motion within a solenoid. As soon as the current passes it is obliterated by virtue of the attraction, of which Mr. Page and Mr. Bourbouze have made such intelligent use. The plate, meeting no resistance, turns just as it reaches the shoulder. I can give to the spring any tension whatever, so that the time the movable plate takes to make a half or quarter revolution can be regulated at will. The impression is taken during the passage of the aperture in the movable plate across the aperture in the fixed plate. It is easily understood how it may be possible to shorten the time of passage, either by substituting a simple slit or by increasing the tension of the spring.

In order to estimate the time precisely during which an impression is taken, certain experiments are necessary which I have not yet been able to carry out, and which are of the most delicate kind. I may say that this time appears to me not to exceed eight or ten hundredths of a second. Should it be found that it is only one half of a hundredth, I shall not be at all surprised; for the clearness with which I have obtained my images proves the exposure to be so short, that, when the aerostat is moving six to ten metres in a second, it does not traverse any perceptible space while the aperture is uncovered.

A photograph taken at Rouen, in the vertical position, and with by no means favorable circumstances (it was after six o'clock in the evening), shows all the objects contained in a surface of three hundred metres square. I should think that I was then at a distance of 1100 metres from the earth.

Thanks to the excellent instrument of M. Trouvé the weight of my apparatus is only 700 grammes, and is so manageable that after having made a part of the connection I have obtained a marvellous view of the Seine, showing all of its numerous windings, even to Quilliboeuf, and perhaps still farther.—*L'Electricité.*

MR. BRAMWELL ON THE PERKINS SYSTEM.

In view of the report about to be made by order of the United States Government, on what is called the Perkins system, employed by the "*Anthracite*," the little screw steam yacht which recently crossed the Atlantic with so much success, the following report made by Mr. Bramwell at the request of the Perkins Engine Company before the departure of the yacht, may be of interest to engineers and those interested in steam navigation. The engines of the vessel, like her boilers, are of peculiar type, and are the invention of Mr. Loftus Perkins—of the direct acting inverted pattern with surface condensation. They consist of two cylinders, the after of which is bored in two diameters. The smaller diameter bore forms the high pressure cylinder, and receives steam from the boiler during the first half of the down stroke; the larger diameter is the medium or intermediate cylinder, and is supplied at the upstroke with the steam used in the smaller bore during the preceding downstroke. The exhaust from the large bore passes into a chamber, and thence to the low pressure or forward cylinder, giving a total expansion of thirty-two times. The distribution of steam in the after cylinder is effected by three lifting double-beat valves of somewhat peculiar construction, but the low pressure or forward cylinder is fitted with an ordinary slide-valve, having an expansion valve on its back. The condenser is fitted with galvanised wrought-iron tubes, rising vertically from a tube plate, and having closed tops. Within these tubes are smaller ones, through which the sea-water enters and passes down the annular spaces to the inlet of the circulating pump. The exhaust steam comes into contact with the exterior of the galvanised tubes, and, when condensed, is drawn off and returned to the hot well surrounding the upper part of condenser. The space between the high-pressure piston and the upper side of the intermediate piston is in connection with the chamber from which the low-pressure chamber is supplied with steam. The cylinders and covers are heated by steam, which circulates through wrought-iron pipes cast into the thickness of the metal, and they are also clothed to prevent loss of heat. The boiler is formed of rows of horizontal wrought tubes, 3 inches in external diameter, connected at frequent intervals by vertical thimbles, the whole series being contained in a wrought-iron double casing, having the space filled in with vegetable black. The boiler is supplied with fresh distilled water, a still being fitted in connection with the condenser to keep up the supply. The actual dimensions of the cylinders are high pressure 7¾ inches, diameter, intermediate 15 13-16 inches, and the low pressure 22 13-16 inches, the latter alone being double-acting. The stroke is 15 inches. These are the chief features of the engines. The trial carried out by Mr. Bramwell appears to have been confined to taking diagrams, and weighing the coal consumed, which was done with minute accuracy, the weight of the sacks being deducted from the gross total. But Mr. Bramwell says that before comparisons can be properly instituted between the economy of the engines of the *Anthracite* and those of different construction, the latter should be tried with the same rigor as characterised the trial of the former. We venture to think, however, that engineers will scarcely regard the trial as altogether what could be wished, for there are several questions of much interest, to which no answer can be found in the report. However, 128 diagrams were taken, and the net result shows that the consumption per horse-power was 1.7lb. per hour,—a very good result for engines so small, but not quite so low as might have been expected. The precautions taken by Mr. Bramwell to obtain a correct estimate were complete so far as they went, and his report is minute in its details. The throttle-valve, stop-valve, and other parts were sealed in the positions to which they were placed, and the coals having been weighed into sacks, the bunkers were closed and sealed. The trial lasted for 12 h. 3 min., but after the 15th cwt. of coal had been used the engines were allowed to run until they stopped through the burning down of the fire. For 10 hours, however, the mean revolutions were 130.7 per minute, the average indicated horse-power during nearly nine hours being 80.9. The loss of water during the whole 12 hours was 23½ gallons. The mean pressures of the various diagrams were ascertained by dividing the areas (obtained with the planimeter) by the length of the diagrams, a method which Mr. Bramwell thinks more accurate than measuring the height. The engines worked with remarkable smoothness and regularity, and with the exception of tightening up two glands about an hour after the start, there was not a spanner or hammer, or any tool used about the engines, nor was a single handle shifted during the 12 hours the vessel was under way. The link motion was in full gear during the whole run, with stop-valve full open, and throttle set so as to cause the engines to run about 130 revolutions per minute. About one gallon of lard oil was used, the cylinder and slide dispensing with lubricant in the Perkins system; grease being inadmissible where it is liable to come into contact with the steam in these engines. It is reported that the *Anthracite*, in her voyage across the Atlantic, used only 20 tons of coal, and 436 gallons of fresh water, and it would be of considerable interest, as Mr. Bramwell suggests, to have a thorough trial of a compound engine of about the same power, viz., from 70 to 90 horse-power. In connection with the trial upon which Mr. Bramwell reports there is a point which we should like to see elucidated. The boiler-pressure is supposed to have been somewhere about 360lb. on the square inch, but the maximum pressure on the first piston is only about 200lb., and the average in the first cylinder about 120lb., a rather serious discrepancy, though this ratio of loss is not unknown.
—*Eng. Mech.*