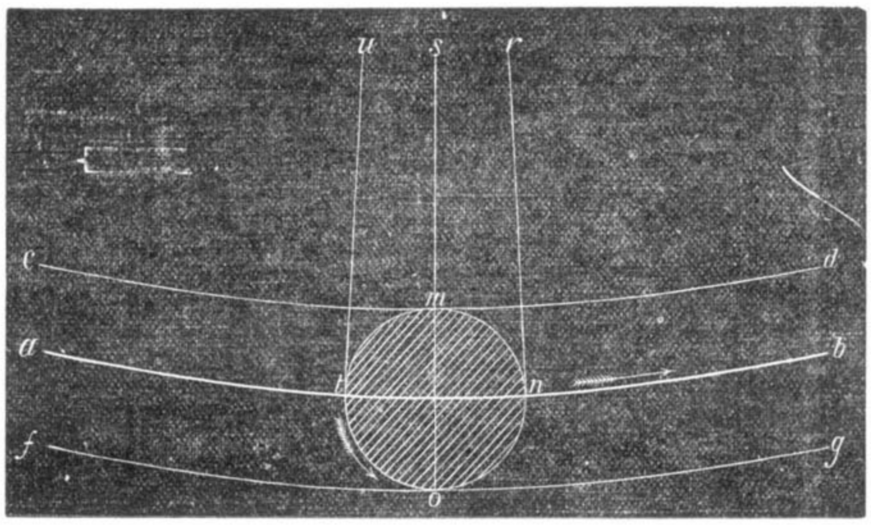
Correspondence.

The Relative Attraction of the Earth and the Sun.

To the Editor of the Scientific American:

The subject of terrestrial and solar attraction having recently been discussed in the SCIENTIFIC AMERICAN without leading to any definite conclusion, I propose to show, by the following demonstration, the exact amount of the solar energy which tends to produce irregularity in the earth's attraction at certain points during the diurnal revolution. Matter resting on the surface of the earth is at all times under the influence of four principal forces, namely, terrestrial attraction, solar attraction, the centrifugal force produced by the earth's orbital motion round the sun, and the centrifugal force caused by the earth's rotation round the axis. In considering the effect produced by these forces on a particle of matter placed on the surface of the earth, the centrifugal action caused by the earth's rotation round the axis may be left out of sight, as it simply tends to diminish the attraction of the terrestrial mass, the diminution being constant at any given point, in whatever position the earth may be placed. Planetary and lunar attraction, it needs hardly be stated, do not appreciably affect the question under consideration. The influence of the three first named forces on matter near the surface of the earth will be readily comprehended by the following brief explanation, reference being had to the accompanying diagram representing a section of the earth in the plane of the ecliptic, and part of the earth's orbit. *o m s* is a straight line drawn through the center of the earth towards the center of the sun, *n r* and *t u* being tangential lines also pointing to the center of the luminary. *a b* represents part of the earth's orbit, *c d* and *f g* being curves parallel to the same, intersecting the central radial line at *m* and *o*.



Mr. Slaughter, in his communication to the SCIENTIFIC AMERICAN, correctly assumes that the weight of bodies on the surface of the earth is not permanent, and that the greatest difference takes place under the meridian, at *m*, and at the opposite point *o*, at midnight; but he has greatly overestimated the energy of the disturbing cause, apparently overlooking the important fact that solar attraction is counteracted by the centrifugal force resulting from the earth's motion round the sun. It needs no demonstration to prove that, unless the sun's attraction on the terrestrial mass was exactly balanced by the centrifugal force caused by the orbital motion, our planet would fall into the sun or retreat from the luminary into boundless space.

