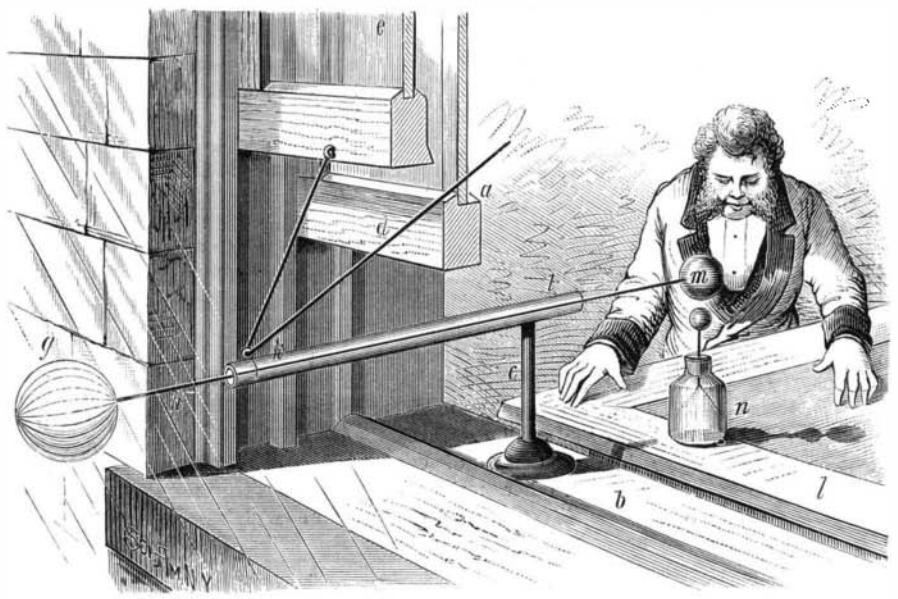
APPARATUS FOR DETERMINING THE ELECTRIC CHARGES OF FALLING RAIN.

When it was demonstrated by Benjamin Franklin that thunder clouds were masses of watery vapor charged with electricity, the conclusion was very natural that the rain falling from such clouds might possess the same charge, and the electricians of a former generation contrived apparatus to prove this and to estimate the amount of the charge. In consequence of the advance of electrical science and the multiplicity of various pieces of novel apparatus, the old contrivances are now nearly forgotten, but our attention has been called to this subject by the recent suggestion that the ignition of petroleum tanks, now so alarmingly frequent, may sometimes be caused by rain from a thunder cloud.

It may, therefore, be well to give to the readers of the SCIENTIFIC AMERICAN an engraving of one of these pieces of apparatus as it was in use nearly a century ago by investigators of atmospheric electricity. It consists of a globe, *g*, of brass wire attached to a conducting wire, *h h*, which passes through a long glass tube, *k l*, supported by an insulating stand, *c*, placed on the window sill, *b*, and a few cords, *d*, attached to the upper sash, *e*, the lower sash, *a*, being raised. The end of the wire is provided with a brass ball, *m*, reaching over a table, *t*, on which a gold leaf electrometer, or any other equivalent apparatus, may be placed, which, being brought into contact with, or even in the vicinity of the charged globe, *m*, will indicate the electric charge of the rain.

Experiments with this apparatus have shown that the drops of occasional showers are most always more or less charged with electricity, and that it is only totally absent during foggy, moist days and rain storms of long duration; that on the contrary, sudden rainfalls after a clear spell are always charged, and that, as was expected, the strongest charges are obtained during thunder storms. Even traces of electricity have been occasionally observed without any rain falling, the air itself being charged.



