The Dairy of the Exhibition.

Chief of Construction Burnham has designated sites for the Forestry, Sawmill, Dairy and Agricultural annex buildings They will be grouped on the space formerly planned for a lagoon, south of the Agricultural building and near the lake shore. The lagoon, which is a natural one, will disappear, the buildings being constructed on a piling foundation over it. The approximate dimensions of the Dairy building are given as 95×200 feet; those of the Forestry building 200×500 feet. Chief Buchanan, of the Department of Agriculture, has secured the construction of all these structures. The Forestry building will be unique in that it will be surrounded by natural tree trunks as columns, one or more of which will be contributed by each of the several States. The sawmill people have been making a vigorous plea for their building, in which to show the actual operation of producing lumber.

No feature of the Exposition, probably, will possess greater interest or value to the agriculturist than will the dairy school, the holding of which substantially in accordance with the plan submitted some time ago by Chief Buchanan is now assured. The school will include a contest between both herds and individuals of the chief breeds of dairy cattle, with a view of ascertaining the respective merits of each in milk giving and butter and cheese producing. Each herd will be charged each day with the food consumed, accurately weighed, and will be credited with the milk, butter, and cheese produced. Manufacturers of dairy utensils and appliances will gladly furnish all that will be required in their line. Accommodations will be provided, so that spectators may view the processes of butter and cheese making.

The tests and all details of management will be under rules to be prepared by a committee composed of one member from each of the dairy cattle associations in the United States, three from the Columbian Dairy Association, three from the Agricultural Colleges and United States Experimental Stations, and one from the manufacturers of dairy utensils.

The manufacture of the product will take place in the dairy building, in an operating space 25 by 100 feet, above which on either side will be a gallery which will accommodate fully 500 spectators. The school, in all probability, will continue through four months, and each participating herd will be represented by a given number of cows. The results of this test and of the exhibition which will be made of the latest and most advanced scientific methods known in connection with the feeding and care of cattle, the treatment of milk and the production of butter and cheese, cannot fail to be of very great value to the dairy interests of this country. These interests, it is scarcely necessary to state, are of enormous importance and extent, and, indeed, are scarcely surpassed by any other branch of industry in respect of the amount of money invested. It cannot be doubted that the Exposition Dairy School will cause a more economic and scientific management of the dairy interests of the entire country, and consequently a greater return from the capital and labor invested.

The India Rubber Tree.

The India rubber tree cannot stand shade, and unless the seedlings are fully exposed to light and well drained, they cannot grow. Owing to this it is found that in the depths of the forest, where light and air are shut out by the dense crowd of trees of many species, natural reproduction takes place by the germination of seeds carried by birds high up in the crowns of other trees, aerial roots descending in process of time to the ground, and developing into a huge hollow cylinder round the foster stem, which is soon killed. The descent of the roots may take years, but once they have taken hold of the ground, the further growth is exceedingly rapid. In cultivating, the seeds are found to grow much better than cuttings, and these are tended in large nurseries until they are 10 feet high, when they are transplanted into clearings made in the forest, in strips of 40 feet wide, alternating with 60 feet of natural forest, this being found necessary to furnish the necessary moisture, while narrower clearings do not give air and light enough. Trees grown in grass land were found on tapping to yield scarcely any rubber, the difference being attributed to absence of the moisture afforded by the forest. Plants of 1874-75 were found, in April, 1889, to have attained an average height of 61 feet 11 inches and a girth of 11 feet 5 inches, thus having grown at the very rapid rate of 6 feet 1 inch in height and 9 inches in girth per year.—*Demerara Argosy.*

Improved Cementing Material.

V. L. Daguzau says: This material is called by the inventor pyro-cement, and is "a blackish product, which adheres strongly to iron, wood, stone," etc. The following constituents and proportions yield a useful result: "18 to 25 per cent of gas petroleum or other resinous matters, 75 to 80 per cent of clay or argillaceous earth and silica, 2 to 8 per cent of natural sulphates."

Correspondence.

The Grooved Cartridge.