Before entering on a demonstration showing the exact difference of the weight of 20,000 pounds (assumed by Mr. Slaughter) under the meridian and at midnight, it will be proper to state the magnitude of the elements on which the demonstration will be based, namely: the mass of the sun, 314,760 times that of the earth; mean distance between the centers of the sun and the earth, 91,430,000 miles; half equatorial diameter of the earth, 3962·91 miles, and mean semi-diameter, 3956·30 miles. Agreeably to the dimensions thus specified, the radii of the curves, *c d*, *a b*, and *f g*, will be respectively 91,426,044, 91,430,000, and 91,433,956 miles. It should also be stated that the writer has recently constructed an instrument by means of which it has been ascertained practically that, at the rising and setting of the sun, solar attraction, exerted on a body resting on the surface of the earth at *n* or *t* (see diagram), is exactly balanced by the centrifugal force acting in an opposite direction called forth by the earth's orbital motion round the sun. The following explanation will give a general idea of the instrument referred to: A solid cast iron ball, eleven inches in diameter, highly polished, is immersed in a bath of mercury, and connected by a fine steel wire to a delicate chemical balance, in such a manner that any attractive force acting on the ball will disturb the balance. The force of gravitation being inversely as the square of the distance, and directly as the mass, the attraction of the sun on the floating ball can be ascertained by the following calculation: 91,430,000÷3,956·30= 23,109·9, mean radii of the earth contained in its distance from the sun. Dividing the square of this amount in the sun's relative mass, 314,760, we learn that the sun attracts the ball with a force=0·0005893 of terrestrial attraction. Hence, as the weight of the ball is nearly 181·47 pounds, or exactly 1,270,300 grains, the sun attracts it with an energy of 0·0005893 × 1,270,300=748·6 grains. Careful tests of the new instrument have shown that any pull exerted laterally on the floating ball may be measured by means of the chemical balance applied, provided the force exerted exceeds eight grains. Hence, a difference amounting to less than one hundredth of the energy exerted by solar attraction, or the centrifugal energy resulting from the motion of the ball round the sun, can be readily detected by the adopted device. It only remains to be stated that not the slightest disturbance of the balance has been observed during repeated trials made while the sun has been rising and setting; thus proving that the pull of 748·6 grains, exerted by solar attraction on the floating ball, is counteracted by some other force. For astronomical purposes, the result of the trial can only be regarded as an approximation; but for our present purpose it is abundantly precise, since it takes cognizance of an energy of only 8 grains in 1,270,300 grains, or $\frac{1}{158000}$ of the weight of the body attracted. Referring to the diagram, it will be seen at a glance that the sun's attraction on a particle at *n* acts in the direction indicated by the line, *n r*, while the attraction of the earth on the same particle is exerted at right angles to *n r*; and that consequently solar attraction will not affect terrestrial attraction at the points *n* and *t*. It will be evident, therefore, that, leaving out of sight the constant influence of the earth's axial rotation, the weight of bodies during sunrise and sunset shows the exact amount of terrestrial attraction.

