OUR ASTRONOMICAL COLUMN.

BROOKS' COMET.—Dr. F. Bidschof has computed the following elements and ephemeris for the comet discovered by Mr. W. R. Brooks, on October 16 :—

T = 1893 September 19·6929 Berlin mean time.
Ω = 175° 1·0 } Mean
ω = 348 30·7 } eq.
i = 129 54·6 } 1893·0
log q = 9·91335

Ephemeris for Berlin Midnight.

1893.	R.A. app. h. m. s.	Decl. app. ° ′	log r	log Δ	Brightness
November 2	12 45 59	+24 35 9	0·0600	0·1913	0·88
6	12 53 13	27 51 8	0·0782	0·1788	0·85
10	13 1 12	31 21·1	0·0961	0·1662	0·83
14	13 10 2	+35 4·6	0·1137	0·1539	0·81

The brightness of the comet on October 18 has been taken as unity.

THE PLANET JUPITER.—At the present time Jupiter is a fine object for observation, his declination being between 18° and 19° north of the equator. Coming into opposition on November 18, telescopes of moderate power can be used effectively for observing the belts, small spots, and other fine details. Large instruments—that is, those having an aperture of 15 or 16 inches or more—may be used also for observations of the 5th satellite. Assuming the period of this satellite to be 11h. 57m. 21·88s. with a probable error of about a second of time according to Mr. Marth, the following are the approximate times of elongation :—

Greenwich Time.

	East. h. m.		West. h. m.
Nov. 2 ...	9 9 p.m.	...	3 8 a.m.
6 ...	8 47	...	2 46
10 ...	8 24	...	2 23
14 ...	8 2	...	2 1
18 ...	7 40	...	1 39
22 ...	7 18	...	1 17
26 ...	6 56	...	12 55
30 ...	6 34	...	12 33

THE WAVE LENGTHS OF THE NEBULAR LINES.—Last week we referred to Prof. Keeler's paper, read at the congress of Astronomy and Astro-Physics at Chicago, and we may add here a few words with regard to the results it included, as they are of importance. This paper, on "The Wave-lengths of the two Brightest Lines in the Spectrum of the Nebulæ" is the outcome of a series of measurements made with the 36-inch refractor and the large spectroscope of the Lick Observatory, the dispersion employed being equivalent to twenty-four 60° flint prism. The "normal position" of a nebular line is defined as the position of the line in the spectrum of a nebula at rest relatively to the observer. The results with respect to the two chief nebular lines are—

Normal position of the chief nebular line on Rowland's scale ... ... λ 5007·05 ± ·03
Normal position of the second nebular line on Rowland's scale ... ... λ 4959·02 ± ·04

Prof. Keeler considers the greater part of this probable error to be due to comparisons with the third line, which could not be observed so accurately. From all the observations he finds that the motion of the Orion nebula referred to the sun is + 11·0 ± 0·8 miles per second, and the wave-length of the chief line in this nebula, corrected for the earth's orbital motion, is 5007·34 ± ·013.

GEOGRAPHICAL NOTES.

YET another plan for polar exploration is announced with no definite purpose of pushing on to the pole, although that may incidentally be reached. Mr. Robert Stein, of the U.S. Geological Survey, proposes establishing a station at the south end of Ellesmere Land, which will be kept in touch with the outer world by the whalers hunting in Baffin Bay. Here a number of observers will live gaining experience in Arctic travel, and from this base "a fan of secondary stations" will be pushed out a hundred miles or so further north, where comfortable houses will be built and frequent communication kept up with headquarters. From each secondary station the staff of five hardy observers will travel northwards, combining science with sport, and even when tracking the musk-ox or white bear each explorer will carry his "four-pound aluminium theodolite" and "make game of the heights and bearings of the mountain peaks." We fear that if this expedition, or rather system of exploration, is really set on foot, its difficulties will become much more real than they now appear. In any case it would be wise to postpone work on so large a scale until the two well-equipped expeditions already in the field have added their contribution to our knowledge of Arctic conditions.

M. E. DE PONCINS, who is travelling in Central Asia, has written some interesting letters to the Paris Geographical Society. In the latest, dated from Chajan, in the Pamirs, on July 9, he mentions the curious fact that while in Europe he has repeatedly suffered from mountain sickness on Mont Blanc and Monte Rosa, he eats and sleeps at 4500 metres in the Pamirs just the same as at sea-level. In crossing snow-passes at 5750 metres his horses caused some trouble, but with this exception he found the Pamirs a pleasant region where it was easy to get about in summer.

THE Russian Government has organised a new province in Siberia under the name of Anadyr. It occupies the extreme north-east of Asia, and is very thinly peopled, mainly by natives, Koriaks, Kamchadales, Chuchis, &c., the last named being the most numerous and the least uncivilised.

DR. E. V. DRYGALSKI, who has spent eighteen months in North-West Greenland studying the phenomena of Arctic glaciers, has returned to Europe, and his report of the work done by his expedition will be expected with much interest.