To the Editor of the Scientific American:

I came across a copy of the SCIENTIFIC AMERICAN, dated April 26, 1890, in which you give a description of the new rifle adopted by the German government. You say for it: The cartridge forms an innovation upon all others that now exist, inasmuch as it has no projecting rim at the base; but, on the contrary, has a small groove, in order to allow it to be grasped by the extractor hook. Now I can prove that I am the original inventor of that construction of cartridge, as will be seen by the plans and specifications, No. 7,779, published at the British Patent Office, entitled "Jennings' Combined Single Loading and Repeating Rifle," and dated 26th June, 1885, that is, three years prior to the German model, 1888. R. JENNINGS.

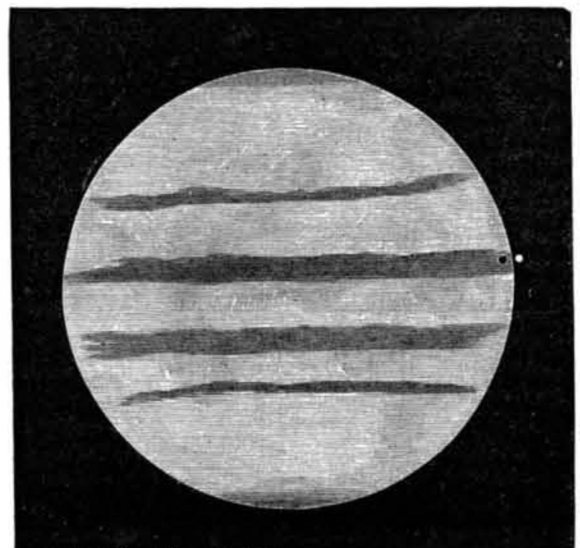
54 Fruit St., Youngstown, O., Aug. 5, 1891.

JUPITER.

To the Editor of the Scientific American:

The planet Jupiter is now in good position to observe even with small telescopes. The ever-changing relations of the four moons to each other and the planet will interest and instruct.

The belts are also of constant interest. I send herewith sketch of the planet as observed last night. Four



JUPITER AUG. 28 1891.

belts were very prominent and finely marked. The little white spot near the right hand edge of Jupiter is the first satellite about to transit, which occurred at 9 hours 52 minutes. The small black spot just entered upon the disk of the planet is the shadow of the satellite. It came on 13 minutes before the satellite itself, and, of course, preceded it entirely across the planet. The satellite could be easily seen in transit upon the gray background formed by the belt.

WILLIAM R. BROOKS.

Smith Observatory, Geneva, N. Y., Aug. 29, 1891.

How to Get Rid of Snails.

To the Editor of the Scientific American:

In one of your numbers, a correspondent inquires as to the getting rid of snails and slugs. I remember a few years ago traveling in Brittany and meeting boys carrying sea sand in baskets. Having asked them for what purpose, they answered it was to prevent snails and slugs getting on to the flower beds, and that it answered perfectly. Your correspondent might try this remedy. A. B.

Sainte Adresse, France, August 15, 1891.

Jet Propulsion.

To the Editor of the Scientific American:

I note the remarks of Mr. W. H. Wetherill in your issue of August 29. The principle of hydraulic propulsion is already secured, in that past experiments have shown its superiority to that of the screw propeller; but its adoption has been retarded because experimenters have used impractical pumps; consequently a medium size jet has not been obtained—a condition vitally germane to the success of the method. For example, the two 9 inch nozzles on the English torpedo boat of 66 feet and the one ¾ inch jet of Dr. Jackson's yacht of 106 feet, both size nozzles being extremes.

The experiments made by the English Admiralty employed centrifugal pumps of great capacity and comparatively little power, while the steam pumps used in the United States experiments had great power and little capacity. A pump which combines capacity and power will effect the speedy adoption of the principle.

I contend the screw is not intermittent. It has a continuous thrust—every blade constantly doing duty by turning a complete circle. Suppose one blade were left on the shaft, does Mr. Wetherill think its action is intermittent? If not, could a screw propeller with more blades be regarded as intermittent? So with three or four constant jets impinging the water of flotation at the same time, while each jet is independent of the others in its work; thus each blade is independent yet continuous in its action.

In conclusion, the possibilities of obtaining greater speed through the screw propeller are nearly limited. The application of its highest power is nearly reached; but with a practical pump three or four times the power can be realized. In this direction lies the probability of four days Atlantic liners.

