

Summary.—The following are essential requisites to the successful use, safety, and convenience of apparatus for naphthalizing of gas or air for illuminating or for heating purposes:

First. The apparatus should be substantial, not liable to derangement, simple in construction, requiring no special skill in its management, easily taken apart, readily put together again, and uniform in its action.

Second. It should present the largest possible surface for evaporation for its bulk or cubic contents, and be safe or doubly safe against any possible accident from leakage of gas or naphthaline, with facilities for charging it readily, without risk of escape of fluid or vapor, and by the least possible trouble.

Third. Its construction should be such that the pressure of the medium entering the apparatus should not be diminished at the outlet pipe, so that the size of flame will always be the same, irrespective of the number of lights used within the capacity of the instrument.

Fourth. It should be provided with a surrounding air chamber of a non-conducting medium to avoid the accumulating of intense cold on the exterior of the apparatus, insuring a depressed temperature to the vaporized medium below that to be assumed by the gas or mixture after entering the service pipes.

Fifth. The fluid should leave no residue or deposit when evaporated.

Sixth. Its cost to consumers should be within the reach of persons of moderate means.

The time has arrived when this important category of economic art should take its proper rank of usefulness and value in popular domestic comfort and economy, and also those branches of trade where in heating with gas it must be found indispensable.

J. BURROWS HYDE.

#### Carpenters Poisoned by Chemicalized Wood.

MESSRS. EDITORS:—The St. Louis, Vandalia & Terre-Haute Railroad Co. have just finished building a freight depot in this city, the timbers—shingles included—of about half the building were saturated with a poisonous compound—arsenic, corrosive sublimate, and salt. If anything else, I do not know.

Inclosed is a slip of newspaper containing an account of the death of one of the carpenters employed on the building: "Levi Willison, one of the men poisoned sometime since by working on the timbers and shingles of the Vandalia depot building, which had been saturated with some chemical preparation to render them non-combustible, died yesterday. No inquest was held. Another workman, whose name we could not ascertain, is not expected to recover."

Nearly all the carpenters were in a condition similar to the patients that are to be seen in a venereal hospital. The genital parts were most affected. Perhaps the poison would not affect them so if the work was done in cold weather. The timber so prepared will only smoulder away when put in a fire—no blaze.

I consider the inventor anything but a public benefactor unless he can invent some means to save the workmen. The harm outweighs the good.

JOHN O'CONNELL.

East St. Louis, Ill.

[We wish our correspondent would ascertain and inform us whose process was employed in the preparation of this timber.—EDS.]

#### Mississippi State Fair.

MESSRS. EDITORS:—You were kind enough to announce in June that our State Fair would be held Oct. 10th. The time was soon after changed to Oct. 24th, so as not to conflict with the St. Louis and Memphis fairs, from which points we expect many visitors.

The Mississippi State Fair will open at Jackson on Monday, Oct. 24th, and will continue to include the Saturday following. Machinery can be entered and placed in position after Oct. 15th. We are well prepared for a grand exhibition of the industry of our State, and there will be thousands of planters here to note what is new and useful in the way of agricultural implements, machinery, etc.

We are pleased to know that the SCIENTIFIC AMERICAN will be represented by Prof. Colton, from whom we have had the pleasure of a call.

I. L. POWER.

Jackson, Miss.

#### FORTIFICATIONS AND HISTORY OF STRASBOURG.

This city, the capital, in old times, of the half German province of Alsace, and now the capital of the department of the Lower Rhine, boasts its five hundred cannon and its eighty-two thousand inhabitants, and is one of the strongest fortresses in France. It stands on the Ill, about a mile and a half from the broad Rhine, and the stream beside which it is built intersects it with many channels.