A NOVELTY in political boundary lines is reported in *La Géographie*, which states that the frontier between Turkey and Servia is to be marked throughout its length by a wire fence.

THE November number of the *Geographical Journal* is rich in new contributions to geography and exploration. The Earl of Dunmore's paper on the Pamirs and Central Asia occupies the first place.—The Rev. J. A. Wylie gives an account of a journey through Central Manchuria, with many interesting notes on places and people, and a detailed itinerary which must prove valuable to subsequent travellers.—Lieut. B. L. Sclater writes a detailed report on routes and districts in Southern Nysaland, illustrated by a new map of the district east of the Shire as far as the Milanji Mountains, largely compiled from his own prismatic compass surveys.—Mr. Theodore Bent communicates a letter from Mr. Swan, who is now in Mashonaland, giving an account of fresh ruins recently visited on the Lotsani and Lundi Rivers, the "orientation" of which to the setting solstitial sun he believes he has established.—Mr. W. S. Bruce and Dr. C. W. Donald publish a preliminary report of their observations during a voyage toward the Antarctic Sea, and Dr. Schlichter gives his paper on the determination of geographical latitudes by photography.

INSTITUTION OF MECHANICAL ENGINEERS

ON Wednesday and Thursday of last week, October 25 and 26, a general meeting of the Institution of Mechanical Engineers was held in the theatre of the Institution of Civil Engineers, in Great George-street, Westminster; the President, Dr. William Anderson, occupying the chair. Dr. Anderson retires in rotation this year, and Prof. Alexander B. W. Kennedy, F.R.S., is proposed as his successor. There were two papers down for reading, as follows :—"On the Artificial Lighting of Workshops," by Mr. Benjamin A. Dobson, of Bolton; and "On the Working of Steam Pumps on the Russian South-Western Railways," by Mr. Alexander Borodin, Engineer-Director.

Mr. Dobson's contribution was an interesting and valuable paper, in which he described the results of inquiries he had made with a view to obtaining the best mode of artificial illumination for the large workshops of his engineering establishment at Bolton. Mr. Dobson's works are engaged in producing textile machinery, more especially that for cotton-spinning. Many parts of such machinery require to be finished

in the highest manner, and with mathematical accuracy. In order to accomplish this a good light is necessary, but unfortunately that is a thing Mr. Dobson can seldom get from natural sources at his works. We do not as a rule expect to find engineers and manufacturers exclaiming against the smoke nuisance; we rather look to hear such things from those who cultivate the gentler arts. It is therefore, perhaps, worth while to quote a few passages from Mr. Dobson's paper, in which he speaks of the state of the atmosphere in Lancashire:—

"Although Lancashire coal has a number of excellent qualities, yet it is one that makes the most smoke of any. A large portion of the Lancashire manufacturing industries, great and small, date from a number of years back, when smoke-consuming and smoke-preventing apparatus had not yet been devised; and many of the factories are working at the present day under pretty much the same conditions as when they started. Hence the atmosphere in all manufacturing towns in Lancashire is heavily charged with unconsumed carbon, producing an excess of cloud and fog, which, while inducing an excess of rain, acts also as a screen against the rays of the sun, and thus does a double injury to the neighbouring agriculturist, the producer of the country's native wealth. A circle of thirty miles radius around Manchester is said to include a larger population than an equal circle around any other place in the world; and within this circle, about twelve miles north-west of Manchester, lies Bolton, the town with which the author is best acquainted, where all winds, except the west and north-west, bring the surcharged atmosphere from other manufacturing districts, producing at any season of the year, if the wind happens to be slight, a sky ranging from dull lead to dark brown. For four years in succession it has occurred at the writer's works, that on June 21, the longest day, the gas in every room, amounting to nearly 7500 jets, has had to be lighted by eleven o'clock in the morning, and has remained lighted until work ceased; and this has occurred also in other towns, in weather that ought to have secured abundant sunshine. To such an extent does gloom prevail that in clear weather the effect of bright sunlight becomes even distressing to the eye-sight, simply from the rarity of the contrast."