JOHN W. HAHN.

Newton, Mass., August 29, 1891.

Collapse of a Kitchen Boiler under Apparently Normal Working Conditions.

To the Editor of the Scientific American:

A 30 gallon upright copper boiler had been in use twenty years and was in perfect order. It was supplied from a tank under a maximum head of 8 ft. 6 in. Minimum head (tank almost empty) about 3 ft. 6 in. A few days ago (Monday, Aug. 31), the tank having been drawn down for washing so that the head was about 4½ ft., the upper part of the boiler suddenly collapsed, hot water being drawn at the same moment in the washtubs.

The cause was at first not evident, nor had the plumber any explanation to offer.

The facts are that within a year the range formerly in use has been taken out and a larger one put in, with water back having a much greater heating power. It now appears that for some time a snapping has been noticed in the hot water pipes, which indicates that steam had been formed in the boiler and was condensed with the noise observed; proving that the water back was too powerful for the demands made upon it.

On the morning in question the fire was hot, the water in the boiler was undoubtedly at the boiling point, and had forced back water into the tank until there was a steam space of fifteen or eighteen inches in the boiler.

On opening the faucet in the tub the pressure was relieved—cold water passed into the boiler from the tank, and the condensation was instantaneous, allowing no time for equalization of pressure through the feed, or open faucet, which was at the end of not less than 13 ft. of ¾ in. pipe, and was probably only partly open.

It appears from this that water backs are put in without any calculation as to their capacity, and that under some conditions steam may be formed and a collapsed boiler result, with all the details of inlet and outlet in ordinary working order.

The primary cause in this instance was the unnecessarily powerful water back, to which the low head of water was contributory. The conditions have been the same for twenty years as regards pressure; but a pipe water back running around the top of the fire had been used in the old range.

This accident serves to call attention to the need for especial care in proportioning the water back to the work it has to perform where a low pressure water supply is in use. DURAND WOODMAN.

80 Beaver St., N. Y., Sept. 2, 1891.

White Metal Alloys.

The following alloys are used as lining metals by the Eastern Railroad of France:

Number.	Lead.	Antimony.	Tin.	Copper.
1	65	25	0	10
2	0	11·12	83·33	5·55
3	70	20	10	0
4	80	8	12	0

No. 1 is used for lining crosshead slides, rod brasses and axle bearings. No. 2 is used for lining axle bearings and connecting rod brasses of heavy engines. No. 3 is used for lining eccentric straps and for bronze slide valves. No. 4 is a special alloy for metallic rod packing.

A Light Concrete.

F. Sang states, tufa sand, which is found as small pellets or granules in the Rhenish provinces, is mixed dry or wet with Portland or other cement, and the concrete formed moulded into any desired shape. A mixture of equal parts is said to be as strong as granite and less than half its weight, but for many purposes a mixture of 1 part of cement to 3 to 5 of tufa sand suffices.

Besides being applicable for ordinary building purposes, the patented material is said to be a good nonconductor of heat, and therefore to be fit for forming the roofs of bakers' ovens and similar uses.

THE race of the two-year-olds for the Futurity stake of $75,000 took place at Coney Island, N. Y., on August 29, and was won by His Highness, a bay colt 15·2½ hands high, of such splendid proportions that he would be readily taken for a well furnished three-year-old. He was bred at the Kentucky stud of the late Hon. August Belmont, and was sired by imported The Ill Used, out of imported Princess, the dam of Prince Royal and Her Highness. He cost his owner, Mr. David Gideon, $3,400 at the closing-out sale of Mr. Belmont's race horses at Babylon, N. Y., last February. It is said His Highness has already netted over $100,000 for his owner.

Improvements in Aluminum Alloys.

