Hints for Inventors on Steam Condensers.

MESSRS. EDITORS:—In the article under this caption, published Feb. 2d of this year, two important facts were presented, viz:—

(1.) That upon depriving water of the air incorporated with it—in other words, in distilling it—it is rendered incapable of ebullition, and upon converting it into steam in this condition it explodes with force.

(2.) That this explosion takes place not at the boiling point, but at 45° to 75° F. above it—generally at about 260° F., though frequently not under 300°.

Upon these data, well established by Donny, Tyndall, and other experimenters, it is assumed:—

(*a.*) Than if a condenser enforce or permit the escape of air from its vacuum, it should on the contrary provide for its impregnation with the "feed" to supply the loss and to preserve the normal status of the water.

(*b.*) That all gases, oils, etc., corrosive or explosive *per se*, or rendered such by combining with air, or each other, should be discharged, absorbed, or otherwise disposed of and disarmed.

If condensers are not constructed in subjection to the first principle (*a*) set forth, they increase the liability of boilers to burst, for they tend to exhaust the "feed" of its air, thus carrying the boiling point above its legitimate place and approximating it to that of explosion.

To illustrate: if upon trial, with the engine at rest, the pressure in the boiler is found to be only 30 lbs. to the square inch, while the temperature of the water stands above 241° F., say at 300°, the engineer should apprehend imminent danger, because it is evident that the heated liquid is nearly freed of air and may at any moment be converted into steam with destructive energy. The injection of cold water into the boiler at such a crisis would instantly precipitate the catastrophe.

In the face of these facts, every boiler, whether working with a condenser or without one, should have delicate and accurate instruments attached for registering two things, viz., the *pressure* of the contained steam and the *temperature* of the water under it. A thousand disasters charged to high pressure, unequal expansion and contraction, hot flues, gases, oil, etc., might thus be readily avoided, or traced home to their true cause.

The following table may be of use to novices or skeptics in conducting experiments in this direction entitled to confidence:—

PRESSURE AND TEMPERATURE OF STEAM.

Pressure in lbs. per sq. inch.	Corresponding temperature, F.	Pressure in lbs. per sq. inch.	Corresponding temperature, F.
15	212·8°	130	352·1°
30	251·6°	150	363·4°
45	276·4°	170	373·6°
60	295·6°	190	382·9°
75	311·2°	210	391·5°
90	324·3°	230	399·1°
110	339·2°		

From this table it may be observed that when the pressure is that of the atmosphere (15 lbs.) the temperature of the water is at about 212° F. It should however be borne in mind that these figures are not correct when the water is not quite pure. Thus if common salt be added, the boiling point, under the 15 lbs. aforesaid, ascends to 224° F.; if the liquid be saturated with nitrate of potash, it rises to 238°; if with chloride of calcium, to 264°, and so on.

Hence the importance of knowing the condition of the water used and of relieving it of impurities. Whatever carries the boiling point above its true level, under assigned pressure causes undue consumption of fuel and may provoke alarming consequences.

If condensers are not constructed in subordination to the second principle (*b*) laid down, the explosive and corrosive gases, oils, and other agents generated or introduced, may inflict serious injury by accumulation or combination and expose the boiler to convulsions or explosions. Hence full and effectual provisions should be made for ridding the vacuum of these facile and refractory elements and thus guaranteeing the purity of the feed water on the one hand and its integrity on the other.

From these considerations it would seem that inventors in this field should aim to produce condensers—

1st, Which free the steam of all obnoxious and explosive constituents, or which, by combining with each other or with air, may be rendered such.

2d, Which restore to it or the feed water the air lost from any cause, thus preserving the "feed" in a normal condition with respect to its constituents of air and water.

From these considerations it would also seem that manufacturers and others who make or use boilers or condensers should look well to their plan of construction and their system of operation, not only in contemplation of safety but of interest.

Have we boilers constructed with the *registers* noted attached?

Have we condensers built in conformity to the two principles above enunciated? SUGGESTOR.

A Simple Plan of Determining the Ordinates of Circles.

MESSRS. EDITORS:—A few days ago I was obliged to calculate the ordinates for a part of a circle of 500″ rad., the tangent taken as axis. By using the formula, $y=R-\sqrt{R^2-x^2}$, I found:—

$x=$1″; 2″; 3″; 4″; 5″; 6″; 7″; 8″; 9″......
$y=$0·001″; 0·004″; 0·009″; 0·016″; 0·025″; 0·036″; 0·049″; 0·064″; 0·081″... } No. 1.

the ordinates representing in the third decimal the squares of the numbers 1, 2, 3, 4, 5....with sufficient accuracy for abscissas not exceeding 25″.