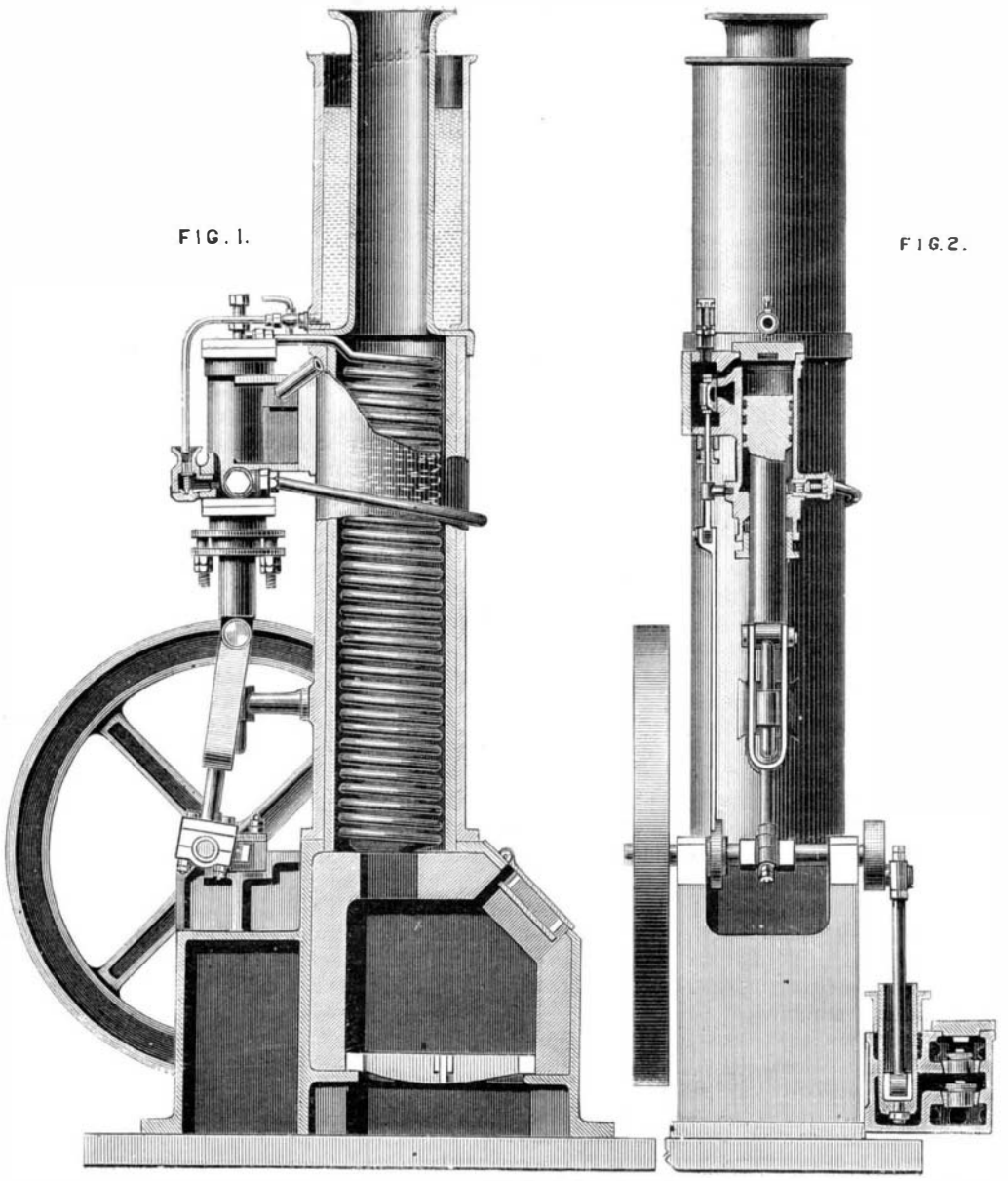
APPARATUS FOR DETERMINING THE ELECTRIC CHARGES OF FALLING RAIN.

DAVEY'S SIMPLEX MOTOR.

We give engravings of a form of motor for small powers, invented by Mr. Henry Davey (and called by him the "Simplex"), which is being constructed by his firm, Messrs. Hathorn, Davey & Co., of Leeds. This little engine is exceedingly simple and direct in its construction, and it is probable that it may take a not unimportant place among the small power motors in the improvement of which so much has been done of late years. Mr. Davey's machine is in reality a steam engine, in so far that it works almost entirely by steam, but as a steam engine it has the special feature that it has no boiler, in the sense at least of any vessel containing a considerable quantity of water. A reference to the engravings will show that it has a single cylinder only, made with a very large piston rod so that the area above the piston is much greater than that below. The space above the piston is, in fact, the real working cylinder, while the space below is only a compressing pump. The steam distribution is effected by a slide valve shown in Fig. 2, while the pump chamber has connected to it two small single-beat valves, one (Fig. 1) opening inwards, and the other (Fig. 2) opening outwards into a coil which lies within the furnace, this coil taking the place of the boiler. It is inclosed in a cast iron casing lined with firebrick, and the fire is placed below it, as shown. The way in which the engine works is as follows: On its up-stroke the piston draws a quantity of air into the cylinder below the piston, and along with this air a small quantity of water is always taken in. This last comes about by the help of the little cup above the suction valve, into which a fine stream of water is constantly running. On moving downwards the mixture of air and water is first compressed up to a point determined by the working pressure of the engine, and then pushed through the delivery valve into the coil, when the little puff of water is at once flashed into steam. There is no valve between the delivery valve of the pump and the slide valve, but perfectly free communication, and each time a new portion of water is introduced into the coil, a corresponding portion of steam passes away to the steam cylinder. Here it works exactly in the usual way, about which nothing more need be said. It will be seen that the engine may be briefly described as a steam engine which has no boiler, but takes in its feed water as it requires it instead of working always from a large reservoir of steam and water. The air does not appear to play any appreciable part in driving the piston; its chief use is to insure that the water, when sent into the coil, is really blown in as spray, and not allowed to drop or run in.

