

W. W. S. asks: Did the supposed planet cross the disk of the sun or not, on March 24? I can in no way find out. Answer: It is stated that Vulcan was seen to cross the sun's disk on March 14, 1873 by Mr. Cowie at Shanghai, China. Its sidereal period is 24 days, 22 hours, 31 minutes. The existence of other intra-mercurial planets is inferred. A sharp lookout should be kept for them. Mr. John H. Tice of St. Louis states that, in 1859, he saw the planet pass the sun's disk.

W. S. D. asks how to cover glass with a thin coat of tin in a liquid form, in the manner that silver is put on or in any other way, so as to be bright like silver. Answer: We know of no method of coating glass with tin from a solution. An amalgam of tin and mercury is employed on mirrors, in which case the tin foil is used and the mercury poured over it.

O. M. asks: 1. Have the flame protuberances on the sun ever been seen by simply viewing them through properly colored glass and a telescope, without the intervention of the prism? 2. Are all the flames of the same color, so that all may be seen if any are? 3. Where may properly colored glass be obtained for this purpose? I think some noted English spectroscopist saw the flames in the manner indicated above, but I am not certain of this. Answers: 1. Dr. Huggins' experiments with colored media were unsatisfactory. 2. The solar prominences have been seen in a three inch chromatic, using a direct vision spectroscope of five prisms, and magnifying the spectrum with a small telescope. Usually the light is sent through five and a half prisms of dense flint glass. In the spectroscope, the light of the protuberances is concentrated in these images at the hydrogen lines (C, F, and G, of the solar spectrum), while the general light of the sun becomes faint by dispersion. We usually look at the red image at C and photograph either the bluish green one at F or the violet one at G.

R. C. P. says: I built 2 steam boilers 26 feet by 36 inches, with a 14 inch flue in each; they were tight with 60 lbs. of steam; but fearing that they leaked (where we could not see the place) when they were hot, we tested them with 63 lbs. cold pressure; and with this test they leaked at places where they showed no signs of leaking with steam on. Did the cold pressure strain them more than the hot? If so, what is the difference? Answer: It is evident that a boiler when cold is in a different condition than when heated. Boilers may be tight in one case, which are slack in the other. Joints may be quite open, when the boiler is cold, which will be closed by expansion, when steam is raised. An article published in the SCIENTIFIC AMERICAN some years ago describes an excellent method of testing boilers; and as it is one that we can thoroughly recommend, we reproduce it here, as a matter of interest and importance to those who have charge of boilers: "If a boiler be filled full of water up to the very safety valves, and all apertures closed, when a fire is built in the furnace the water will be expanded and raise the valve, if the boiler is strong enough to withstand the strain; but if it is not, the weakest part will be shown, and sometimes sheets are torn out by this method. Steam is not generated from the water during this test, and if a rupture does take place in the boiler, no one will be injured by it."

J. R. says: Can a hot air engine be run by suction? If so, cannot the suction be formed by condensing rarified air? Will rarified air act with the same pressure upon the piston as condensed air, there being a vacuum produced in the receiver? If so, cannot power be gained, the action of heated air being the same in power as that of condensed air? The dense air is pumped out of the receiver through a smaller aperture than that of the receiver or rarified air pipe through which it is fed. Answer: If we understand our correspondent rightly, the same bulk of air must be pumped out that is admitted to the cylinder. The application of heat to air causes it to expand, or, if expansion is prevented, increases its pressure. Our correspondent's idea seems to be both to increase the pressure and volume of the air.