Louis the Fourteenth, in 1681, always unscrupulous in his ambition, got possession of Strasbourg, which was then a free imperial town, by an unexpected foray upon it during a time of peace. It was the ambition of France, even then, to extend her Rhenish frontier and push Germany further back. Vauban instantly set to work to secure the conquest by strengthening what was weak, and increasing what was already strong. He built a pentagonal fortress or citadel of five bastions, besides five sluice houses, whose outer works extend to the arm of the Rhine. He gave this stronghold—which will hold seventeen hundred and fifty men—the motto, "Servat et observat." He also constructed large sluices at the spot where the Ill enters the town, so as to lay the whole country round, between the Rhine and the Ill, under water, in case of need. On the side of the Porte-des-Mines, which

could not be inundated, the glacis was mined. The arsenal contains—or did before the present war—arms and equipments for nearly four hundred thousand men, and it has also nine hundred and fifty-two cannon, including the five hundred and fifty required for the ramparts and for the citadel. To all these resources of the semi-German town, facing the Duchy of Baden, we must add a cannon foundry, which, every year, produces three hundred pieces of artillery of various calibers, and boasts one furnace that will contain twenty-six thousand four hundred kilogrammes. The town, as a military center, also possesses eight barracks, sufficient for the accommodation of ten thousand men, a military hospital, built for twelve or eighteen hundred beds, and used, since 1814, as a military hospital school. The stronghold is also the seat of a regimental school of artillery, under the command of a general. It is impossible for the traveller to forget, when in Strasbourg, that the town is an important fortress, for all the seven gates are shut in the winter at eight, and in summer at ten o'clock, though diligences are allowed to enter later, as well as travellers by post or steamboat.

The greatest modern event that has taken place at Strasbourg was the wild attempt at an insurrection made in that city by a certain Prince Louis Bonaparte—a man not yet altogether forgotten—on the 30th of October, 1836, the year Charles the Tenth died. The misguided prince, son of Louis, the ex-King of Holland, had been educated in Switzerland, and was a captain of artillery in the army of that country. Having entered into a treasonable correspondence with Col. Vaudry, of the Strasbourg garrison, who gained over a few of the men, and filled the adventurer's mind with too sanguine hopes, the prince came to Strasbourg to fire the train and try for the throne. On the morning of the 30th of October, the prince, dressed as like his uncle as possible, and wearing decorations and a cordonrouge, proceeded to the barracks. The zealous colonel, assembling his men instantly, told them, with great alacrity in lying, that there had been a revolution in Paris; that Louis Philippe was no more; lastly, that Napoleon the Second, a descendant of the "great man," had been proclaimed; and that there, in fact (pushing forward the prince), he stood before them. The coup de théâtre succeeded for the moment. The soldiers, pleased at the remarkable attention paid to them by the new emperor, shouted and followed him as their commander. The prefect was arrested in his bed, and a guard was placed over him. A body of the mutineers, led by a Colonel Pargin, then marched to the house of General Voirot, the commander of the division, and requested his allegiance to the new chief. The general, however, calmly addressing the soldiers, soon convinced them that they had been tricked. The general, being then set at liberty, at once secured the citadel.

In the mean time, the emperor of an hour and his zealous colonel had proceeded to the barracks of the Forty-Sixth Regiment, and tried the old plan. But an aide-de-camp of General Voirot gave notice to the colonel of the regiment, who, going to the barracks, found the prince and his plotters reasoning with the soldiers, and trying to gain them over. The colonel was prompt; he at once closed the gates, and trapped the whole party. General Voirot then, having released the prefect, came down from the citadel, and carried the prince and his accomplices straight to prison. The minor conspirators were tried and punished, but the arch plotter, treated in a generous and somewhat contemptuous way by Louis Philippe, was packed off from L'Orient to the United States, on the 21st of November, in a French frigate. Singularly enough, a similar attempt was made at Vendôme on the very same day by an hussar sergeant, who wished to proclaim the rights of man, arm the pioneers, and march on Tours. He shot a brigadier who tried to arrest him, and then gave himself up. He was condemned to death.

The choicest promenades of Strasbourg are beyond the enceinte. The two finest are called the Contades and the Robert-sau. The latter is composed of huge lawns, intersected by walks designed by Le Notre, Louis the Fourteenth's great gardener, of a splendid orangery (twelve hundred trees), where the Empress Josephine lodged in 1806 and 1809, of an English garden, a suspension bridge that leads to the Isle of Wacken, and of a smiling and coquettish village.

