

Lunar Caustic for Purifying Spirits.

Although some sorts of spirits are associated in our minds with lunatics, and others with "moon-shiners," the subject of which we are about to speak is of a quite different nature, being at once scientific and practical.

Berlien has discovered the fact that raw spirits can be purified by treatment with a solution of nitrate of silver and subsequent rectification. From two to two and a half parts of dry nitrate of silver are sufficient for one million parts of crude spirits, a ten per cent water solution being employed. The odor is entirely removed from the worst quality of crude spirits by this infinitesimal amount of silver; a good quality of raw spirits requires correspondingly less, and a one per cent or a one-hundredth per cent solution of silver is then employed.

IMPROVED STEAM BOILER.

The boiler shown in the annexed engraving is intended to accomplish three very important results: First, the rapid generation of steam by a complete exposure of the water to the action of the fire; second, to superheat the steam by forcing it into contact with the smoke flues through narrow openings; and third, to prevent the destruction of the upper ends of the flues by cooling them with the moisture carried up by the steam.

To accomplish the first result a series of flues are arranged in clusters in the fire box, as clearly shown in the engraving. These clusters, generally composed of nine tubes each, are each joined to a single tube passing through the crown sheet. By this arrangement a great extent of water surface may be exposed to the heat without obstructing the smoke flues or taking up a great deal of the crown sheet surface. A circulation is maintained through a tube connecting the lower end of the cluster with the water-leg of the boiler.

It will be noticed that near the upper head of the boiler there is a horizontal partition dividing the steam room of the boiler into two portions, the upper portion being the reservoir for dry steam. The apertures through the horizontal partition are a little larger than the flues, so that the steam in passing to the upper compartment of the boiler is brought into close contact with the flues and superheated. This not only relieves the steam of all superfluous moisture, but it tends to preserve the flues by preventing overheating.

This boiler presents a large and efficient heating surface, and it has, without much additional cost, a superheater which will always supply dry steam.

Between the horizontal partition and the tube sheet a ring of L-shaped cross section is attached to the inner surface of the boiler shell, forming a receptacle for mud and other impurities in the water, which are carried upward by the natural circulation of the water, and which, in boilers of ordinary construction, find their way to the water-leg, impeding the generation of steam and working destruction to the boiler.

The inventor informs us that he can generate 100 lb. steam pressure in five minutes with this boiler, and that it will rapidly and economically generate steam for continuous work. The boiler is especially adapted to steam fire engines and other forms of portable engines where both compactness and great power are required. These boilers are made by the La France Fire Engine Company, of Elmira, N. Y., who should be addressed for further information.

Tree Culture on Waste Land.

Hitherto the abundance of natural timber in this country has made it easy to dispense with timber culture, and for the most part our land owners have taken little interest in such slow-growing crops. This state of things, however, is rapidly passing away. The demand for special woods for manufacturing purposes is steadily and rapidly increasing, while the natural supply is diminishing and must ultimately become quite inadequate. Meantime there are millions of acres of land suitable for timber culture and for nothing else, except poor pasturage that our land owners are allowing to lie waste and idle for lack of a little forethought, and too frequently our would-be thrifty farmers will risk their surplus means in wild-cat speculations, promising but never yielding large and speedy returns, when the same money spent in planting timber would soon convert their worthless swamps and stony places into valuable properties.

