carriers. "These enable plates smaller than the largest size for which it is constructed to be placed in it."

All modern cameras for use in the field are made with bellows-bodies so that they can fold up into small compass for ease in carrying. In purchasing a camera, the photographer should get one which will open to a considerable distance—if possible as much as twice the length of the largest sized plate which it will work. In some part of his career the amateur is sure to aspire to the taking of portraits. His attempts in this direction are almost certain to be failures, and to cause great pain to his friends, but nothing is surer than that the portraitist fit will attack him. When it comes to this, he will