Astronomical Notes.

OBSERVATORY OF VASSAR COLLEGE.

The computations in the following notes are by students of Vassar College. Although merely approximate, they are sufficiently accurate to enable the observer to recognize the planets. M. M.

POSITIONS OF PLANETS FOR OCTOBER, 1880.

Mercury.

Mercury may be seen late in October after sunset. It should be looked for some nine or ten degrees south of the sunset point.

On October 31 Mercury and the bright star Antares set nearly at the same time. Mercury can also be found by its position between Venus and the horizon.

Venus.

Venus may be seen after sunset all through the month, setting at 6h. 13m. P.M. on the 31st.

On October 20 Mercury and Venus will have very nearly the same declination, but Venus will be more than 6° east of Mercury.

Venus will be in conjunction with the crescent moon on the evening of October 5.

Mars.

Mars rises and sets so nearly with the sun that it is not likely to be seen in October.

Jupiter.

Jupiter comes into its best position in October. It is in opposition to the sun on the 7th.

The most interesting evenings in October will be the 9th, 16th, and 23d.

On the 9th (if the observer take the hours between 8 and 10 P.M.) the smallest satellite will be seen to come out from eclipse, and the next in line will pass off from the face of the planet. The planet will be seen early in the evening with two satellites only.

On the 16th Jupiter may be seen with two satellites, and as the largest satellite reappears from eclipse nearly at the same time that the first enters upon the planet's face, two moons must be seen near Jupiter.

On October 23 the largest and the smallest satellites disappear behind Jupiter within little more than an hour's time, while the first satellite approaches transit.

A telescope of three or four inches aperture will show markings and spots on the face of Jupiter, and the planet should be carefully watched by amateurs all through October, usually the best month in the clearness of the skies.

Saturn.

Saturn follows Jupiter, rising 33m. after Jupiter on October 1, and 37m. after Jupiter on October 31.

Saturn also comes into opposition in this month on the 18th. As the two planets are so near together in the skies, it will be easy to turn the glass from one to the other, and to notice the difference of light and color, the position of the ring of Saturn relatively to the planet, and the grouping of the satellites of Jupiter. And although a small telescope will show Titan only, among the numerous satellites of Saturn, it can be watched all around its revolution, and the slowness of its motion compared with the rapid motion of the satellites near to Jupiter.

A good glass of four inches aperture may show also Rhea, the satellite of Saturn next in size to Titan.

Saturn is in conjunction with the full moon on the morning of October 18.

Uranus.

Uranus must be looked for in the morning. It rises at 3h. 40m. A.M. on October 1. On October 31 it rises at 1h. 50m. A.M.

On October 31 Uranus is 2½° west of Delta Leonis, but nearly 14° south of the star in declination. It will be difficult to find it in the early morning hour without a well mounted telescope.

Neptune.

Neptune is approaching opposition and passes the meridian on October 31 almost exactly at midnight, at an altitude in this latitude of more than 62°.

Gould's Comet.

Professor Klinkerfues, of Gottingen, has published a letter on Gould's comet, discovered last February at Cordoba. His object is to point out that the probable identity of this comet with those seen in 1843 and 1868 need not be rejected because it does not appear to have been seen, although so conspicuous an object between those years. So nearly does it approach the sun (within, indeed, about 100,000 miles of its surface) that the resistance to its motion when at perihelion is likely to be sufficient to produce a very considerable diminution in its periodic time, the case being, in fact, one of resistance from the sun's atmosphere itself, and not merely, as has been conjectured in the case of Encke's comet, from the ethereal medium existing in space. Hence there is nothing extravagant in the supposition that the resistance of the part of the corona within which the comet passes may be quite sufficient to diminish its period of revolution from 175 years to 37 years. Carrying this view still further back, Professor Klinkerfues contends that it is probable that the same comet may be identical with one seen and described by Aristotle in the year B.C. 371, when that philosopher was only thirteen years old and still living in his birthplace, Stagira. He considered it likely that while the period of revolution from B.C. 371 to A.D. 1668 was 2,039 years, it was diminished by the resistance of the sun's atmosphere, first to 175 and then to 37 years; and, further, that it has at the late passages through perihelion been again decreased to 17 years, so that it may be expected that the comet will return in the autumn of 1897.

HINTS TO THE YOUNG STEAM FITTER.

BY WM. J. BALDWIN.