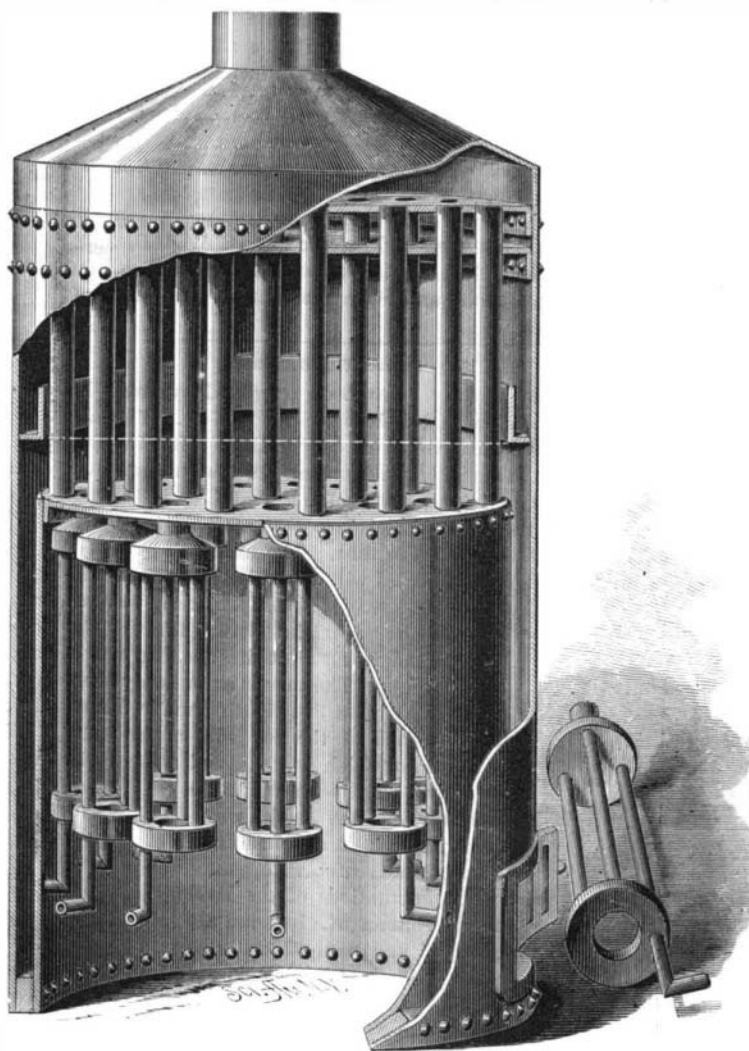
A correspondent, writing from Wisconsin, tells of a piece of land that was planted with walnut twenty-three years ago. The land was flooded every spring and summer, and was unfit for any ordinary cultivation. The trees are now from sixteen to twenty inches through, and have been sold for \$27,000. No particulars are given as to the cost of planting the grove or the amount of attention it has had during the years of growth. There can be little doubt, however, that the investment was small in comparison with the return, and the land would otherwise have remained entirely unproductive. To the country the timber crop was so much clear gain. It is clear that our national resources

might be enormously increased by a similar utilization by timber culture of lands which are now left unused and unproductive; and the planters would find their groves a surer investment for the security of their family possessions than any savings bank deposit.

Photozincotypes.

In Moll's *Notizen*, Herr J. Husnik writes as follows on photozincotypes with a sensitive asphalt solution:

We have at last reached the point of a more intimate knowledge of asphalt, and have thereby obtained a correct explanation of many of its properties hitherto kept secret.* It appears that by treating this substance with ether certain less sensitive components are removed, so that a residue "insoluble in ether" is left, which possesses in a considerably higher degree that sensitiveness to light so much desired in order to render the asphalt process practically useful. The way in which asphalt manifests its sensitiveness to light consists in becoming insoluble, or difficult of solution in its usual solvents, after exposure. Thus, a zinc plate, coated with an asphalt solution, which has been exposed for some time under a linear negative, may be developed by spirit of turpentine, so that all the whites dissolve while the lighted parts remain undissolved. And if, after fully developing, the zinc plate be washed first with spirit and then with water, and now allowed to become perfectly dry, the operation of etching may at once be begun;



LA FRANCE'S PATENT STEAM FIRE ENGINE BOILER.

but, as such a plate had formerly to be exposed for hours in the sun, and for days—in winter even for weeks—in the shade, in order to get a good picture which could be developed with turpentine, it was not possible to turn the process to practical account. Gillot, Yves, and Barret, and other firms in Paris have, however, employed the asphalt process for years, but the secret of the greater sensitiveness of their solution was never known.

In Switzerland and America also one often heard of the asphalt process being employed for zincography, and, as already mentioned, the veil has now been torn from the secret. We know at last that progress in this process is to be sought in the direction of elimination from the solution of the insensitive particles.

Such a sensitive solution can, when requisite, be diluted with a little anhydrous benzole (not benzine, in which asphalt is insoluble). Benzole which contains a little water cannot be used either, as in drying it would cause the asphalt solution to wrinkle up and would not furnish an equal surface.