J. W. Langley finds that if pure aluminum be alloyed with between one half per cent and 10 per cent of titanium, the product is harder than aluminum, nearly as incorrodible, and capable of acquiring by hammering or rolling a degree of elasticity and hardness much superior to pure aluminum. These alloys are fusible below the melting point of steel, the temperature required depending upon the percentage of titanium. When the proportion of titanium is less than 5 per cent, the alloy is nearly as malleable as pure aluminum. The presence of iron and silicon in this alloy are injurious, tending to render it brittle and non-malleable, but a small proportion of chromium is of substantial benefit in increasing the elasticity of the product. The alloy is prepared by the action of metallic aluminum on titanic oxide. The method used is also claimed for the preparation of alloys of aluminum with any more electro-negative metal, and is as follows:

A bath of preferably pure fluoride of aluminum and sodium is prepared in a carbon crucible, the oxide or other salt of titanium added, well mixed and allowed to dissolve; when the mass is thoroughly incorporated and quite fluid, metallic aluminum is charged in, the relative proportions of aluminum and oxide or salt being such that the percentage of oxide shall be about twice the percentage of metal required in the alloy. The temperature of the bath rapidly rises on the introduction of the aluminum, and as soon as this ceases, the reaction is completed and the mass is teemed into a suitable vessel, allowed to cool somewhat, and the fluid slag run off from the metal. The latter is remelted before use.

The proportion of fluoride used is from one to four times the weight of the aluminum. Fluoride of sodium, fluoride of aluminum, sodium and calcium, or generally a fluoride of any metal or metals more electro-positive than aluminum, may be used for the bath, but cryolite is disadvantageous, on account of the iron it contains.

The process must not be conducted in a siliceous crucible, a portion of the silicon being reduced and entering the alloy. Chromium may be introduced as oxide into the fluoride bath, or an alloy of chromium and aluminum may be mixed with the manufactured titanium alloy.

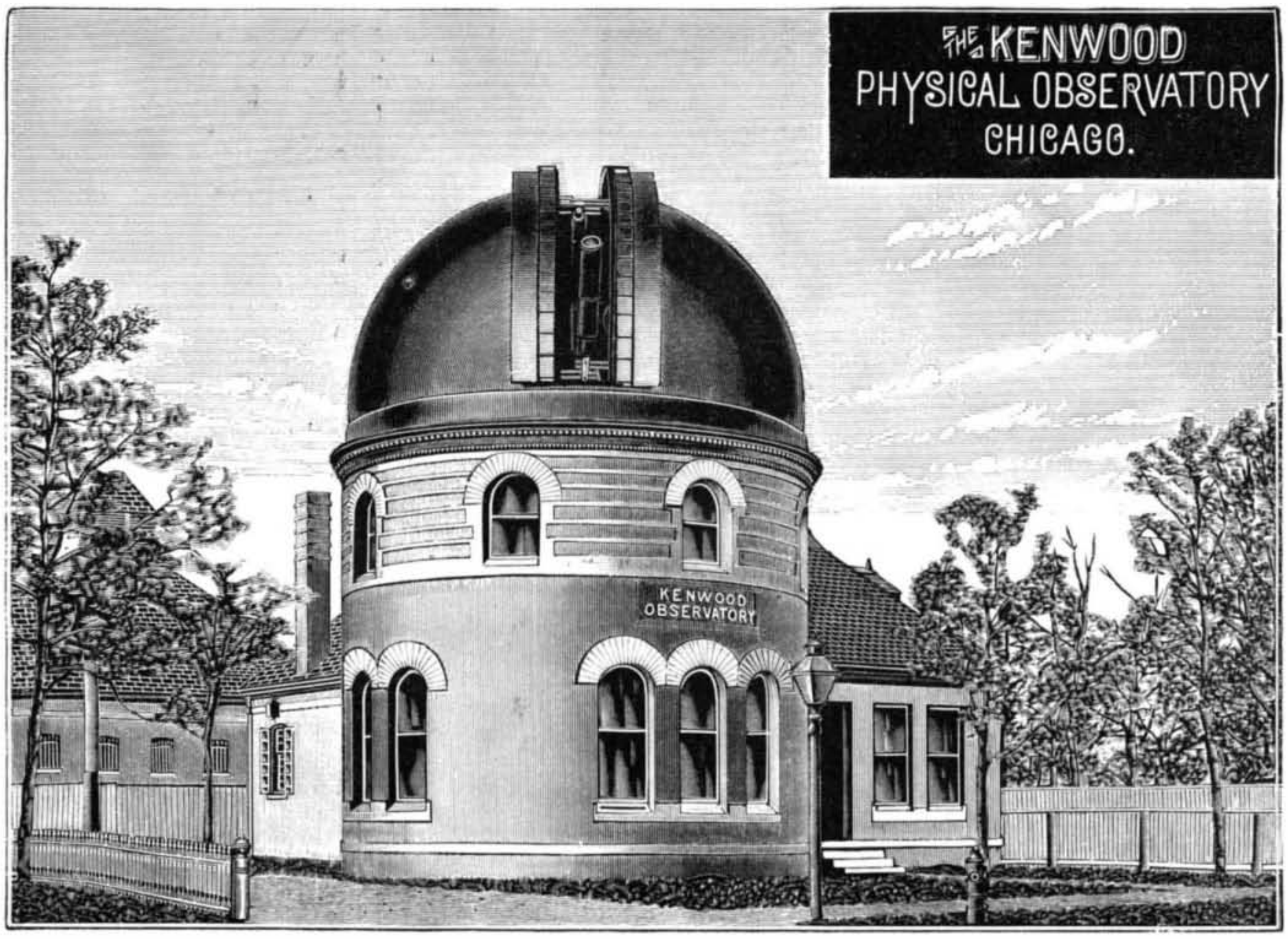
Price of Rare Metals.