EXHAUST STEAM AND IT'S VALUE.

Among the many who own steam engines and the engineers who run them there are few who have a just appreciation of the *thermal* value of the clouds of exhaust steam continually blown to the winds from the apparently numberless exhaust pipes, which can be seen from the top of a high building in any of our large cities.

When I say that three-quarters of the *practical* thermal value of every pound of coal burned in the boiler furnace is lost past recovery to the consumer, I am putting it at less than the actual loss; and could this heat be converted into available motion, suitable for power purposes, it would be a boon indeed, and money in the pockets of the one who could do it. Perhaps there is a chance for the electrician to convert it into energy; but as yet engineers can use it for heating purposes only, where its full value can be shown in the heating of water, air, or any tangible substance.

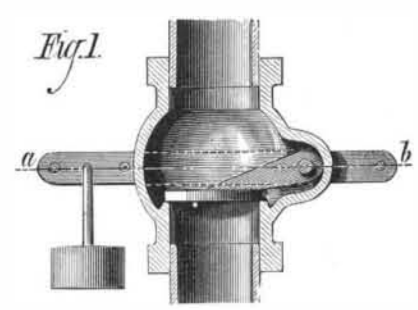
Fig. 1

The first purpose the exhaust steam is generally used for is to warm the feed water, the object being to raise its temperature as high as possible before it enters the boiler, thereby to save fuel.

The first question which nearly always suggests itself to the engineer is, How hot can feed water be made? The second which he sometimes considers, but seldom arrives at a satisfactory conclusion about, is, What percentage of the coal heap does the heating of the feed water represent? and the third, which rarely comes under his notice, is, How much of the exhaust steam from an engine can be used in heating all the feed water necessary to supply the loss caused in the boiler by supplying steam to the same engine? and how much of it is left for use elsewhere, partly or wholly, to heat the *fact ry* in winter or for drying purposes?

The answer to the first question is: Water under the pressure of the atmosphere cannot be heated above 212° Fah., and when the feed water passes the check valve at a temperature of 200° it should be considered good, although it is possible to do better.

Where water is *forced through* a heater the temperature can be raised higher than when drawn by a pump *from* the heater, as the lessening of the pressure also lessens the capacity of the water for *sensible* heat.

Some makers of feed water heaters claim they can heat the water above 212, because it is under pressure; but it is evidently a mistake to attempt it, as both the water to be heated and the steam necessary to heat it should have a pressure above atmosphere, and any attempt to keep a back pressure in the exhaust pipe for the *simple purpose only* of warming the feed water above 212° is attended with a loss instead of a gain.

The attempt to heat the feed water 5° above 212° by a back pressure of 2 pounds, the mean pressure in the cylinder being 50 pounds, is attended with a loss in energy more than five times greater than the gain to the feed water.

The answer to the second question is: That when the feed water is raised from *mean temperature* (39°) to 212°, by the use of the exhaust steam at atmospheric pressure, it is equivalent to very nearly two-thirteenths of the weight of the fuel necessary to convert water at *mean temperature* to steam at *any pressure.* and 15·18 per cent of the coal heap is the greatest possible saving that can be made for this difference of temperature.

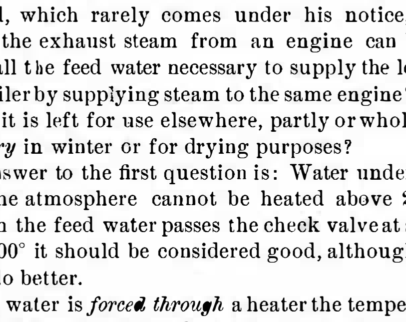
Fig. 2

To find the saving for other differences of temperature in the feed water, divide the difference between the temperature of the cold water as it enters the heater and that at which it enters the boiler into 1,146, less the difference between the cold water and 32, and the product is the fraction of the coal heap.

The answer to the third question is: That two-elevenths of the exhaust steam is the greatest quantity that can be utilized in the warming of the feed water, and making a generous allowance for loss by radiation, etc., there will still be three-fourths of all the exhaust steam for other purposes.

The next general purpose for which the exhaust steam from an engine can be used is in the warming of the air of a building, to which purpose it is often applied, though not as much as it should be, as there appears to be an idea among many users of steam that it is just as well to take live steam from the boiler as to cause one or two pounds back pressure on the engine for the purpose of getting a circulation and driving the air from all parts of the coils.