The solution must be kept perfectly free from dust. Before being coated the zinc plate should be carefully dusted, and any excess of the coating solution should be poured off into another vessel, and not back into the stock bottle until it has stood to settle for a couple of days, after which the upper part may be poured back. When the film has become dry it may be slightly warmed and then exposed under a clear line negative—preferably in the sun, as then only half an hour of an exposure is required. The plate is now laid in a bath containing oil of turpentine, and when the image has become visible the denser portions may be

* Dr. Kayser's examination of the properties of asphalt.

gone over with a small soft pencil, so that they may be developed at the same time as the lights.

When the shadows appear sufficiently clear, remove the plate and coat it with alcohol or place it in a bath containing alcohol, and when the oil of turpentine has been partially washed out, place it under a jet of water falling from a certain height, so that the water may come in contact with the whites and remove any oil of turpentine that might still be adhering to them.

The development is an operation requiring great care and rapidity of work, which can only be learned by practice. The plate, being well developed, is next warmed, and when it has cooled again the next stage is the etching. Should the shadows, however, not be deep enough, they should be gone over with a pencil dipped in oil of turpentine, and when that has been allowed to act for a short time the whole plate should again be washed in the above mentioned turpentine bath, and the procedure with the alcohol bath and the water tap repeated. This plan gives sharp pictures, and may be used with advantage for much reduced reproductions of woodcuts.

ENGINEERING INVENTIONS.

An improved scow, from which the load can be dumped conveniently and rapidly, has been patented by Mr. John R. Knuth, of New York city.

Messrs. William H. Burden and Frederick C. Burden, of Cleveland, Ohio, have invented an improved car axle journal oiler which is simple and effective. It consists of two conical wheels connected by a square shaft, and pressed against the journal by a spring contained in the journal box. An endless chain is suspended from the shaft and extends into the oil in the journal box.

Mr. John U. Mueller, of Detroit, Mich., has patented an improved jetty shutter. The invention consists of one or more rows of piles, driven some distance apart somewhat back from the line of breakers and on the line of the intended improvement, said piles being securely connected some distance above water level with longitudinal beams, and further stiffened and secured by braces and ties, while fastened to the inner longitudinal beams are the shutters, which are intended to form a settling basin for the mud, sand, clay, gravel, etc., driven by the waves toward the shore.

Messrs. William P. Woodruff and Charles H. Woodruff, of New York city, have patented an improved elastic packing for piston rods and other rods that slide through stuffing boxes. It is so constructed as to retain its elasticity when pressed down by the gland. It is formed of a central core of metallic turnings, surrounded by a layer of cloth and alternate layers of anti-friction metal and brass in the form of narrow strips wound spirally upon the cloth-covered core, and in the combination, with such packing rings, of an anti-friction metal seat, having a large ring groove in its upper side and two or more small concentric ring grooves in its lower side.

Mr. Eugene H. Angamar, of New Orleans, La., has patented a boiler adapted for application to horse cars now in use, so as to utilize such horse cars without material changes. The invention consists in a boiler made in two portions, separated by a mediate chamber, the water and steam spaces of the parts being connected by pipes.

Astronomical Items.

A writer in the *Providence Journal* says: If the planet Neptune was discovered or supposed to exist on account of certain perturbations in the movements of Uranus, and if the erratic movements of Mercury reveal the presence of planets within his orbit, why should not the near approach of Jupiter to the sun stir up a commotion in his fiery elements? The sun is still diversified with spots, and the planet is near enough to perihelion to make his influence felt. Astronomers have been wise prophets thus far as to the influence of the commencement of the sun-spot cycle. Tornadoes and cyclones of extreme severity have borne witness to abnormal conditions of the atmosphere, and a wave of intense heat, such as has not occurred for a quarter of a century at this season of the year, has confirmed the exactness of previous observations. We must still expect the usual storms, waves of heat, and auroral displays that follow the maximum of sun spots; we have yet to learn whether the coincident perihelia of the four great planets will increase and prolong the elemental warfare. This is one of the most interesting problems of the day, as well as one of the most practical and important. It will not meet with a hasty solution, for the period of observation extends to the year 1885.

The June moon falls on the 22d. The morning sky of the 2d will show a lovely picture of the waning crescent of the old moon, near to the brilliant Jupiter and his less distinguished rival Saturn. On the 6th, one day before her change, she will be near Venus.

The new moon of the 7th will be near Mercury on the 8th, Mars on the 11th, and Uranus on the 14th; and the waning moon on the 30th will again pay her respects to Jupiter. On the 22d there will be a total eclipse of the moon, which will be invisible in this portion of the globe, but will be partly visible in the Western part of the United States, and entirely visible in the Pacific Ocean.