It seems to me that this fact might come very handy to draftsmen and engineers generally for drawing parts of circles of large radii, because it is very easy to keep in mind the above progression. This progression, however, enables us to find by one single division the ordinates for circles of 4, 5, 10, 25, 50, 100, 125, and 250 rad., no matter whether inches, feet, or yards—abscissas and ordinates being of the same unit respectively.

Suppose the ordinates for a circle of 125′ rad. are wanted: 125 is the fourth part of 500—thus we find by dividing progression No. 1 by 4:—

$x=$¼′; ½′; ¾′; 1′; 1¼′; 1½′; 1¾′......
$y=$0·00025′; 0·001′; 0·00225′; 0·004′; 0·00625′; 0·009′; 0·01225′......etc.

If we do not mind the trouble of a single division and following multiplication, we are able to find also the ordinates for 6, 8, 9, 12, 14, 15, 16, 18, 21, 22, 24....radius.

For instance, the ordinates for a circle of 24′ rad. would be calculated thus:—We have to calculate first the ordinates for a radius of 4′ by dividing the progression No. 1 by 125 (or multiplying it by $\frac{8}{1000}=0·008$:—

$x=$0·008′; 0·016′; 0·024′........
$y=$0·000008′; 0·000032′; 0·000072′.....

If we multiply these figures by 6, the result will be the ordinates for 24′ radius:—

$x=$0·048′; 0·096′; 0·144′........
$y=$0·000048′; 0·000192′; 0·000432′.....

It is easy to understand that we must choose the abscissas according to the scale used and the purpose the curve is drawn for. It would be sufficient in the last case (24′ rad.) to take from progression No. 1 only $x=$3′; 6′; 9′; 12′, etc., because $x=$3′ is the first abscissa which corresponds with an ordinate measurable by the aid of dividers.

A. HARDT, Draftsman P. & E. R. R.

Williamsport, Pa.

The Grammatical Problem.

MESSRS. EDITORS:—It is an exceedingly rare thing to find in your paper any statement on which a question can be raised, but in your issue of March 30th, under the head of "A Grammatical Problem," you imply that the apostrophe and s in the possessive case of nouns is a contraction of the word "his." If this is so, how does the same form ('s) make also the possessive of nouns of the feminine gender, as well as the possessive plural which should be, on the same principle, a contraction of their? Does not the apostrophe denote the omission of the letter e of the old Anglo Saxon genitive case in es? The Anglo Saxon gives no authority making the possessive plural in the same way, but the English language finding a good form for the possessive singular adopts the same form for the possessive plural. The rule then for the formation of possessives becomes very simple; for the possessive singular add es to the nominative singular, which for compactness drops the e; for the possessive plural add es to the nominative plural, which for the same reason, drops the e, and to avoid the hissing sound of two s's coming together, drops also the final s. This explains why the apostrophe comes before s in the singular and after it in the plural, which has always been a puzzle to schoolboys. It also makes your ground perfectly tenable, that the s in possessive cases of nouns ending in a sibilant can be properly omitted. C. P. G.

Boston, Mass.

The Roman Numerals.

MESSRS EDITORS:—Being a constant reader as well as subscriber to your valuable hebdomadal, I was lately very much interested in the plausible theory given by one of your correspondents concerning the derivation of the numerals now in use from those of the Arabs.

Can you enlighten me as to the origin of the Roman numerals? We can readily understand the C and the M, the initial letters of the Latin words, *centum* and *mille*, but why should V represent five, and X ten? In Worcester's Dictionary we are told that the letter V was used to designate the number 5 "perhaps from its resemblance to an outspread hand." Will Shakespeare says, "Our fathers had no other book but the score and the tally, thou hast caused printing to be used." These primitive sticks or tallies, one of which was in the hands of the creditor, the other of the debtor, were cut or notched simultaneously so that they might tally together. Now, may it not have been that when the tally among the Romans was superseded by the arts of writing and printing, that the numerals notched on the sticks, one, two, three, four, then crossed by a diagonal line to denote five, may have been supposed to bear a resemblance to the letter V? Might not the X in the same manner have been suggested by the two diagonal lines of the tally. E. M. G.

Baltimore, Md.

THE GOLDEN HEGIRA.

At the date of the discovery of America the whole amount of gold in commercial Europe was estimated at $170,000,000. During the succeeding one hundred and twelve years the opening of new fields of supply added about $6,387,500,000, so that had there been no loss nor shipments, there should have been at the commencement of the present century $6,557,500,000 in the commercial world. If to this we add the enormous receipts from California and Australia developed in late years and the continued supplies drawn from the older fields, the statement will seem incredible that instead of accumulating, the stock of gold in Europe is actually on the decrease. The inquiry then naturally arises, what becomes of the precious metal?