C. H. H. says: A boiler in this section was destroyed, either by a collapsed flue or by its back head giving way. It was of 40 inches diameter, 20 feet length, 1/2 inch shell, with 1/2 inch heads; the flues were 14 inches diameter of heavy three sixteenths inch iron. The boiler carried 98 lbs. of steam. The boiler was thrown a distance of 10 or 12 rods and pieces of saw logs were driven into the boilers. One log was driven into one of the flues for a distance of 10 or 12 feet, tearing it open about 4 feet in length. The boiler struck a white oak stump, about 30 inches in diameter, splitting it open at a right angle with the direction of the boiler. It finally struck a large oak tree, which apparently stopped the force and changed ends of the boiler. The front head was torn out, one or two sheets being badly torn and the back head nearly all out. The force was exerted from the back head. The boiler was old. No one was injured. What caused the trouble? Answer: In the SCIENTIFIC AMERICAN for April 26, 1873, will be found a formula for ascertaining the pressure necessary to collapse boiler flues, made of good iron and truly cylindrical. Applying the data given in our correspondents letter, we find the pressure per square inch necessary to collapse these flues to be about 103 pounds per square inch; so that we can hardly err as to the probable cause of the present explosion. We have alluded before to the excessive working strains to which boiler flues are frequently subjected, and to the great danger of the same; and we hope that our readers will aid us, by communications, to rouse the owners of steam boilers to a sense of their criminal carelessness.

A. asks if the sun differs in distance from the earth in any parts of the year; and if so, what is the difference, and at what time does it change? Answer: The mean distance of the earth from the sun is now estimated at 91,678,000 miles. On June 30, the sun is 2,500,000 miles further away than at the end of the year, when it is nearest the earth.

E. G. says: Can you tell me why my boiler always leaks when the water is unusually high in it? It is 54 inches in diameter and 11 feet long, with 65 two and three quarter inch flues. Sometimes it will be perfectly tight for weeks; but if by any neglect the water is allowed to get 2 or 3 inches above the highest gage cock, it will leak at every joint, and sometimes troubles me for days before the leaks stop up again. Answer: It is impossible to answer a question of this kind without looking at the boiler. Still, we will advance a theory which might possibly account for the leak. The boiler may be set in such a manner that it can just sustain its own weight and that of the water which it contains when the proper water level is maintained. Raising the water level three inches will increase the weight between 900 and 1,000 lbs., and this may bring a strain upon the boiler which it cannot bear, on account of improper setting; while it might be able to withstand a much higher steam pressure without leaking, as, in this case, the weight on the supports of the boiler would not be altered.

E. B. T. says: After using a very powerful punching machine, on removing the sliding head, which had got dry, the fine cuttings dropped out and immediately took fire, or exploded like powder. The material was cast iron. Can you explain this? Answer: Substances containing carbon, when reduced to a certain fineness, and the particles (brought to a certain temperature, arranged in a certain way in respect to each other) have been known to absorb oxygen from the air so rapidly as to take fire spontaneously. Yours is evidently a case of this kind. We remember no example precisely similar.

M. says: I would advise J. N. H., who asked as to the comparative merits of a turbine and an overshot wheel, to put in the best turbine water wheel that he can buy; the advantages of a turbine over an overshot wheel are many, some of which are that there is no trouble with back water and no trouble with ice. A scientifically constructed turbine will not vary materially (in the amount of work that it will do) from the overshot, and some well informed millwrights give a turbine the preference in quantity of work with same amount of water.

MINERALS.—Specimens have been received from the following correspondents, and examined with the results stated:

J. H.—It is calc spar or crystallized carbonate of lime. The effervescence with acid is due to the carbonic acid in it. It contains no iron or sulphur. Commercial acids frequently contain iron, and prussiate of potash is partially decomposed by strong sulphuric acid, so as to give a blue color when no iron is present. Test your acids before testing your minerals. The brown specimens are limestone containing some alumina, which gives them the characteristic odor of clay when breathed on.

COMMUNICATIONS RECEIVED.

The Editor of the SCIENTIFIC AMERICAN acknowledges, with much pleasure, the receipt of original papers and contributions upon the following subjects:

- On Cooperation. By J. P. M.
On Chickens and Eggs. By H. E. H.
On a Fossil Corn Shuck. By J. H. F.
On the Million Dollar Telescope. By W. W. B.
On the Navigation of the Yarra. By J. M.
On a Celestial Phenomenon. By A. S. T.
On Flying Machines. By W. M. K.
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On Attraction and Repulsion. By I. F. T.
On an Auroral Phenomenon. By G. M.
On the Zodiacal Light. By T. R. L.
On an Auroral Display. By H. P. C.
On Steam Power on Canals. By W. J. B.
On the Newtonian Theory. By J. T. W.