Correspondence.

What is the Temperature of the Sun?

To the Editor of the Scientific American:

The voltaic arc affords a very ready means of comparison. The intensity of light in a good arc is fully equal to that of the sun. Therefore, the temperature of the sun is not greater than that of the arc.

The temperature of the arc is not greater than 60,000° Fahr. Therefore, the temperature of the sun is not in excess of 60,000°; and those who have estimated into the millions have gone very wide of the mark. Rossetti's estimate of 20,000°, and Spoerer's of 27,000°, are nearer the point.

The light, and consequently the heat, condition of the sun can be very closely imitated in the incandescent electric light, whose temperature can be closely calculated. The voltaic arc emits light by reason of the incandescence of minute particles of carbon passing between the electrodes. In the incandescent light, so-called, the carbon is a solid mass. The dissociated particles of carbon in the arc are much more highly heated than the particles of the solid incandescent pencil, but the latter is homogeneous, and therefore more like the sun. To bring a carbon pencil to that point of incandescence at which it acquires the intense limpid appearance of the sun, no longer seeming an opaque mass but seeming transparent, it is necessary that the pencil should be heated above 12,000°. It is a veritable miniature sun, so far as the heat condition is concerned. Under no circumstances can its temperature exceed 50,000°, and the pencil even temporarily remain a solid; and even at the lower temperature volatilization occurs. Therefore, the temperature of the sun is not less than 12,000°, nor more than 50,000° Fahr.

There is another way of arriving at the result:

The diameter of the sun is said to be 800,000 miles. The earth is said to be 95,000,000 miles distant from the sun. The diameter of the earth's orbit is therefore 95,000,000 + 800,000 + 95,000,000 miles, or roughly, 190,000,000 miles. The heating surface of the sun is represented by a sphere 800,000 miles in diameter, and if we imagine the diameter of the earth's orbit to be that of a hollow sphere surrounding the sun (its inner surface situated 95,000,000 miles from the source of heat), we can approximate very nearly the difference in the degree of heat where we are and at its source. As the diameter of the sun is contained in the diameter of the earth's orbit 237.5 times—as the heat of the entire surface of the sun is distributed over a space (the space of the surface of an imaginary hollow sphere having a diameter equal to that of the earth's orbit) 237.5 times the surface of the sun—it follows that the heat of the sun at the sun's surface must be 237.5 times as great as it is at the earth's surface; and if we assume a mean of 100° at the earth, the temperature of the sun must be 23,750°, no more nor less, and this corresponds very nearly with what I have observed in electric temperatures. W. E. SAWYER.

New York, June 5, 1880.

[NOTE.—Recent comparative photometric experiments between the light of the sun and the light of the electric arc show that the latter has a yellow tinge, the sunlight a purplish hue. This would afford ground for the inference of a higher temperature for the sun than that yielded by the electric arc.—EDS. SCI. AM.]

On a New System of Photography.*

BY L. WARNERKE.

When experimenting with various phosphorescent substances it occurred to me to apply it to photography, and the following are the results obtained up to the present moment:

I prepare a phosphorescent plate, either rigid or flexible, by applying phosphorescent sulphide of calcium, either in the form of paint or powder, to the surface of glass or paper. The coating must be very smooth and uniform. Several substances can be used to cement the powder. Balmain's paint answers fairly well, but I suggest that albumen may be found more suitable, because it forms, when mixed with phosphorescent calcium, a coagulum which protects the phosphorescent material from the destructive action of the atmosphere (carbonic acid and moisture) more effectually than anything else.

A glass may be coated with collodion and a luminous surface formed on it. The film may be stripped off, and this will be found to be the best process by which to produce a smooth plate.

The plate so prepared, and previously kept in the dark, is inserted in the dark slide and exposed in the camera. After exposure it is removed to the dark room and put in contact with a sensitive collodion or gelatine dry plate. After suitable exposure by contact the sensitive plate can be developed and gives, as the result, a negative with perfect gradation, but reversed.

Theoretically, instantaneous exposure in the camera should be sufficient to give the requisite impression to the

* A communication to the Photographic Society of Great Britain.

phosphorescent surface; and, if this surface could be produced sufficiently fine and smooth, it would be so practically. However, a few seconds' exposure with bright light is sufficient to render the luminous image easily discernible in the dark.