In a paper read before the Polytechnic Association Dr. Stephens stated that of our annual gold product, full fifteen per cent is melted down for manufactures; thirty-five per cent goes to Europe; twenty-five per cent to Cuba; fifteen per cent to Brazil; five per cent direct to China, Japan, and the Indies; leaving but five per cent for circulation in this country. Of that which goes to Cuba, the West Indies, and Brazil, full fifty per cent finds its way to Europe, where, after deducting a large per centage used in manufacturing, four fifths of the remainder is exported to India. Here the transit of the precious metal is at an end. Here the supply, however vast, is absorbed and never returns to the civilized world.

The Orientals consume but little, while their productions have ever been in demand among the western nations. As mere recipients therefore, these nations have acquired the desire of accumulation and hoarding, a passion common alike to all classes among the Egyptians, Indians, Chinese and Persians. A French economist states that in his opinion the former nation alone hide away $20,000,000 of gold and silver annually, and the present Emperor of Morocco is reported as so addicted to this avaricious mania that he has filled seventeen large chambers with the precious metals. The passion of princes, it is not surprising that the same spirit is shared by their subjects, and it is in this predilection that we discover the solution of the problem as to the ultimate disposition of the precious metals. This absorbtion by the Eastern nations has been uninterruptedly going on since the most remote historical period. According to Pliny, $100,000,000 in gold was in his days annually exported to the East. The balance of trade in favor of these nations is now given as $80,000,000 annually.

Actual loss to the world, to a great amount, is yearly caused by sinking in the ocean, and in some of the processes employed in the arts, as plating and gilding. In concluding, an estimate concerning the actual loss of coin in circulation by abrasion may be proper. In a report made by the director of the United States mint a few years since, is given the following results of some careful and comprehensive experiments made at the mint to ascertain this loss, showing that waste of gold and silver by this cause has been generally greatly overestimated. "On our silver coins taken promiscuously the average amount of loss from abrasion was ascertained to be one part in 6·30, while the gold coins tested seperately showed an average loss on the half-eagle of one part in 3550; the double eagle one in 9000; and a careful estimate as to the proportions of the various sizes of coins actually in circulation in the United States, made of two metals, led to the conviction that the yearly loss does not exceed one part in 2,400."

Life-Saving Inventions.

The session of the Board of Commissioners, appointed under the authority of the Secretary of the Treasury, to examine in to the merits of inventions of a life-saving character, seems likely to be quite a protracted one. About three hundred inventions have been registered for examination, but a small proportion of that number have as yet been put to a practical test. Having, however, now thoroughly systemized their labors, the work will be pushed forward with greater speed. All the inventions presented for examination have been ranked under the following classes:—

1. Boilers, safety valves, steam and water gages, anti-incrustators, steam pumps and siphons, hose and hose couplings, fusible alloys.

2. Life boats and rafts, detaching gear, lowering apparatus and life preservers.

3. Steering apparatus, drags, windlasses and capstans.

4. Fog signals, signal lights, devices for reefing top sails, and nautical instruments of all kinds.

Under a fifth division are classed all other life-saving inventions not specially included in either of the foregoing. The first section has been disposed of and the Board are at present engaged in testing the numerous devices of disengaging tackle.

The Commissioners consist of the following gentlemen: Joseph Cragg, Local Inspector of Steamers, district of Baltimore, Md.; Supervising Inspectors—Asaph S. Bemis, Ninth district, Buffalo, N. Y.; Alfred Guthrie, eighth district, Chicago, Ill.; J. V. Guthrie, sixth district, Louisville, Ky.; William Rogers, tenth district, New Orleans, La.; Col. Chas. L. Stephenson, fifth district, Galena, Ill.; John M. Weeks, Local Inspector, district of New York,; Capt. Wm. M. Mew, General Superintendent of Steam Inspection. A. S. Bemis, esq., is President, and M. A. Clancy, Esq., Secretary.

Coal Oil as a Lubricator.

D. W. S. of St. Louis says: "I have found after three years' use of an article styled in the market 'lubricating oil,' which costs here fifty cents per gallon, that it answers my purpose quite as well as lard oil. Our machinery runs very fast, from 1,000 to 4,000 revolutions per minute, and I find the bearings to be in a better condition than when we used lard oil. At first we were not successful in procuring a good article."

Our correspondent asks where menhaden oil can be obtained. This is not the first inquiry we have had for this oil, and the manufacturers would do well to advertise it. It is manufactured extensively on Long Island, but we cannot give the name of any party engaged in its sale.

ALLOY FOR HARD TOOLS AND BELLS.—20 parts iron turnings or tin waste, 80 steel, 4 manganese, and 4 borax. To increase the tenacity, the proportions may be varied and two or three parts wolfram may be added.

THE TRADES OF FRANCE are to be represented at the Exposition by delegates both male and female, elected by their constituents. Every working man and woman of Paris is to be allowed one free admission.

PRODUCTION OF ANILINE.—By adding to nitro-benzole an acid solution of chloride of tin, a strong reaction is obtained in a few moments, great heat is evolved and aniline is produced.