MACHINERY VS. MANUAL LABOR.

A correspondent of the New York *Herald* has been interviewing the leaders of the leather trade, in Massachusetts, now the chief industrial interest of that commonwealth. In his talk with Mr. Coolidge, a large manufacturer, he was told that eighty per cent of the work on boots and shoes was now done by machinery; whereat he "could not fail to remark what a terrible blow this machinery had inflicted on manual labor."

His study of the statistics of the trade, as gathered by Mr. Wright for the State Labor Bureau, only confirmed this impression. He found that in 1865 there were in Massachusetts 206 boot and shoe factories, employing 52,821 persons. Now, while machinery has increased the productive capacity of each workman tenfold, there are 1,500 boot and shoe factories, employing only 51,280. A few lines above in the same article, Mr. Coolidge is credited with saying that there are 3,500 firms in Massachusetts engaged in the making of boots and shoes; and in the next day's *Herald*, the correspondent is accredited with the discovery that in 1865 there were employed in Massachusetts 30,000 more shoemakers than to-day.

Somebody's arithmetic is evidently at fault. The probability is that the figures copied from Mr. Wright's tables are most to be trusted; and that we are to take as evidence of the power of machinery to turn men out of employment the circumstance that there has been a diminution of about 1,500 boot and shoe makers in Massachusetts since 1865 (52,821 less 51,280), while the value of the annual product has been increased by upwards of $70,000,000.

Admit that it would be a serious thing to them to deprive 1,500 men, women, and children of their means of earning a living, notwithstanding the fact that the same cause increased tenfold the productive capacity and the earnings of 50,000 other men, women, and children. But has the introduction of machinery in shoemaking diminished the demand for labor in Massachusetts by that amount? The evidence does not show it. How many additional men, women, and children are required (above the number employed in 1865) to make ready for market, transport, and sell the additional $70,000,000 worth of boots and shoes? How many men are employed in making the leather used in making the increased number of boots and shoes? And how far would 1,500 operatives go to supply the demands of the numerous establishments devoted to the manufacture and sale of shoemaking machinery?

"Fifteen years ago," said Mr. Coolidge, "quite a business was done in importing calfskins to this country. We imported also a large quantity of manufactured goods from abroad for the retail business. All this is changed now; instead of importing we export. We are exporting leather very largely, and our facilities for manufacturing are being continually improved. There is no country in the world that can compete with us, as with the aid of the twenty-seven firms right around us here doing nothing else than selling boot and shoe machinery we can in a moment have all defects remedied; and in fact hardly a week passes but these men improve our machinery."

The introduction and improvement of machinery do undoubtedly make necessary a continual readjustment of manual labor, but it never diminishes the aggregate demand for such labor. Even in the extreme case of shoemaking, where within a few years four fifths of the work has been turned over to machinery, the increase of production made possible by the change, and the necessary development of collateral lines of productive labor, as in the manufacture of the new machinery and the production of the additional raw material used, far more than compensate for the relatively smaller number of operatives required. The logic of uncritical thinkers on this point appears to be something like this: Before the introduction of machinery the annual product was so much; the number of operatives so many. To-day the annual product is ten times what it formerly was; consequently the number of operatives should be ten times as many. But it is not. Therefore machinery has dealt a terrible blow to labor!

The essential condition of such an increase of production, namely, that there must be a corresponding widening of the market through diminished cost, possible only by the use of labor saving machinery, such loose reasoners leave entirely out of account.