Iridium, a very heavy metal of the platinum group, so named from the iridescence of some of its solutions, and well known in connection with its use for the points of gold pens, may be bought to-day at approximately $720 per pound. The present price of platinum, the better known tin white, ductile, but very infusible metal, is on a par with that of gold, namely, about $350 per pound. But generally its value fluctuates between its more popular brothers, gold and silver. The rarest metal—and it is so rare that recent discoveries have thrown doubt on its elemental character—is didymium, and its present market price, if one may thus term the quotation of an article that never appears on the market, is $4,500 per pound. The next costliest metal is barium, an element belonging to the alkaline earth group; its value is $3,750. Berylium, or glucinium, a metallic substance found in the beautiful beryl, is quoted at $3,375.

To prevent the feet from sweating, try the following: One part of salicylic acid, one of subnitrate of bismuth, and two of starch. Wash, and apply powder freely.

THE KENWOOD PHYSICAL OBSERVATORY.

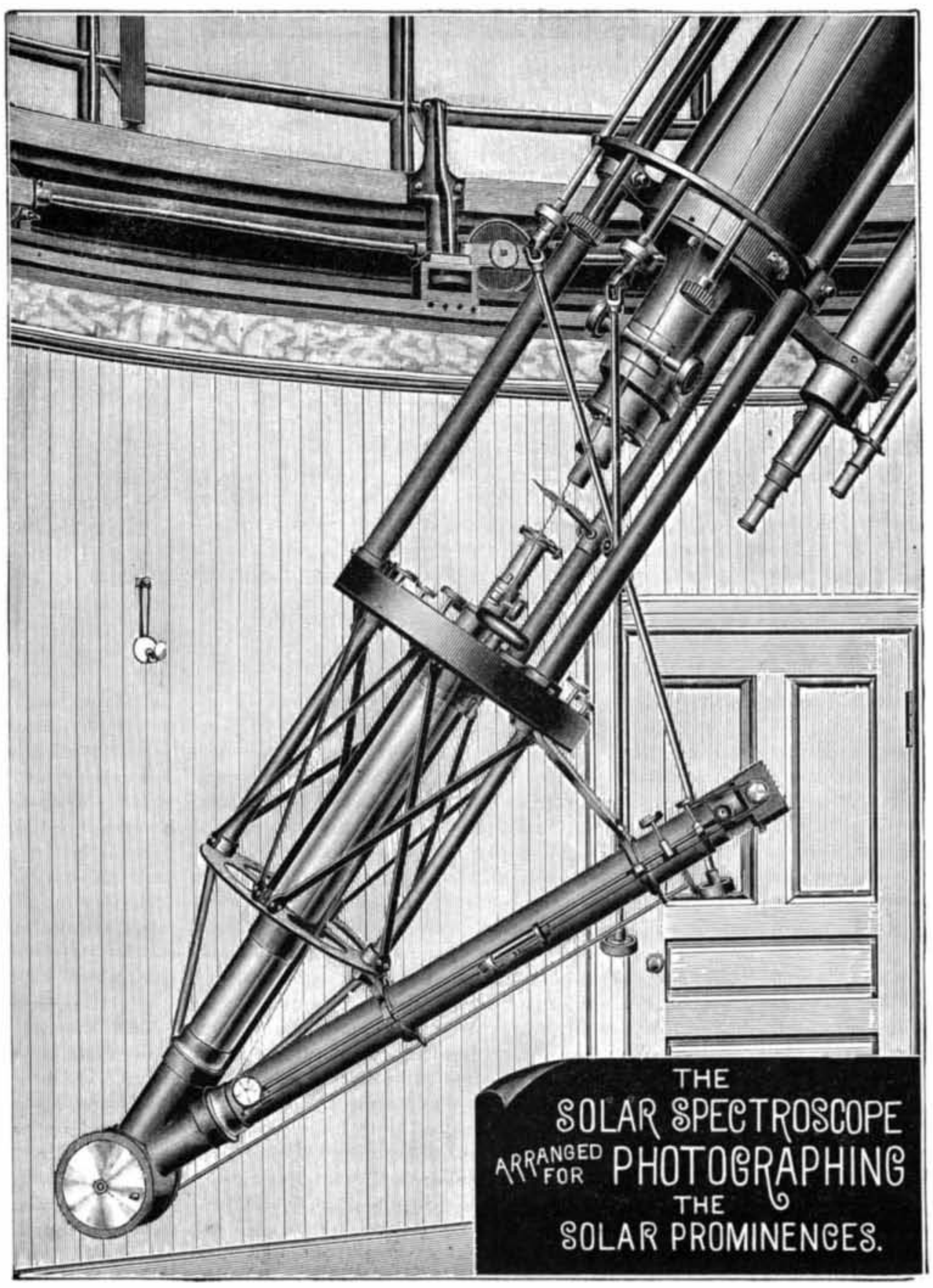
GEORGE E. HALE, DIRECTOR.