The loss in power to an engine from back pressure is very nearly directly as the difference between back pressure and mean pressure. Thus, in an engine of 50 pounds mean pressure, with a back pressure of 2 pounds, there is a loss of 4 per cent, and as the available energy of an engine cannot represent one-quarter of the *practical thermal* value of the coal, the loss caused by 2 pounds back pressure cannot represent more than 1 per cent of the coal, and as it is an incontrovertible fact that the exhaust steam contains more than three-fourths or 75 per cent of the *practical* thermal value of the coal, the balance is largely in favor of using the exhaust steam. The steam fitter when preparing to use the exhaust, usually places a *back pressure valve* in the exhaust pipe of such construction that it can be loaded to suit, so as to reduce the back pressure to a minimum when in use, and to hold it open when not required.

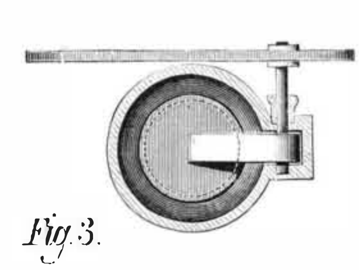
Fig. 3.

Fig. 1 shows a section of a back pressure valve with the weight hanging on the positive end of the lever, showing the position of the valve when the steam is turned into the coils. Fig. 2 shows the weight on the negative end of the lever, the position usually used in summer. Fig. 3 shows cross section on line *a b*, Fig. 1, to show stuffing box and spindle.

Exhaust and live steam should never be used in the same coil at the same time. It is often attempted, but is very difficult to regulate, and the better way is to make the exhaust coils no larger than there is steam enough to fill them, and should this not prove sufficient for the space to be heated, add live steam coils with entirely independent connections.

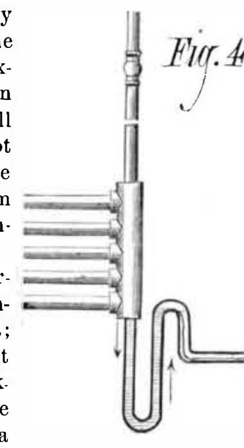
Fig. 4.

Sometimes coils are furnished with two sets of connections, live and exhaust; but this requires constant attention to prevent workmen, etc., from crossing the steams, thereby causing a waste.

Another objection to having live and exhaust steam connections on the same coil is the style of trapping used for one is not fit for the other.

A very good way to *trap* and provide for the condensed water from an exhaust steam coil is to have an inverted water siphon to the sewer or tank, as shown in Fig. 4, with a vapor pipe to the roof to remove an excess of pressure and the air. This pipe should have a check valve on it to prevent the return of the air between the strokes of the engine, and the water trap should be as deep as possible.

MECHANICAL INVENTIONS.

Mr. John P. McKinley, of Black Hawk, Miss., has patented an improved sawmill head-block, by means of which the knees of the head-block can be adjusted by the driving power of the mill, and it is so constructed as to enable the sawyer to set the head-blocks very quickly and accurately.

An improved machine for filing gin saws has been patented by Mr. Alexander F. McAllister, of Marshall, Texas. This machine employs rotary files, and is supported and guided by arms which engage the periphery of the saw.

Mr. Marcus M. Rhodes, of Taunton, Mass., has patented an improved apparatus for ganging and assorting disks of varying thickness, for coins, buttons, and other purposes. The invention consists of an improved mechanism for feeding disks or planchets to gauging calipers of a sliding spring caliper bar, the range of whose every movement is determined by the thickness of the disk being gauged, and a group of receiving tubes reciprocated beneath the calipers by novel mechanism

An improved machine for making rubber belting has been patented by Mr. Jacob D. Joslin, of Trenton, N. J. This machine is intended for receiving the stock and folding and preparing the belt for vulcanization.

An improved wrench or pipe-tongs that may be adjusted without screws has been patented by Mr. Theodore P. Franke, of Buffalo, N. Y. The invention consists of a hollow internally-socketed handle, containing in its upper section a movable serrated lower jaw resting upon a spiral spring, and adjustable by means of a rod that passes up through the handle.

A RECENTLY patented compound for flavoring cigars consists of rum, alcohol, oil of apple, tonka bean, valerian root, and laudanum. Such are the vile doses that go into the smoker's mouth.