M. VICTOR REGNAULT.

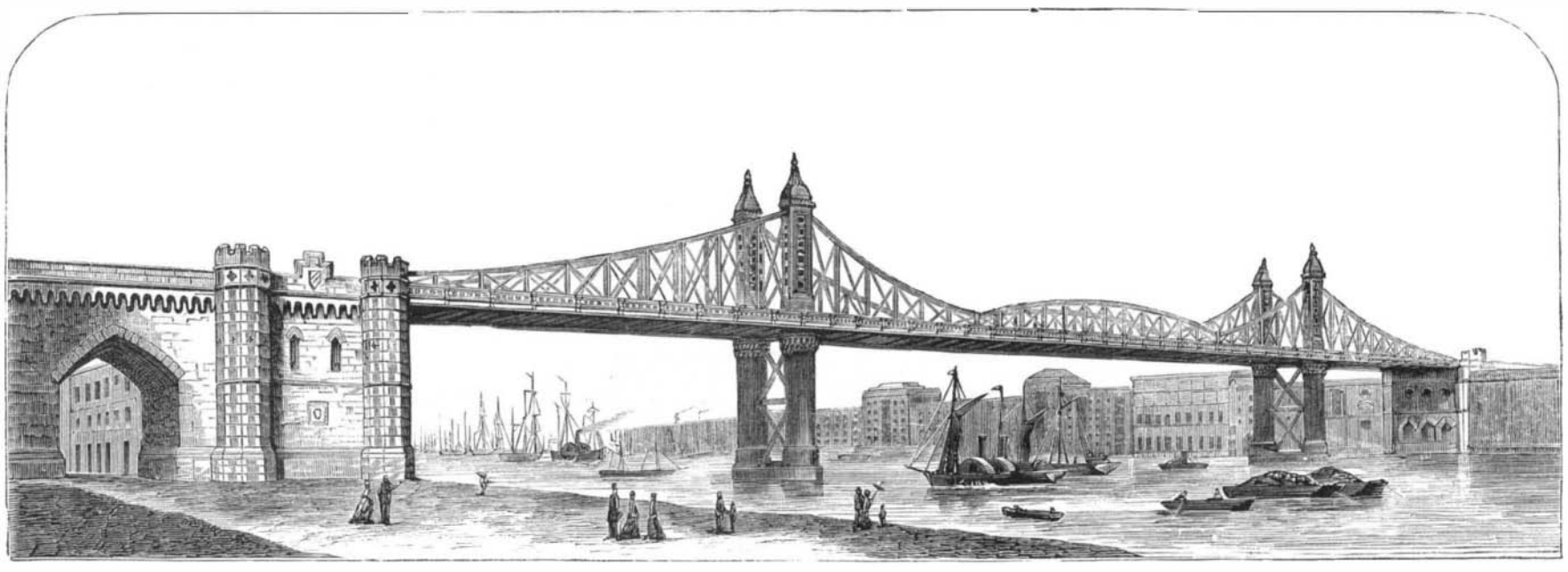
M. Victor Regnault was one of the few masters of science who have attained equal eminence in two great departments of philosophy, and it is even questionable whether he

M. VICTOR REGNAULT.

achieved his highest reputation as a chemist or as a physicist. As a teacher and chemical investigator he has had few peers, and his large number of published works attest the thoroughness of his grasp of chemical science. As a physicist, his researches on the nature of gases are classic. He studied all the great experimental questions relative to heat, established the empirical laws of the elastic force of vapors, and measured their numerical coefficients with an accuracy that is marvelous, in view of the colossal nature of the task which he undertook. He was the father of Henri Regnault, one of the ablest painters France has produced, but who fell during the Franco-Prussian war. It is said that grief for this bereavement greatly impaired M. Regnault's health; and he suffered a still further loss in the destruction of the notes of his investigations, continued over many years, by the Prussians during the same conflict. After long illness he died in January last at the age of 68 years. We take the portrait herewith presented from *La Nature*.

PROPOSED BRIDGE OVER THE THAMES.

The increased traffic of London has reached such a point that the construction of a new bridge over the Thames below London bridge has become desirable. The Metropolitan Board of Works of that city has been for some time engaged in the discussion of plans, regarding which there is much difference of opinion. We copy from the London *Engineer* an illustration of one of three alternative designs proposed by Sir Joseph Bazalgette. In a future issue we shall illustrate another of Sir Joseph's plans—the one which he deems the most practicable—in which he proposes to construct the largest arch in the world, crossing the Thames near the Tower by a single span of 850 feet. The form shown in our engraving is much less expensive, but offers considerable obstruction to navigation. It is of a composite type, being a double cantilever bridge with a central bowstring span of 444 feet. Its appearance is quite graceful. Some doubt is, however, thrown upon the feasibility of securely placing the cylinders carrying the cantilevers, owing to the deep and narrow tideway and the nature of the Thames bottom, and it appears more likely that the single arch will be adopted.