We may now enter on the task of determining the precise amount of difference in weight which results from transferring the supposed 20,000 pounds from *n* to *m*, and from *t* to *o*. Agreeably to the laws of motion, the centrifugal force of equal bodies, moving round a common center at unequal distances in equal times, is directly as their radii. Consequently the centrifugal force of a body at *m*, caused by the orbital motion round the sun, must be less than the centrifugal force at *n*. The difference will be ascertained by dividing the radius of the curve *a b* in the radius of the curve *c d*. Accordingly the diminution of the centrifugal force will be 91,426,044÷91,430,000=1−0·9999562=0·0000437. Now the sun's attraction at *m* is greater than at *n*, in the inverse ratio of the squares of the radii of the curves *c d* and *a b*, namely: $91{,}430{,}000^2 \div 91{,}426{,}000^2 = 1{\cdot}0000875 - 1 = 0{\cdot}0000875$. Consequently solar attraction exerted at *m* is 0·0000875 + 0·0000437 = 0·0001312 greater than at *n*, where it is exactly balanced by the centrifugal force caused by the earth's orbital motion. We have already demonstrated that solar attraction at the point *n* is 0·0005893 of terrestrial attraction; thus the supposed weight of 20,000 pounds will be attracted with a force of 0·0005893 × 20000 = 11·786 pounds at *n*. Mr. Slaughter estimates that the attractive energy amounts to 12 pounds 10 drams, the discrepancy being occasioned by his calculation having been based on *data* somewhat incorrect. Solar attraction at *m* being 0·0001312 greater than at *n*, it will be found, by multiplying this decimal fraction by the total attraction at *n*, that in transferring the weight, from *n* to *m*, it will be subjected to an additional attraction of 11·786 × 0·000312=0·001546 pound. Obviously, when the weight is transferred from *t* to *o*, a *diminution* of solar attraction will take place in the inverse ratio of the square of the radii of the curves *f g* and *a b*; while the centrifugal force will be *increased* in the direct ratio of the radii of these curves. Calculation shows that the former is 0·0000865, and the latter 0·0000432. Allowing for the stated increase of centrifugal force, it will therefore be found that the solar attraction at *o* will be 0·0000432 less than at *t* or *n*. Consequently, by transferring the 20,000 pounds to *o*, the solar attraction of 11·786 pounds, exerted on this mass when placed at *t* and *n*, will be reduced 0·0000432 × 11·786=0·000509 pound. The previous demonstrations having established the fact that an increase of the sun's attraction of 0·001546 pound takes place during the transfer from *n* to *m*, it will be readily perceived that a difference of solar energy of 0·001546+0·000509= 0·002055 pound will result from the difference of attraction at *m* and *o*. In other words, the weight of the supposed mass of 20,000 pounds will be 0·002055 pound less at noon than at midnight. Agreeable to Mr. Slaughter's computation, the diminution of weight will be 24 pounds 1 ounce, thus upwards of 11,000 times greater than we have established by the foregoing demonstration. Those who do not feel disposed to investigate the subject closely may arrive at a correct conclusion, concerning terrestrial attraction, by simply considering that the gravitating energy is affected by only two appreciable disturbing causes, namely, solar attraction and the centrifugal force resulting from orbital motion; and that these opposing forces are very nearly balanced throughout the entire terrestrial mass, completely neutralizing each other at its center. Likewise that, at all points on the sphere tangential to the sun's rays, solar attraction is exactly balanced by the centrifugal force caused by the orbital motion, a fact practically established by the floating ball of the instrument before referred to. Let it also be remembered that the increase and diminution of the distance from the sun at noon and at midnight amounts to less than $\frac{1}{11000}$ of the earth's distance from the solar center. A moment's consideration, therefore, will show that the disturbing force which modifies terrestrial attraction must be exceedingly small. Again, if such a great disturbance of the earth's attraction existed as Mr. Slaughter supposes, the beat of the pendulum would be so irregular, from hour to hour, during the diurnal revolution, that the most perfect clock would prove a very imperfect device for measuring time. With reference to the proposed employment of heavy weights for ascertaining the variation of terrestrial attraction resulting from solar influence, it should be borne in mind that, by means of the pendulum in combination with the balance wheel of the chronometer, the amount of any appreciable irregularity of terrestrial attraction may be accurately measured. It will be remembered that the present Astronomer Royal of England, many years ago, computed the earth's density by ascertaining the variation of the beat of the pendulum at the mouth and at the bottom of the Harton coal pit, 1,200 feet deep. This depth being only $\frac{1}{17000}$ of the earth's radius, we can judge of the efficacy of the pendulum as a means of measuring terrestrial attraction.

J. ERICSSON.

The Duration of Brain Impressions and the Memory.

To the Editor of the Scientific American:

I have read, with interest, your article on the velocity of nervous impulses, in No. 7 of your current volume; and I am induced by it to ask you whether any experiments have been made to ascertain the length of time required to produce an impression on the mind which will be retained in the memory.

In a case wherein I defended a party indicted for assault with intent to murder, the proof showed that the prosecutor, on whom the assault was committed, was standing in a public road, talking to the father of the defendant about an alleged larceny of hogs, when the defendant approached him from behind, and struck him on the back of the head with the butt end of a gun, and he fell senseless from the blow. A fight ensued between the friends of the parties, in which a number of shots were fired; and after the fight was over, the prosecutor was carried into a yard near by and resuscitated, regaining consciousness in about thirty minutes after receiving the blow. He testified most positively that he had not the slightest recollection of receiving the blow. He recollected and detailed the conversation between himself and defendant's father up to the moment the blow was struck, and also what occurred and what was said when he regained consciousness, as stated by a number of other persons who witnessed the occurrence; but of the blow itself, how, when, and from whom it was received, not the slightest impression had been made on his mind. Except the surface bruising on the back of the head, which lasted a few days only, no bad effects were experienced from the blow, and his mind and memory are unimpaired.