One of the first of these motors (having a cylinder 3·5 inches in diameter, and 4 inch stroke) has been for some time at the Engineering Laboratory of University College, where the students have made a number of experiments with it, working under various conditions. The motor has been very considerably improved since this particular one was made. In his later engines Mr. Davey has used a small separate pump set on the top of the cylinder, instead of employing the space under the piston for a pump, and in the larger sizes he is making the cylinder double-acting.

This little motor is very substantially made, it takes up very little space, is easily started, and has no explosible boiler, and we do not see why it should not be made very economical of steam, although this has not been attempted in the first instance. There is plenty of room in the world for all the small engines that have yet been brought out, and we shall be glad to hear that Mr. Davey has been successful in getting his well into use.—*Engineering.*



DAVEY'S SIMPLEX MOTOR.

Color Blindness in Dyeing.

While the attention of scientific experts is being called to this subject, in reference to railroad employes and all persons concerned in the distinguishing of colored lights and signals, as connected with the necessary precaution in the protection of human life in traveling, it might not be deemed an undesirable opportunity for us to call the attention of our special community to the immediate bearing which this defectiveness of vision has on operative dyers. It will readily be granted that no artisan has more necessity for extreme nicety of ocular discernment in shades of color than the one whose whole occupation is among them; and that on the critical truthfulness of his vision depends the accurate production and reproduction of tints, which to fail in would cost serious sums to his employer.

Color blindness, in the full meaning of the term, is not likely to exist among dyers, but it is not only likely, but very possible to produce at least some of the effects by the changing of colors; that is to say, the workman who has his eyes engaged constantly on a red, for instance, if put on to a green may find himself in trouble, and so on through various colors. Now, as to tint shades, is it not very evident that the impression received on the eye by looking on one tint continually will incapacitate the sight for the perception of a true and exact shade of that color?—and yet extreme accuracy is demanded. Let a dyer working on a red for some time have his attention turned to a blue, and will he not at first see a purple? Most certainly, because the visual rays are fraught with red,—and when brought to bear upon the blue, blend with it, at first strongly, and gradually thereafter.

All have not been gifted alike; it is evident that with some workmen this affection may be still more injurious than with others. Those of bilious temperament are subject to a yellowish influence on the vision, which must of necessity prove fatal to the truth of observation in color.

There is no sense more exquisitely delicate than that of sight, and there is no man more dependent on its ability than the dyer.

In taking up the trade of dyeing the early learner knows nothing of the nature of his sight, but goes at it as though it were plowing, or any other calling in which the sensitiveness of the eye is not called into requisition at all. But how important is the constitution of the eye to him who is engaged in a study of colors which must be carried to the most minute perfection. Now, how necessary is it that an examination by a qualified expert should decide on the healthy state of the eye before the trade is chosen. And still further, how advisable is it that occasional examination should be made by a doctor of the eyes of every workman in the dye-house, to decide whether there is any decrease of visionary power, and to prescribe the fitting treatment if there is.

Every employer should consider this matter, and see if his interest is not concerned in it; for the health of the sight of a good, faithful man is as much their concern as the bodily health is his.

While on this subject we may as well suggest the very simple practice to testers of colors of having a purely white material as a plain on which to rest the sight when alternately viewing colors; by this means the eye is enabled to take in the succeeding tint without any influence from the former one.—*Textile Colorist.*

Invaded by Slugs.

Four or five years ago a Rochester gentleman received from Germany a box of bulbs in which he found a number of large slugs. They were unwisely set free in one of the city parks