PROPOSED BRIDGE OVER THE THAMES.

BASTARD PATENT RIGHTS.

Mr. Sayler's bill for the better security of property in patterns for metal castings (H. R. 2022) might better be styled a bill for securing to certain parties more than patent privileges in the absence of patent rights. It forbids the use of any metal casting as a pattern in moulding unless by the written consent of the owner or producer of the original pattern from which the casting was made; thus giving to pattern makers, unconditionally and for nothing, greater protection than inventors can secure through the agency of the Patent Office or the copyright act. The man who makes a positive and useful addition to the world's scientific knowledge or industrial achievement may enjoy a temporary exclusive control of his invention or discovery on proving his right and paying certain fees. Mr. Sayler's bill proposes to give to every maker of a moulder's patern, however common and simple its design, all a patentee's privileges for nothing and forever! and this at a time when the same legislative body has under consideration a bill for depriving inventors of no small part of the limited protection which patents have hitherto afforded them.

No doubt it is very annoying to pattern makers to have their unpatentable designs appropriated by others without their having to pay for patterns, but that is one of the conditions of every trade. Whatever is good and taking is sure to be copied with small regard for the introducer's feelings. Pattern makers suffer no more than other people, and there is no good reason why they should be specially exempted. There is certainly no just ground for giving them all the benefits of the patent law while exacting none of its conditions.

The sole object of the patent system is to encourage original research and invention for the advancement of science and the industrial arts; and it aims to secure that end by recognizing a temporary property right in new and useful inventions. No such end is proposed by Mr. Sayler's bill; nor would any such effect be produced by it. It aims simply to give special privileges to a class which has no right to such privileges. The bill was referred to the Committee on Patents, but might as fitly have been sent to a Committee on Indian Affairs.

The Ticinese in California.

One of the most industrious, frugal, temperate, and well-to-do elements in this cosmopolitan State is the Ticinese, composed of former inhabitants of the Canton of Ticino, Switzerland. Their number is estimated at 7,000, distributed principally in Marin, Napa, Santa Clara, and San Luis Obispo counties. The great majority are engaged in the dairy business, and notably so in Marin county. It is stated upon good authority that they manufacture fully one half the amount of butter and cheese made in this State, and the products of their labor always bring the highest price in the market because of the excellence of quality and fullness of weight. Quite a number of the Ticinese are small farmers, some of whom own their own land, but as a rule, both for farming and dairy purposes, the land is rented. Their property in milch cows, horses, wagons, and other things necessary to their business, is very large. As a reward of their unceasing industry and frugality they are never "hard up," and, when the proper occasion offers, are generous to a fault in spending their money. In their feasts and convivial parties they are as jolly a lot of fellows as ever sat down to do honors to the inner man. The Ticinese are a branch of the Italian family, and all speak the Italian language, their mother tongue.—*San Francisco Chronicle.*

A Method for Producing Cheap Heating Gas for Domestic Purposes.

That gas is the most perfect kind of fuel for either manufacturing or engineering purposes is a fact that has long been maintained by the most eminent metallurgists and engineers; and that, wherever it has been used for domestic purposes, it has been found to perform its office most admirably, is a fact that cannot be controverted. Yet, notwithstanding all this, its adoption as a calorific agent has been comparatively slow. Possessing the merits of cleanliness, freedom from trouble, simplicity of management, easy regulation of the heat employed, allowing it to be rapidly generated and as rapidly checked when no longer needed, together with numerous other advantages that will be obvious without enumeration, it may appear strange that this mode of heating has not enjoyed a far more extended application for various domestic purposes. The two great drawbacks that have operated to prevent this thus far seem to be the high price of ordinary illuminating gas, which renders the usual methods of generating heat to be more economical, and the impracticability of using, on a small scale, any of the gas generators and appendages that have hitherto been devised for the purposes of producing gas fuel for domestic uses. All of the apparatus thus far brought to the notice of the public by inventors has the great fault of being so bulky, cumbersome, and costly, as to adapt it for use only in such large establishments as clubs, hotels, hospitals, prisons, etc., in which the consumption of gas for cooking purposes would of necessity be large. What we want is a small, compact apparatus that shall produce a cheap heating gas, and one that can be afforded at such a price as to place it within the reach of every family of moderate means.