A similar result was observed, during the late war, in persons stunned by the explosion of shells. A gentleman now in this city, who was an officer in the Confederate Army, was fighting in the ranks, at the battle of Murfreesboro', in Tennessee. Just as he was in the act of taking aim with his rifle, a shell struck his weapon and exploded. He fell senseless, blackened with powder, and apparently dead. He had been struck on the head and other parts of the body with fragments of the shell, and was dangerously wounded; but after an unconsciousness of several hours, he was discovered to be alive, and was cared for and recovered. His mind and memory are as clear as ever, and he is now a successful lawyer in full practice. He assures me that no impression of the explosion of the shell was made on his mind. He saw no flash, heard no sound; he recollects distinctly aiming his rifle to fire; but after that, there is a perfect blank in his memory until his resuscitation.

These instances appear to indicate that the nerves of sensation may be paralyzed in less time than is required to make an impression on the mind which memory will retain. What time is required to make such an impression? The flash and noise of the explosion of a shell immediately in front of a man in battle would excite the nerves of sight and hearing as violently as it is possible to excite them; and in the last instance stated, the light of the flash certainly reached the eye before the fragment struck the head. What caused the delay in stamping an impression of it on the memory, and how long must the vital organs remain intact to enable the mind to receive an impression through the senses?

It seems to me that these questions suggest a field for scientific inquiry, in which important results may be reached.

Montgomery, Ala. D. S. TROY.

Crude Petroleum in Steam Boilers.

To the Editor of the Scientific American:

Mr. I. M. Allen, President of the Hartford Steam Boiler Inspection and Insurance Company, says in his report: "In some parts of the country, crude petroleum has been found to keep boilers free from scale without injury to the iron; while in the same districts and in the immediate vicinity, boilers not using purifiers would have a scale from $\frac{1}{4}$ to $\frac{3}{4}$ inches thick." He continues: "We have a specimen of scale in this office nearly $1\frac{1}{4}$ inches thick, that was removed from a boiler in the West by crude petroleum. I am aware that there is a great prejudice against using anything of the kind in steam boilers, but earth oils are very different from animal oils. They are very volatile; and in an experience of several years, where hundreds of boilers have been treated with them, we have found no injury to plates or tubes, and the boilers have been kept free from scale." Further on in the report, he again says: "Feed water heaters are of great service in removing sediment, if they are of proper construction. But an open heater, using exhaust steam, with no appliance for preventing grease and sediment from entering the boiler, is not to be relied upon; and as I have already said, steam users should be careful, in selecting a heater, to get the best; we have experienced a vast amount of trouble with improperly constructed heaters. The subject of incrustation and scale is one that cannot be elaborately treated in a report like this" etc.

Now, what struck me as peculiarly significant in the above is the fact that the President of the above named company says that, during several years, they have known hundreds of boilers to be kept free from scale, etc., by the use of crude petroleum in the boilers, and that he should afterwards discourage the use of open heaters as being peculiarly fitted to let grease into the boilers. It would have been more consistent with his experience of the use of crude or rock oil, as a boiler cleaner, to recommend the use of open heaters, provided rock or crude oil is used as a lubricator; for it is only by the use of an open heater that crude or any other oil can be gotten into a boiler while it is in use; and a constant and unvarying supply must certainly be better than an occasional and perhaps not a sufficient one. My own experience, as a mechanic and user of engines and boilers, is that, where crude or rock oil is used as a lubricator for cylinders, there is no objection to the open heater; but on the contrary, it is beneficial to the boiler and a pretty sure preventive of scale or incrustation. I do not think, however, their use with animal oil is to be recommended; but with crude oil, properly prepared, there does not seem to be any objection at all, but, on the contrary, benefits.

In my own case I have used an oil prepared from petroleum, which is especially adapted for lubricating hot surfaces; and by its use, I have overcome the objection brought by Mr. Allen to the use of the open heater.