Also enquires from the following: J. T. B.—V.—M. B. O.—J. M. E.—P. E.—G. R. E. G.—W. A. B.—F. J. S.—H. E. F.—W. H. M.—C. A.—C. P.—J. M. G.

Correspondents who write to ask the address of certain manufacturers, or where specified articles are to be had, also those having goods for sale, or who want to find partners, should send with their communications an amount sufficient to cover the cost of publication under the head of "Business and Personal," which is specially devoted to such enquiries.

[OFFICIAL.]

Index of Inventions

FOR WHICH

Letters Patent of the United States

WERE GRANTED FOR THE WEEK ENDING

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AND EACH BEARING THAT DATE.

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APPLICATIONS FOR EXTENSIONS.

Applications have been duly filed, and are now pending for the extension of the following Letters Patent. Hearings upon the respective applications are appointed for the days hereinafter mentioned:

- 25,488.—HYDRAULIC PRESS.—M. H. Clark. September 3.
25,508.—TAILOR'S SHEARS.—R. Heinsch. September 3.
25,512.—BUNG HOLE BERER, ETC.—J. Kirby. September 3.
25,662.—CONSTRUCTION OF PRISONS.—E. May. Sept. 17.

EXTENSIONS GRANTED.

- 24,493.—FURNACE DOOR FRAME.—P. A. Sabbaton.
24,478.—STONE SAWING MACHINE.—A. T. Merriman.
24,456.—STEAM HEATING.—S. F. Gold.
24,446.—STRAW CUTTER.—R. Daniels.
24,512.—BOLSTER FOR RAILWAY CABS.—A. Ward.
24,451.—METALLIC EARS FOR HANDLES, ETC.—T. Evans.
24,484.—STRAW FOR PAPER PULP.—J. B. Falser, et al.
24,484.—PAPER PULP.—J. B. Falser et al.
24,484.—PAPER PULP.—J. B. Falser et al.
26,415.—WINDING THREAD ON SPOOLS.—H. Conant.

DESIGNS PATENTED.

- 6,703.—LATH BED.—W. F. Burton, Chippewa Falls, Wis.
6,704.—HEATING STOVE.—J. V. B. Carter, Detroit, Mich.
6,705 to 6,703.—CARPETS.—J. Fisher, Philadelphia, Pa.
6,709.—FLOWER VASE.—J. Mersereau, Port Chester, N. Y.
6,710.—NUBIA.—J. Phipps, Philadelphia, Pa.

TRADE MARKS REGISTERED.

- 1,314 to 1,318.—TOBACCO.—Allen & Ellis, Cincinnati, Ohio.
1,319.—BOOTS AND SHOES.—H. H. Bigelow, Worcester, Mass.
1,320.—TOBACCO AND SNUFF.—G. W. Gall & Ax, Baltimore.
1,321.—WHISKY.—Hastings & Berlin, St. Louis, Mo.
1,322 & 1,323.—PISTOLS.—Merwin & Co., New York city.
1,524.—OILS.—Matthew Hoagkinson et al., Marietta, Ohio.
1,325.—BRANDY.—J. A. Jackson & Co., St. Louis, Mo.
1,326.—INSECT POWDER.—P. Reynard, St. Louis, Mo.
1,327.—LAGER BEER.—T. Rempeny, Williamsburgh, N. Y.
1,223.—AXES, ETC.—Collins Co., Collinsville, Conn.

SCHEDULE OF PATENT FEES:

On each caveat... \$10
On each Trade-Mark... \$25
On filing each application for a Patent (17 years)... \$15
On testing each original Patent... \$20
On appeal to Examiners-in-Chief... \$10
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