The two great celebrities of Strasbourg, besides the immortal but unknown discoverer of the pâté, are Kleber, Napoleon's general, and Guttenberg, the supposed discoverer of printing. A monument to Kleber stands in the center of the square named after him, and is raised over the hero's body, originally interred in the minster. This brave man, who, after many victories in Egypt, was assassinated by an Arab fanatic under a tree still shown in a garden at Cairo, was much esteemed by Napoleon. "Kleber sometimes sleeps," he said; "but when he awakes it is the awaking of the lion." There was a little of the German unreadiness and phlegm about this brave Alsatian until battle roused him. He was never seen at his best but when under fire.

Guttenberg, who practiced printing as early as 1436, at Strasbourg, perfected his invention at Mayence. His assistant, Peter Schöffer, who made metal letters with even greater success than his master, was a native of Strasbourg. The statue of Guttenberg in the herb market, now called the Place Guttenberg, was modeled by David.

But the wonder and delight of Strasbourg is the cathedral—one of the masterpieces of Gothic architecture. Founded by Clovis, in 510, reconstructed by Pepin and Charlemagne destroyed by lightning in 1007, it was rebuilt in 1015 by Erwin de Steinbach, and finished in 1413 by Jean Hultz, of Cologne, after the tower had been four hundred and twenty-four years incomplete. According to tradition, ten thousand workmen toiled at the holy work for the good of their souls, "all for love, and nothing for reward."

An epitome of Gothic art, this cathedral contains specimens

of every style, from the Byzantine upwards. Heaven send it a safe deliverance from Prussian shot and shell; let the gunners aim wide of that noble, heaven-piercing spire, which, according to the best guide books, rises four hundred and sixty-eight feet above the pavement—that is twenty-four feet higher than the great Pyramid—and sixty-four feet higher than St. Paul's, the body of the church itself being higher than the towers of York Minster. The view from this network of stone repays the giddiest person. Beyond the dull red roofs, and the high-roofed and many-windowed houses, spreads the whole country of the Rhine and Black Forest, and on the side of France you see those Vosges Mountains, that might have been held against the world. Hope describes the netting of detached arcades and pillars over the west end of the cathedral to be like a veil of the finest cast iron, so sharp and bright is the carving of the durable stone; while Dr. Whewell, comparing the building to an edifice placed under a rich open casket of woven stone, laments the sacrifice of distinctness from the multiplicity and intersection of the lines. The triple portal is peculiarly fine, and is, in itself, a world of quaint statues, and bas-reliefs. The middle arch is adorned with no less than fourteen statues of the Old Testament prophets; on the right arch are the Ten Virgins, and on the left the Virgins treading under foot the Seven Capital Sins. In the Revolution these carvings were destroyed, and the great brass doors melted down into money, but they have been restored with a most reverential care. The choir is plain and simple Romanesque, but the nave is the choicest early decorated German Gothic. The town's special treasures are the fine stained windows of the Fourteenth Century, recently restored (spare them, gentle gunners), the vast marigold windows, and the famous astronomic clock, one of the wonders of Europe, comprising a perpetual calendar, a planetarium on the Copernican system, and shows the hour, the day of the week, the month of the year. It was made in 1571, and, after standing still for fifty-six years (a good rest), was repaired in 1842 by a mechanic of the town. This part of the cathedral is supported by a single pillar of great symmetry, and above the Gothic cornice appears the effigy of Erwin de Steinbach, the architect of this vast building, whose tombstone was discovered, in 1855, in a humble little court behind the chapel of St. John. In an old house at the southwest corner of the Minster Platz there are preserved some curious ancient architectural drawings belonging to the cathedral.

The church of St. Thomas (Protestant) deserves a visit for its fine monument of Marshal Saxe, which cost the sculptor, Pigalle, whom Louis the Fifteenth employed, twenty-five years' labor. It represents the old warrior descending to the grave. France, a female figure, tries in vain to deter him, and, at the same time, to repel Death. Theatrical, say the critics, and French, but the expression of affection and anxiety in the woman's face is very tender and touching. This monument would have been destroyed by the revolutionary iconoclasts, had not a Strasbourg man named Mangel-schott, when the church was turned into a straw warehouse, covered it up with bundles of hay. They also show in this church the mummies, curiously preserved, of a Count of Nassau Searwerden and his daughter.