I hope that you will, as early as possible, clear away the confusion on this subject, and thus confer a great benefit on those whose business compels them to use steam boilers.

Detroit, Mich. ONE OF THEM.

A Sewing Machine Engine.

To the Editor of the Scientific American:

There is probably no field that presents more instances of simple and apparently perfect mechanical construction than that of steam enginery. I recently saw an extremely simple oscillating engine in one of the show windows of a sewing machine store. It consisted of scarcely more than a cylinder of about $2 \times 1\frac{1}{4}$ inches, clamped to one of the rear corners of an ordinary sewing machine table; the clamp serving also as a rest for the trunnions of the cylinder, the engine being connected by a belt to the upper pulley of the sewing machine. The oscillation of the cylinder caused the alternate admission and discharge of steam, the steam being supplied through a one quarter inch flexible tube. The boiler was about the size of an ordinary one gallon milk can, and could be placed in any convenient out-of-the-way place, in the room or out of it; the vertical tubes of the boiler were made of extremely thin brass, and braced within with a spiral wire.

I know nothing as to the success of this device; but it would be difficult, I think, to get up anything more simple for the purpose, in the line of steam engine manufacture.

Some cheap power, either steam, air, or something else for working the sewing machine for family use, is one of the great needs of the time; and inventors who have the subject in hand should bear in mind that, in order to succeed, their devices must be cheap, durable, and inexpensive to run. To ensure the first of these qualities, the device must be very simple; to ensure the second, it must receive the very best material and workmanship. F. G. W.

The Eucalyptus or Australian Blue Gum Tree.

To the Editor of the Scientific American:

I have just read an interesting article in the SCIENTIFIC AMERICAN of February 14, upon the Australian fever tree, or, as it is called here, the eucalyptus or Australian blue gum. In closing your article, you state that this tree, which is now attracting considerable attention to its medicinal and sanitary qualities, has been acclimated to the south of France, Algiers, Corsica, Cuba and Mexico, and suggest that it might be cultivated to advantage in the swamps of the Southern States. I thought it might not be uninteresting to you to know that this tree is already being extensively cultivated in California, where it was introduced over twelve years ago. Some of the trees that were set out in this city about that time are now 70 feet in hight and 20 inches in diameter. Probably 100,000 of these trees have been sold in this city and San Francisco this season; and not less than that number are already growing in and about this city, the tree being very popular on account of its quick growth and clean, lasting foliage, to say nothing of its sanitary qualities. I have raised from the seed and planted about 10,000 on a farm within two miles of Oakland during the past four years. The first were planted four years ago this spring; and when set out, were from 12 to 15 inches in hight. Some of these trees have already made a growth of 40 feet. The land is rolling foot hills, 300 feet above tide water; and the trees have passed through three unusually dry seasons and have had no attention except being plowed once each year and kept clear of weeds. Thus they seem to flourish equally as well as those planted in the low lands or marshes, better in fact than the latter. No tree here, excepting the Monterey cypress, indigenous to California, seems to stand the drought so well as the blue gum, which has made it a very popular ornamental tree. Upon my place I have some five or six varieties of the same tree, namely, the blue, red, white, iron bark and pepperetta. Of these, the blue gum is the quickest in growth and is the most extensively cultivated.

The seeds are first started in hot beds. After the plants are up an inch or two high, they are placed under slats to harden and prepare them for the hot sun when set out, which has to be carefully done, without removing the boll from the roots. The tree then makes a vigorous growth, frequently shooting up five or seven feet in the first year, the green stalk having the appearance of a rank weed. This appearance will continue for two years, when the tree not only begins to change the appearance of its body but also the shape of its leaves; the latter, which when young were very broad and blue, now begin to appear at the top of the tree, long, slim and of a very dark green, the tree thus carrying in appearance two distinctly marked leaves. I have sent you by express four different varieties of these leaves, which I hope will reach you in a state to explain more fully than I have done here.