In 1872, prizes were offered by the Society of Arts, of England, for inventions that should tend to promote economy in the use of fuel for domestic purposes. After a careful investigation of the claims of a large number of exhibitors, it was found that inventors had made so little advance worthy of the name in the direction of fuel economy, that no prize could justly be awarded.

Among various inventions which made their appearance after the conclusion of the society's experiments was one by Mr. Joshua Kidd, based on the principle of the admixture of gases from ignited coal with the hydrogen from decomposed water. The remarkable feature of the process was the complete gasification of the fuel used, and it was this fact which led some gentlemen interested in the subject to adopt the idea and purchase the patent. A description of the apparatus, which two years of trial and experiment have enabled them to alter and adapt to carry out the principles of the original invention, forms the subject of a paper by Mr. S. W. Davies, in the current number of the society's journal. Numerous attempts have been made by previous workers in this direction to produce a cheap gas for heating purposes, by the action of water vapor on incandescent carbon. It has long been known that if steam be passed over coke or charcoal heated to redness, a decomposition of the steam takes place, hydrogen, carbonic oxide, carbonic anhydride, and a small proportion of marsh gas being produced. The composition per cent by volume of the mixed gas produced in this way is, according to analysis:

Hydrogen	54·52
Carbonic oxide	31·86
Carbonic anhydride	12·00
Marsh gas	1·62
	100·00

It is evident, therefore, that we have here a very important heating gas, could we succeed in producing it economically in considerable quantities. How to do this has formed the subject-matter of numerous patents, very few of which have been commercially a success, owing to the large and costly nature of the apparatus devised for carrying out the process. The apparatus under consideration will be seen to labor under neither of these disadvantages. It is small, compact, by no means costly, and combines a gas generator, boiler, and superheater in one; it generates its own blast, is continuous in its action, and so easily worked that a person of average intelligence may be taught to attend to it in a few hours.

The generator consists of a hollow cylindrical body or case, made of wrought or cast iron, terminated below by a cast iron bottom, with a hole in its center of about one half or one third its own diameter. Below this again, and forming part of the bottom casting, is a second hollow cylinder of the same internal diameter as the hole above it. In this lower cylinder the fire grate is lodged, the blast pipe opening into it below the fire grate. The grate fits loosely, and is attached to one side of the cylinder by a hinge, and supported at the other by a pin. When making gas it is necessary to close the bottom of the small cylinder air-tight. This is effected by means of a flat hinged plate, kept tightly pressed against it by a heavily weighted lever. In the upper cylinder there is a coil of thick wrought iron pipe, fitting closely and attached by means of supports. At the bottom the coil is protected from the intense heat of the fire by a thin lining of gannister. The two ends of the coil are turned outward at right angles, and pass, gas-tight, through the body of the generator. The lower end is connected with an arrangement for supplying water under pressure, and the upper with a steam pipe of smaller diameter passing down parallel to the generator, and terminating in a small steam tap in front of the blast pipe.

The top of the apparatus is a casting of rather peculiar shape. In its center there is a circular opening about nine inches in diameter, communicating below with a hollow inverted truncated cone projecting into the interior of the generator. At the apex of the cone there is a narrow cylindrical ring, the seat for a heavy conical valve, which fits it gas-tight. This is surmounted by a short cylindrical fuel box, carrying at its upper end a hopper, the opening between them being covered by an ordinary flat sliding plate or valve. Attached to the fuel box there is a short flue, used when lighting the fire, but closed when making gas. The whole apparatus is supported on three legs attached to the bottom casting.