There is, besides this, the means of allowing a great range of exposure in the camera; since if the luminous image be not strong enough, prolonged exposure of the sensitive plate in contact with it will correct the shortcoming. By warming the plate bearing the luminous image the luminosity will instantly be increased, and there will be a corresponding effect on the sensitive plate.

The luminous impression, as shown in my previous paper on actinometers, is persistent, and this allows several negatives to be obtained from one luminous plate. By this means it is observed that contact printing is unsatisfactory for want of, or by too much, exposure; it can easily be remedied without the necessity of giving another exposure in the camera.

There is, however, a certain particularity which must be taken into consideration—the luminous image is not sharp. I repeated my experiments in regard to this fifteen times, and I came to the conclusion that the phosphoro chemical focus is far away from the corrected focus of our lenses.

When once impressed the plate will remain luminous for many hours; but the luminosity can be extinguished by exposing it again to the light filtered through certain colored transparent media. Respecting this I may remark that the most suitable extinguishing substance can only be found by actual experiment. I had several sorts of red and ruby glass, and only two of them acted as an extinguisher, but required an exposure of ten minutes to the sun's rays.

I found a green aniline color dissolved in collodion or gelatine more serviceable. The exposure of two minutes to diffused daylight was sufficient to complete the extinction. Strange enough, I have green glass of exactly the same green color, but it does not act as an extinguisher.

I may mention here that by exposing the phosphorescent plate behind a negative a negative luminous image is obtained, which can produce a positive on the collodion sensitive plate put in contact with it, and in this case it will be quite sharp.

If the phosphorescent plate be exposed to the light, and then put in contact with a negative covered with an extinguishing medium, and again exposed to the light, the opposite result to that previously described will be observed.

By using a phosphorescent plate it is possible to obtain a photograph of the red end of the spectrum. To do this the plate is exposed entirely to the light; and when the spectrum is projected on it the rays of low refrangibility will extinguish the excited luminosity of the plate, leaving the lines of the spectrum luminous. This is printed on the gelatine or collodion plate.

The negative passed round for inspection was made under the following conditions: The phosphorescent plate was exposed in the camera for one minute, using a rapid rectilinear lens. The light was of medium quality. A gelatine plate was put in contact with the luminous image for five minutes.

AMERICAN INDUSTRIES.

[Continued from first page.]

establishment, and conveys a good idea of the activity prevalent here. The experimental work is carried on in the laboratory, which is fitted with all of the modern appliances for making electrical tests, and with a full line of chemical and physical apparatus. The machine work is all done in a machine shop covering an area of 80 x 120 feet, well stocked with machinery from the shops of the best makers in this country.

The wire used in winding the armatures and magnets is all covered by a simple machine shown in one of the views in our engraving. The same view represents the machines on which the armatures are wound. The machines and lamps are all thoroughly tested before being shipped.

The carbon rods used in the Weston lamp are all made here, the company having determined by careful tests that their own carbons are better than the French. The operation of making the carbons is very simple; the retort carbon, being ground to an impalpable powder, is mixed with a moistening liquid and forced by hydraulic pressure through a die, which gives them their cylindrical form; they are then baked for a number of hours at a high temperature, and after cooling are inspected and pointed for use.

The manufacture of electric lighting apparatus is now one of our leading industries, and it is likely to expand as the advantages of this system of illumination become better known.

The new works of the Weston Electric Light Company are located at 23 to 29 Plane street, Newark, N. J., and their New York offices are located at 92 and 94 Liberty street.

MISCELLANEOUS INVENTIONS.

Messrs. Lewis H. Raymond, of New York city, and John Roberts, of Dunellen, N. J., have patented a life raft made with sides of equal height below and above the floor, and having independent cylindrical air chambers fastened thereto between the seats above and below the floor, and also having air chambers, made in compartments, formed between the sides at both ends of the raft. The gunwale on the top and bottom of the sides and thwarts is held and braced by means of braces connecting the gunwale and the thwarts.

Mr. Christian J. B. Hirsch, of Zumbrota, Minn., has patented an improved pipe stem. The object of this invention is to furnish a short pipe stem which shall have the effect of a long one, cooling the smoke and allowing the nicotine to condense from the smoke.