The eucalyptus appears to stand a great deal of frost after a growth of two years. In fact our unusually cold weather here, this season, the ice being frequently frozen as thick as a dollar, does not seem to have affected the young trees in the least. The tree will undoubtedly flourish well in the Southern States; and after what is known of its sanitary qualities, it should be extensively cultivated. The seeds are very small, probably 5,000 to the ounce, and can be had of seedsmen in San Francisco.

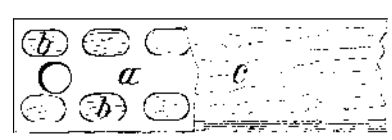
The eucalyptus is already being extensively planted in this State for lumber and fuel; for the latter purpose, it is superior to any timber we have here. As a shade tree, it is entirely free from insects. The leaves placed among clothing are a thorough protection from moths. J. G.

Oakland, Cal.

To Make a T Square.

To the Editor of the Scientific American:

Two years ago, a T square blade which possesses the advantages of both wood and steel was made; and though somewhat expensive, it is an excellent instrument.



In a piece of sheet steel, a, 36 inches long by $2\frac{1}{2}$ wide, and $\frac{3}{64}$ of an inch thick, holes b, $\frac{1}{2}$ by $\frac{3}{4}$, were punched as shown. These holes were filled by pieces of mahogany pressed in firmly with a vise, and then worked down even with the metal. Pieces of mahogany, c, the same size as the steel and $\frac{1}{8}$ thick, were then laid one on each side, and the whole glued together and clamped upon a planer table, where, after it was thoroughly dried, the edges were planed parallel without moving the blade. The wood covering was next reduced to $\frac{1}{32}$ of an inch in thickness, and the corners beveled.

New Britain, Conn. F. H. R.

Value of the Scientific American as an Advertising Medium.

To the Editor of the Scientific American:

I can fully endorse what a correspondent says on this head, in your issue of February 28. Ten years since, I made and sold a small article, which had its day and then passed, as I supposed, into oblivion. Last week, however, I received new orders for it. I am afraid now to advertise in your paper, lest, some quarter of a century hence, parties will demand service long after I am dead and forgotten.

EGBERT P. WATSON.

About Ourselves.

MESSRS. MUNN & CO:

Gentlemen: I take the earliest opportunity of returning you my most sincere thanks for the efficient and honorable manner in which you have conducted the business of obtaining for me a patent for my self car coupling. After employing, during the past five years, as many different agents and failing in each case, it was my good fortune to fall in with a gentleman who strongly advised me to go to you, assuring me that, if I did so and it were possible, a patent could be obtained through your agency. That he was not disappointed in his estimation of your ability, the receipt of my letters patent is sufficient proof; and I, therefore, cannot allow the opportunity to pass of making due acknowledgment of your straightforward and honorable course as patent agents, and I shall not fail to advise all my friends, seeking a like accommodation, to place their business unreservedly in your hands. As we receive the SCIENTIFIC AMERICAN here through the hands of news agents, I presume I shall see a notice of my invention among the notices of patents secured through your agency, which I find in the weekly issue of your valuable journal. THOS. R. LAND.

Grass Valley, Nevada county, Cal.

The Hartford Steam Boiler Inspection and Insurance Company.

The Hartford Steam Boiler Inspection and Insurance Company makes the following report of its inspections in the months of December, 1873:

The number of inspection visits made during this month was 1,156, and the number of boilers inspected, 2,318; of these, 771 received thorough internal inspection. The hydraulic test was applied in 132 cases. These were upright tubulars, or new boilers in the yards of the boiler makers. The whole number of defects discovered was 948—of which 262 were regarded as dangerous. These defects in detail were as follows:

Furnaces out of shape, 43—13 dangerous; fractures, 64—40 dangerous; burned plates, 54—24 dangerous; blistered plates, 174—34 dangerous; deposit of sediment, 138—15 dangerous; incrustation and scale, 120—19 dangerous; external corrosion, 76—17 dangerous; internal corrosion, 31—8 dangerous; internal grooving, 10—4 dangerous; water gages defective, 29—6 dangerous; blow-out defective, 28—11 dangerous; safety valves overloaded and defective, 19—8 dangerous; pressure gages defective, 137—25 dangerous, varying from —20 to +12. Boilers without gages, 66—5 dangerous; deficiency of water, 5—2 dangerous; braces and stays broken and dangerously loose, 67—26 dangerous; boilers condemned, 13. The comments which are made on these reports from month to month may appear to some readers a little stale. We know there is a striking similarity in them all; but when such facts as those above are enumerated, month after month, it shows that there is great need of frequent and careful examination of steam boilers. It must be born in mind that there are all kinds and types of boilers in use in the country, and that the average ability of attendants is very low. Defects which point directly to disaster are met with almost daily, and we believe many explosions of boilers have been prevented by the thorough examination which has discovered such defects as those in the above report. A cursory examination or a simple test will do little towards bringing such defects to light. The work must be thorough, and time enough must be taken. No specific rule can be laid down for making these examinations. Each case requires treatment in accordance with the circumstances connected with it: these are the type of boiler, pressure carried, character of bracing, quality of water, efficiency of attendant, etc., all of which have much to do with the question of preventing boiler explosions. Experiments on obsolete or special types of boilers will do little towards preventing the explosion of boilers in use, because the conditions under which boilers are used in manufactories are very different from those under which experimental boilers are used. Valuable information can be obtained on certain points by well directed experiments. Tests of safety valves are an important matter, and one that should receive special attention. It may, however, be a question whether the best way of making such tests would not be to subject them to actual use on boilers that were doing regular duty, day after day, for six months or a year. We believe in tests that are practical, and our experience goes to show that, especially in a question of such vital importance as that which seeks for its solution the prevention of boiler explosions, too great care and too much time cannot be taken. A great many worthless boiler appliances have been palmed off upon steam users, the only proof of their efficiency being that they had worked well under some experimental test. But when subjected to the conditions of constant use, they have proved utterly worthless.

During the months of November, December, and January, there were 37 boiler explosions in this country; 14 of these were in saw mills and planing mills—7 were railroad locomotives. In one instance, a boiler exploded while being tested by steam. We have never known of but one other instance of testing boilers by steam. This was done by the boiler maker himself, and he was killed, with two others who were assisting him. We think in both cases there was lamentable ignorance. The parties had doubtless read or heard of testing boilers by the expansion of water by heat. It will be readily seen that testing boilers by steam pressure is about as suicidal as to be suspended by a rope around one's neck to test his ability to withstand hanging.

Improved Compound Marine Engines.

The principle of the "compound" steam engine, from which so much good and economical work has of late years been obtained, is that it has both a high and a low pressure cylinder or cylinders, and that the steam which has done duty in the former is made to do duty also in the latter, before it is suffered to escape. The compound engine was first patented by Arthur Woolf, in the year 1804; and he placed the two cylinders in a vertical line, one above the other, and worked them by a single crank. Since that time a great many experiments have been made in relation to the subject, and almost every conceivable combination of cranks and cylinders has been tried; but the accepted type at present is the two cylinder engine, with the cylinders either vertical or side by side. Messrs. Lamport and Holt employ the former construction, with a single crank, and thus return almost precisely to the principles laid down by Woolf, seventy years ago. It now appears that, if his invention had been earlier appreciated at its true value, many millions of tuns of fuel and many hundreds of thousands of pounds sterling would have been saved. The present price of fuel is so high, and its unnecessary consumption is so much to be condemned, on account of the influence which the coal supply exerts over the cost of iron and of many other commodities, that shipowners will often find it necessary to make quickness of passage subordinate to other considerations, and will be forced to inquire how they may safely convey the largest cargoes from port to port at the best paying speed, and with the least expenditure of coal and stores, rather than how they may attain the highest speed without reference to its cost.—*Iron.*

Mr. A. Augustus Adee, United States *Chargé d'Affaires* in Spain, is a native of New York. He speaks and writes the French, Spanish, and German languages, and has superior qualifications for the position he holds. He has been in the diplomatic service for five years, and was for three years Secretary of Legation at Madrid. We have had occasion to require Mr. Adee's services a number of times since his residence in Spain, and we can personally testify to his superior ability in the administration of the office he holds under our government. But few of our representatives abroad fulfil their mission as acceptably to their countrymen as Mr. Adee.