It will be seen now that if a fire be lighted in the interior, and water driven through the coil, the water will be rapidly caused to boil, steam will be produced, which will accumulate in the upper part of the coil, and, if not at once allowed to escape, will take up a further increment of heat and pass into the condition of superheated steam. The tap in front of the blast pipe being opened, the superheated steam will pass down the small pipe outside the generator, and blow with considerable force into the blast pipe, carrying with it a stream of air. By apportioning the size of the steam jet to the internal diameter of the coil, a constant supply of superheated steam is obtained, and, as a matter of course, a continuous blast of air insured. In this way, then, the requisite oxygen to support combustion, and steam for decomposition, are driven into the apparatus with considerable force, and, after traversing the column of heated fuel, issue therefrom as a permanent gas. The gas thus produced is non-luminous, but burns with a reddish-blue flame. It is much richer in heat producing material than that produced by Siemens' method, and of course its calorific value is proportionally increased. The records of the author's experiments with the apparatus show that one ton of fuel (anthracite gave the best results) treated in it yields from 155,680 to 224,000 cubic feet of gas; that is, from three to four and a half times the quantity yielded by Siemens' process, the only patented one that has hitherto met with much success as a method of generating cheap gas for domestic and manufacturing purposes.

Siemens' generators are, moreover, large and costly, and the space occupied by the apparatus is very considerable. They are therefore only applicable to large manufacturing and metallurgical processes, while the generators under consideration can be made almost of any size, so as to adapt them for use in small manufactories or private establishments.

If, after thorough trial, the new method be found to meet all the requirements of the public, as it seems to have met the expectations of those who have been perfecting it, a great step will have been taken towards supplying one of the main desiderata that have thus far been wanting to make gas fuel more available for domestic use.

A Talk about Plumbing and Sewer Gas, by Ex-Alderman Gilbert, of this City.

To the Editor of the Scientific American:

As the story goes, a man was knocked down in one of our thoroughfares by a passing carriage. The people rushed to his assistance, when some one cried out, "It's only a plumber!" and the people passed on, leaving the fallen man to the care of the first policeman who might happen that way.

We often blame the plumber, when it is mainly the system upon which our houses are plumbed that is the cause of the sewer gas nuisance.

The ramifications of water and sewer gas pipes running through all parts of a house when taken as a whole are complicated, and being all hidden beneath the floors, are a mystery to most people; but when each room is taken separately, nothing is more simple. They consist of two pipes, one leading the water from the Croton pipe into the wash basin or other receptacle, with a faucet to shut off the water; the other pipe leads the waste water from the basin to the sewer, and when properly constructed is as tight from end to end as the water pipe.

Now the question is, Why should not the sewer pipe be as effectually closed at the side of the wash basin, to shut out the sewer gas, as the other pipe is to shut off the water, when it can be so easily done by means of a hinged valve on the inside of the basin, that shall rise by its own buoyancy and let the water off to prevent an overflow, and again fall back airtight when the water is let off at the bottom of the basin, thus enabling every one in self defense to see to it that no gas can possibly enter the room, however imperfect the general plumbing of the house may be? This valve may be applied to all basins now in use without alteration. The plumber in defense of his system will answer that the water trap under the basin prevents the passage of sewer gas into the room through the sewer pipe which enters the basin.

This water trap, like all other contrivances to prevent sewer gas from entering our houses, is hidden from sight within the sewer pipe, and an imperfection in it, an opening no greater than the thickness of paper, will allow the gas to stream through; and besides, when water is let off through the waste pipes in the lower rooms, it is apt to siphon the water out of the traps above, thus removing whatever obstruction these water traps might afford when full of water. But supposing the water trap under the basin to be full of water, will it prevent the passing of sewer gas into the room?

It is well known that water will rapidly absorb the gas produced by such impurities as enter the sewers, and we have scientific authority for stating that when the water in the traps becomes saturated with gas, the more ethereal qualities and those which are most detrimental to health will pass into the room.

The sewers are ample to receive all the impure matter from our houses and factories, and carry it off, together with the gas formed within the sewers, to the broad sheet of water that surrounds the city, where it would be rapidly absorbed.

All that need be done to accomplish this result is to abandon the abominable system of ventilating sewers, and allow the ventilation to go on naturally at their openings where they enter the bay and river. During the day while the waste pipes are in action we have all the water of the Croton river running through the sewers; this current of water is sufficient to carry off all the gas that has formed during the preceding night, and that it does carry it off any one can prove by taking off the manhole plate at midday at any point where the descent of the sewer is sufficient to move the water within it. At that time it will be found that the air in the sewer is comparatively free from gas. It is at night when the flow of the waste pipes is stopped that gas accumulates in the sewers, and instead of shutting it within them to be carried off to the bay and river as soon as the waste pipes are open in the morning, we have those ventilating pipes to draw the gas up through the houses with openings into the waste pipes of the rooms, and what gas is not left at these openings is carried out above the roof, to be brought down by the falling dew to poison the air we breathe, and from which there is no escape, when we open our windows for fresh air in a still night.