The Kenwood Physical Observatory had its inception in a spectroscopic laboratory erected in Chicago in the summer of 1888. The addition of a tower and wing during the winter of 1890-91 brought the building to its present form, and it now includes a reception room, library, equatorial room, "slit room," "grating room," photographic dark room, general laboratory, and workshop. The grating room contains a four-inch concave grating of ten feet radius of curvature, mounted in the manner employed by Professor Rowland. A shorter girder allows the use of a grating of only five feet radius, in cases when the light source is too faint to admit of the highest dispersion. Sunlight is furnished by a heliostat on a pier some distance to the north of the building, while a Weston dynamo, driven by a gas engine of six horse power, supplies the direct current used in spectroscopic studies of the electric arc. An alternating current of fifty-two volts is also supplied by the Hyde Park Thomson-Houston Company, and this is especially useful in producing heavy electric sparks with a large induction coil, and in lighting the whole observatory with incandescent lamps. A set of thirty-five Julien storage cells can be charged by the Weston machine, and used when desired.

The mounting of the equatorial was finished in March, 1891, by Messrs. Warner & Swasey, and the excellent 12·2 inch object glass, figured from Dr. Hastings' calculations by Mr. J. A. Brashear, was in place and ready for use early in April, 1891. The spectroscope is of very large size, and was also made by Mr. Brashear. A frame of strongly braced steel tubing carries the collimator and observing telescope, which make with each other a constant angle of 25 degrees. The objectives are exactly alike, of 3¼ inches clear aperture and 42½ inches focus, corrected for work in the visual region. The grating is a 4 inch flat, and in many respects is the finest ruling I have ever seen. In addition to the grating there is a 30 degrees white flint prism, silvered on the back, which is used in photographing the spectra of the fainter stars. The large size of the spectroscope, and the necessity of a perfectly rigid attachment to the equatorial, have caused us to mount the spectroscope and tube as if in one piece, the declination axis coming at the center of their combined lengths. As the object glass of the equatorial has a focal length of 18 feet, the total length of the combination is 22 feet 9 inches. The mounting is built very large and heavy, and carries also a four-inch Clark telescope and a small finder. The weight of the driving clock can be controlled by electric connection with an excellent Howard clock.

As my recent photographic investigations of solar prominences and their spectra have shown the necessity of employing specially corrected objectives in a continuance of



APPARATUS AT THE KENWOOD OBSERVATORY.