An improved hanging lamp, patented by Mr. Otto F. Eichberg, of New York city, consists in combining with a cup perforated at the top, and forming an extension of the tube, an adjustable extension having an interior depending flange and exterior absorbent.

Mr. John S. Birch, of Orange, N. J., has patented a novel key ring, so constructed that keys and other articles can be conveniently placed upon and removed from it, and which will not be liable to become opened accidentally. The invention consists in constructing the key ring of a strip of metal bent into V form, with rounded angle, having its end parts bent inward and outward to form shoulders, having one of its ends longer than the other and bent into U form, and having a lug upon one end and a recess in the other end.

Mr. Augustus J. Kuhn, of Lewistown, Pa., has patented an improved drying apparatus, intended more particularly for drying sand, which, by its peculiar nature, is difficult to dry and inconvenient to handle; but this improved machine may be used to advantage in drying any material that will run through the machine. The principal objects of the invention are, first, to permit the use of exhaust steam for producing the drying heat; second, to save handling of the material from the time it is placed in a wet condition in the machine to its delivery in a dry condition; and, third, to permit the regulation of the feed and delivery according to the heat and condition of the material and to prevent clogging of the feed.

Mr. Jesse M. Harr, of Baltimore, Md., has patented improvements in that class of skylights which are made strongly and studded with thick glass disks and placed in the sidewalk for the purpose of illuminating the dark recesses of a cellar or vault without allowing the entrance of rain and without breaking up the continuity of surface or weakening the pavement at such points.

Mr. John F. Henderson, of Franklin, Ky., has patented an improved coffee pot designed to more thoroughly extract the strength of the coffee and without boiling. A pendant cylindrical water receptacle is placed in the top of the pot, and is provided with a straining sack below, in which is contained the ground coffee.

In preserving fruit, vegetables, and meats by what is known as the "refrigerating" process, a current of air of reduced temperature is, in many instances, forced into and through the chamber or receptacle containing the substances to be preserved. In other cases the air is drawn from a well or through a tube passing through a collar, the current being established and maintained by the rarefaction of the air in the preserving chamber. Mr. Louis G. Volkmar, of New York city, has patented a portable apparatus for use in drying fruit, etc., by means of a cold air current, which is conducted through a tube that traverses an ice box, and is so arranged therein that ice may be packed around and in contact with it.

Mr. Charles E. Wallin, of Salt Lake City, Utah Terr., has patented a horse cover or blanket which affords greater protection than the ordinary blanket to the breast and other parts of the body, also be more comfortable to the animal by allowing greater freedom of movement, yet less liable to rip or tear or become displaced when the animal lies down or gets up. These results are attained by the provision of a detachable breast piece, elastic straps, a pad, and gussets or gores attached to the body of the cover.

Mr. James R. Barry, of Yonkers, N. Y., has patented a novel top, so constructed as to contain the cord when not in use.

An efficient and powerful implement for raising stumps, roots, rocks, and other objects, has been patented by Mr. William H. Wright, of Belmont, N. H. The invention consists of a vertical U-shaped frame in which moves a ratchet bar, the frame being provided with a lever for lifting the ratchet bar, a latch for retaining the bar at the point to which it is lifted by the lever, and springs for throwing the latch in and out of engagement with the ratchet bar.

Mr. Leroy Brown, of Waitsburg, Washington Territory, has patented an improved sulky plow which is so constructed that it may be readily adjusted and controlled by the driver. It is simple in construction, strong, and durable.

Mr. Thomas Bickerton, of Lawrence, Kan., has patented a hand corn planter with a drop slide which will accurately drop the corn. The end plates are shaped so as to prevent dirt from getting between them when thrust into the ground.

Mr. William Lay, of Seneca City, S. C., has patented a cheap, simple, and powerful water motor for running machinery or performing other work. It can be operated with a small quantity and with but slight fall of water.

New York Elevated Railway Cars and Engines.

The total number of engines now running is 167, divided as follows: Second avenue line, 29; Third avenue line, 68; Sixth avenue line, 46; Ninth avenue line, 24. The cars as follows: Second avenue, 66; Third avenue, 221; Sixth avenue, 152; Ninth avenue, 49. Total, 488. The combined mileage of the Eastern Division is about 269,400 miles; of the Western Division, about 146,000. Total mileage per month, 515,400 miles. These engines make two and a half stops to the mile, making an average of over one million train stops a month.