Of the effect of this sewer gas and other bad odors upon the health of this city, which ought to be one of the healthiest in the world instead of being one of the most unhealthy, it is only necessary to refer to the recently published opinions of Drs. Marcy and Hammond. Dr. Marcy says, "There are many days and nights, during the summer months especially, when our city is rendered almost uninhabitable by the dreadful stench. Even closing the windows on hot and sultry summer nights does not exclude the poisonous smells which penetrate everywhere, lurk in every place, and sow the seed broadcast of typhus, dysentery, cholera infantum, and the like." Dr. Hammond says, "The sickening character of the emanations in question is so indisputable that I do not suppose it will be denied by any one who has been subjected to the influence of the horrible stench; it oppresses us in the streets, disgusts us in our moments of relaxation, and, worst of all, it nauseates us at our meals."

"Dr. Chamberlain reports, from a recent conversation with Dr. Richardson, acting Secretary of the State Board of Health of Massachusetts, that there they never have a fatal case of scarlet fever or diphtheria without finding some cause for it in defective drainage, ventilation, or bad sewerage of the dwelling."

The above remarks of the three eminent physicians apply with great force to the sewer gas nuisance, and common sense would seem to dictate the necessity of an air tight covering at the end of every sewer or waste pipe which enters our houses, so placed that one can see that no gas can enter the room.

A most important branch of the plumber's trade, and one which should be skillfully done, is to so construct the basin of a water closet and its fixtures that when the pan or valve at the bottom of the basin is closed it shall be flushed with at least four inches of water, to always stand at that height in the bottom of the basin, and when one sees less than about four inches in the bottom of a water closet basin he may be sure that gas will pass into the room and should at once call in the plumber.

JOHN S. GILBERT,
Submarine Engineer.

ASTRONOMICAL NOTES.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., Saturday, May 25, 1878.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

	H.M.		H.M.
Mercury rises	3 49 mo.	Jupiter in meridian	4 27 mo.
Venus rises	2 43 mo.	Saturn rises	1 50 mo.
Mars sets	10 11 eve.	Uranus sets	0 35 mo.
Jupiter rises	11 32 eve.		

FIRST MAGNITUDE STARS.

	H.M.		H.M.
Alpheratz rises	11 57 eve.	Regulus sets	0 36 mo.
Algol (var.) rises	1 40 mo.	Spica in meridian	9 05 eve.
7 stars (Pleiades) rises	4 00 mo.	Arcturus in meridian	9 56 eve.
Aldebaran rises	5 19 mo.	Antares rises	7 48 eve.
Capella sets	11 02 eve.	Vega in meridian	2 22 mo.
Rigel sets	6 26 eve.	Altair rises	9 01 eve.
Betelgeuse sets	8 00 eve.	Deneb rises	6 28 eve.
Sirius sets	7 27 eve.	Fomalhaut rises	2 40 mo.
Procyon sets	9 38 eve.		

REMARKS.

Mercury rises but 46m. before the sun, and is therefore invisible. Venus is in an uninteresting quarter, as there are no bright stars in her vicinity. She is in that section of the zodiac allotted to the constellation *Pisces*, the Fishes, and the brightest star (*γ Arietis*) within this space is of the third magnitude, and belongs, properly, to *Aries*. She is in conjunction with the moon May 28, in the morning, and is farthest from the sun May 30. Mars is in *Gemini* about 2° north of the central star (*Wasat*) of the constellation. This star (3d mag.) will be remembered by some as having served to indicate the position of Uranus shortly after its discovery, and when its elements were not fully known. Jupiter begins to retrograde this date. Saturn is situated almost exactly upon the *prime meridian* of the heavens, and with the two stars (Algenib and Alpheratz) which form the east side of the Square of Pegasus, indicates the course of this meridian through the pole.