In endeavouring to improve the lighting of his shops, Mr. Dobson naturally turned to electricity. Incandescent lamps were tried, but these were not a very great improvement in illuminating power over gas; whilst with the arc lamp the shadows were so hard and strongly defined that the workmen preferred a very much weaker illumination, if more diffused. When travelling on the Continent, Mr. Dobson visited some cotton mills, and here he found what seemed a very perfect system of illumination. Arc lamps were used, but they were placed in an inverted position to that which is usual, the negative carbon being above, and the positive carbon below. This, of course, threw the greater part of the light rays upwards, as most of the illuminating power proceeds from the crater of the positive carbon. The ceiling is kept well white-washed, so that the light thrown up is again reflected downwards. The sides of the rooms are also whitewashed, in order that a reflection may come from them. The result is that, without any definite source of illumination being observable, the whole room is flooded with a well-diffused light. Mr. Dobson had very kindly arranged to have one of these lamps in the large visitors' room of the Institution of Civil Engineers, so that members were able to judge of its efficiency for themselves. The result was very perfect in regard to absence of shadows. One could stand in any part of the room, facing any way, and read a book or paper without any very perceptible shadow being thrown; indeed, the diffusion of light appeared to us as good as in the open air. Such a result is of the greatest importance, and it is to be hoped that libraries and reading-rooms especially will in future largely adopt this system; or at any rate, that it will be introduced to the exclusion of the direct arc lighting, like that adopted with such unpleasant results in the reading-room of the British Museum. In regard to the cost, Mr. Dobson cannot speak positively on the subject, not having yet sufficient data to go upon, but he anticipates that it will be higher than gas at 2*s.* 8*d.* per thousand, which is the price in Bolton. There will, however, be a much larger volume of light than when the gas was used, and the advantages of the system, in his opinion, altogether outweigh any possible additional cost. In the discussion which followed, Mr. A. P. Trotter gave a good popular explanation of the advantages of a dead white surface for reflecting light, as compared to that of a looking-glass or bright surface. Good white blotting-paper, he said, reflects back 82 per cent. of the light cast upon it. Many persons are under the impression that looking-glass must be a better reflector than paper or a whitewashed surface, because, with looking-glass, a strong shadow can be cast, while from a dead surface no heavy shadow is obtained. The reason, of course, is not so much that the reflected light is less from the dead surface, but that the reflection is concentrated in the case of the looking-glass; with paper or whitewash it proceeds from a vast number of points.

A modification of this system of reflected light, which is of interest, has been adopted by Mr. Aspinall, the chief engineer of the Lancashire and Yorkshire Railway, at the Horwich shops, where the rolling-stock for the line is produced. In these shops the roof is not adapted for putting in large whitewashed reflectors above the lamps, the jibs of travelling cranes, belting, shafting, &c., being in the way; but Mr. Aspinall, having seen the very perfect illumination obtained by Mr. Dobson at Bolton, determined to see if he could not obtain a modified result. He therefore inverted his arc lamps so as to get the positive carbon below, as in the case of the Bolton installation, and the major part of the light would be thrown towards the ceiling. Above the lamp, and therefore not shielding it from view, was a white-washed screen of boards, acting as a reflector. The effect was far superior to that of the ordinary method of arc lighting, where the dazzling stream of light pours upon the spectator to the derangement of his eyesight, and at the same time casting heavy and impenetrable shadows. This arrangement, however, is inferior to the complete system, as described by Mr. Dobson, but may be taken as a very good substitute where, from local causes, the entirely reflected principle cannot be adopted.

Mr. Borodin's paper on Steam Pumps was read on the second day of the meeting, and led to a fairly long discussion. The author gives details of a number of pumps tested in order to find their efficiency under ordinary working conditions. The paper has a commercial rather than a scientific interest, to this extent—that it shows the manufacturers how badly machinery may work; for instance, a pump manufactured by an English firm of very good repute only gave 2953 foot lbs. of work done per lb. of steam, when pumping against a head of 33 ft. and the steam pressure being 90 lbs. Supposing the trial conditions to be properly observed—which there is no reason to doubt they were in the present instance—such a result could only be due to the pump being in extremely bad condition, owing to neglect or ill-usage. It had been in use for a number of years. One meets with the same thing—perhaps to a greater extent—in steam engines where the fuel consumption of 30 or even 40 lbs. per one horse-power per hour has been recorded. Mr. Borodin's paper is useful as supplying awful examples for pump users, and at the same time it opens up the very wide question of the value of trial trip efficiencies. To take another instance, that of war ships, a very high speed may be obtained on trial with picked coal, picked stokers, engines thoroughly overhauled, and, in fact, every possible precaution taken to procure efficiency. Naval captains are apt to say, "We would like to know what our ship will do under fair working conditions in action, rather than what she may be made capable of by tuning her up to concert pitch." That is a very good argument for the captains, but where are we to draw the line? It is impossible to lay down what are the fair conditions of ordinary service for any class of vessels—how bad the coal should be, how inefficient the stokers, how rough the weather. Our only course is to get the highest possible result in every case, and then make such allowance as experience, or common sense, would dictate. The same thing may be said with regard to the pumping machinery dealt with by the author. For instance, a pulsometer referred to in the paper was stated to require 860 lbs. of steam per hour for a certain duty; whilst experiments made by Prof. T. Hudson Beere, with a pulsometer in good order, gave the pounds of steam required for a similar duty as 147·6. Now, it will be obvious that if a contractor requires a convenient pump like the pulsometer, and is prepared to pay somewhat for the suitability in the matter of economy, he need not take 860 as his figure of merit, when 147·6 is the trial trip efficiency, although he may undoubtedly have to make some allowance upon the latter figure.

The paper was favourably received by the meeting, and will no doubt add to the attractiveness of the volume of Transactions in which it will appear.

The meeting concluded with the usual votes of thanks.