certain other stars, it is thought that these bodies must be at a temperature higher than that of the most powerful electric spark, for, were they at this temperature, laboratory observations indicate that the group should be well visible in their spectra.

THE AUGUST SWARM OF METEORS.—Many have already begun to observe, during the past few evenings, some of the forerunners of the August swarm of meteors which at this time are visible in very considerable numbers. Although, at its best, this swarm does not offer such beautiful displays as those which occur when the earth meets with the densest part of the November swarm, yet, on account of their uniform distribution and moderate density along their orbit, the shower is always fairly bright and distinct. Unlike the November meteors, the Perseids always herald their approach a few days beforehand by an increasing number of outliers as the maximum approaches; on the 10th this is reached, and from that time a decrease in their number rapidly diminishes. Another peculiarity of this swarm is that the average intensity year by year does not exhibit such wide variations as those shown by the Leonids, which attain a maximum every 33¼ years. By plotting the paths of the observed meteors on a globe or star chart, the radiant point so found should be approximately 45° R.A. and 57° Declination for the 10th. Close observation every evening will reveal a daily movement of the radiant point eastward among the stars, as shown in the following ephemeris, taken from Mr. Denning's table in the "Companion to the Observatory." The dates before the 10th are given for the sake of those who have commenced their observations early, and would like to compare their observed radiant points with those calculated:—

Date.	Radiant. α.	Radiant. δ.	Date.	Radiant. α.	Radiant. δ.
	°	°		°	°
July 19	19	+51	Aug. 2	36	+55
,, 21	22	52	,, 4	38	56
,, 23	25	52	,, 6	40	56
,, 25	27	53	,, 8	42	57
,, 27	30	54	,, 10	45	57
,, 29	32	54	,, 12	47	57
,, 31	34	55	,, 14	50	58
			,, 16	53	58

The comet with which these Perseids are supposed to be connected, is that which appeared in 1862, and was discovered by Mr. Swift, of Rochester, New York, on July 15. The orbit, after a calculation made by the late Dr. Oppolzer, of Vienna, was found to be elliptic, and the periodic time 120 years. Schiaparelli it was, however, that drew attention to the similarity between the meteoritic and cometary orbits. The next appearance of the comet does not take place before another half-century.

INSTITUTION OF MECHANICAL ENGINEERS.

THE annual summer meeting of the Institution of Mechanical Engineers was held last week in Manchester, under the presidency of Prof. A. B. W. Kennedy, the President of the Institution. The meeting commenced on Tuesday, the 31st ult., and concluded on the Friday following. There were but two sittings for the reading and discussion of papers. The following is a list of the papers on the agenda:—

(1) "Description of the New Electric Lighting Works, Manchester," by Dr. John Hopkinson, F.R.S.

(2) "Electric Welding," by Benjamin Alfred Dobson.

(3) "Description of Twin Screw-Propellers with Adjustable Immersion, fitted on Canal Boats," by Henry Barcroft, of Newry.

(4) "Description of the Manchester Main Drainage Works," by Wm. Thomas Olive, Resident Engineer.

(5) "The Manufacture of Standard Screws for Machine-made Watches," by Charles J. Hewitt, of Prescot.

(6) "Drilling Machines for Cylindrical Boiler Shells," by Samuel Dixon, of Manchester.

The last two papers were adjourned until the next meeting in London. Dr. Hopkinson's paper was a short one, the scope of which is sufficiently indicated by the title. Outlined particulars were given of the new installation at Manchester. There were, however, no special features which require notice in the present instance. The discussion which followed chiefly turned on the use of jockey pulleys. It is interesting to notice, however, the progress that has been made in electric lighting since the author read his first paper on the subject before the Institution, now fifteen years ago. Since that time this department of practical science has undergone an extraordinary development. The only electric lights then were arc lights, the first incandescent lights in a practical form being made about a year later. To-day there are millions of incandescent lights in use. The machine the author used for experimenting upon in 1879 was at that time considered a fairly large one and highly economical; it required six horse-power to drive it. Now many machines have been working for a considerable time, requiring over 1000 horse-power to drive them. The commercial efficiency of the machine then was about 50 per cent., but now machines are produced having commercial efficiencies of 94 per cent.

Mr. Dobson's paper on electric welding was one of practical interest, although the system of welding by electricity is one that is now well known. The author, has, however, adopted this method of joining metal for some time in the extensive works of his firm at Bolton. Practical every-day working for nearly three years of the process of welding by electric force enabled him to give certain indications and appreciations of the method considered as a practical workshop operation. During the period mentioned his firm has had two machines in operation, worked from the same generating dynamo, and engaged upon different classes of work. The one is specially arranged for joining bar iron and steel, and the other, which is a smaller machine, is used for work of a more delicate nature, such as brazing and piecing clean-finished work, where the fire-heat would have destroyed the quality of the work on the adjacent material. Great difficulties were experienced at first in regard to the requisite mechanical power, it being found that this power had been much understated. The author, having about 35 indicated horse-power to spare on a certain engine, and understanding that 30 horse-power would be the utmost required to piece a 2-inch round bar, determined to drive the dynamo from that engine. This practical test showed that instead of 30 horse-power as much as 80 horse-power seemed to be wanted for the larger sizes. A portable engine capable of working up to 100 indicated horse-power with 80 lbs. pressure was supplied and placed at a distance of about 45 yards from the welding machine. Even with this engine it was found that when piecing the larger diameters—as yet nothing over 2¼ inches has been pieced—if the work was to be done in reasonable time, the speed of the engine was greatly checked. A Thomson-Houston welding dynamo was used by the author's firm. Its speed is 1000 revolutions per minute, and it gives at full load a current of 200 ampères at 300 volts with 100 alternations per second. Transformers are used. The author gave full particulars of the work done and tests made. The question of cost had not been alluded to in detail by the author, who admitted, however, that the payment of royalty, the cost of horse-power, and the depreciation, which on electrical apparatus is heavy, together brought the cost considerably over the net cost of the ordinary smith's hearth work; the payment in wages, &c., being considerably less. The loss in weight of iron is about one-twentieth. On straightforward welds the total cost is between ten and fifteen per cent. more than the ordinary smith's work; but in the case of delicate work and difficult operations, the cost is about one-third of that of the smith's work. The real advantage of the apparatus, as at present arranged, is not so much an economy as a method of securing an absolutely reliable result, and occasionally saving considerable expenditure by its adaptability.

In the discussion which followed the reading of this paper, no important points were brought forward.

Mr. Barcroft in his paper described an arrangement by which steam power could be applied to ordinary canal boats. Although doubtless the application was suitable for the position it had to fill, the machinery possessed neither scientific nor engineering interest, except of a very limited order.

Mr. Olive's paper on the Manchester Main Drainage Works was a useful description of an ordinary installation of this nature. The Manchester works have but recently been put up, and are indeed hardly yet in full working order.