The Jews of Strasbourg have now a splendid synagogue. In the middle ages they went through much here. In 1348 there was a wholesale holocaust of these poor wanderers, for two thousand of them, suspected by the ignorant citizens of poisoning wells and fountains, were burned in the Brand Gas-se, where the Prefecture now stands. Rage and fear had seized the people and no Jew was henceforward allowed to sleep within the walls. Every evening, at the signal of a horn blown on the Minster Tower, the detested people were compelled to depart to their houses in the suburbs. The new church contains fragments of a Dance of Death, that grim allegory carried at last to a climax by Holbein.

The Academy, originally a Protestant school, formed in 1532, and made a university in 1621, was suppressed at the Revolution. Here the good Oberlin and Schöpfflein and Schweighauser, and last, but not least of all, Goethe, studied. Goethe took his doctor's degree here in 1772. The Museum of Natural History is rich in Alsatian fossils, especially those of red marl and trias, and the fossil plants found at Sultz-les-Bains and Mulhausen. The botanical collection includes a section of the trunk of a silver fir from the Hochwald, near Bair; its diameter was eight ft., its height one hundred and fifty.

The public library, near the new church, contains one hundred thousand volumes (be merciful to these treasures, too, O amiable artillerymen)! Among the priceless curiosities are the Landsberg Missal, or Garden of Delights; it is full of early Byzantine miniatures, circa 1180, and belonged to Her-rade, Abbess of Stohenberg. Among the early printed books are Cicero, by Faust, 1465, a Strasbourg Bible, by Egggesteur, 1446, and a Mentchin Bible, printed at the same place in the same year. In the two halls are stored some Roman antiquities found in Alsace, the old town standard of Strasbourg, a statue of Rudolph of Hapsburg, and some painted glass from Molsteins. The hope that all these treasures may escape the chances of war will not be confined to students alone.

[Since the above was in type, Strasbourg has capitulated, and is now occupied by the Prussian forces. The defense was very stubborn and heroic.]

THE work of erecting a water battery on the south side of Governor's Island, between Castle William and the South Battery, is now going on under the direction of General Newton and Colonel Eggleston. The battery will be mounted by thirty-six guns, and will be in every respect a formidable work.

LEMONADE can be cheaply made from citric acid and water flavored with essence of lemon.

**Improved Damper Rings for Stoves and Flue Kettle.**

These improvements consist in an arrangement of the flues of stoves in connection with dampers on the cover rings, and a flue kettle hereinafter described.

Fig. 1 is a view of the top of a stove provided with these damper rings. Fig. 2 is a diagram showing the walls of the flues, and the way the damper rings act to direct the course of the flame and hot gases. Fig. 3 is a view of one of the damper rings with a part broken off to show how the improvements may be applied by manufacturers to any stoves in use, by a very slight alteration of the patterns described below.

We shall describe only such parts of the stove as are necessary to explain the action of the damper rings, and the flue kettle.

A, Fig. 2, represents the partition walls which divide the space under the top plate into compartments or flues, communicating with each other by openings, B, when these openings are not closed by the dampers of the rings, as shown at C.

One of the damper rings is shown at D, Fig. 1. It is made like the ordinary ring except that it has cast thereon a descending damper, E, which, when properly turned, stops one of the openings, C, as shown in Fig. 2.

It will be seen that this arrangement enables the flame to be carried around under the kettle holes just as may be desired, heating or cooling parts, or the whole of the top plate, and applying the heat in the most efficient and economical manner, and also in conjunction with the side flues, F, carrying the heat to the oven or the smoke pipe at the will of the operator.

The flue kettle is shown in Fig. 4, with a portion of the outer shell broken off to show the internal construction. It will be seen that it consists of an outer and inner shell inclosing an annular space divided by a vertical partition, G. The bottom of the annular space is closed by a bottom wall except at the openings, H and I. A special damper ring is employed with the kettle, having the damper made as shown at J, forming a sort of chute through which the gases descend to the stove flues after having passed up through the aperture, H, and around the inner wall of the kettle, the inclination of which causes the gases to impinge against it, and heat it very effectually.

The kettle may be made of cast or sheet metal, and will, we think, be found a convenient and economical utensil. The inventor states that he can boil its contents very much quicker with the same fire than in a kettle of the ordinary construction.

The damper ring used with the kettle is provided with stops which secure its rapid and accurate adjustment. In stoves of any pattern this kettle can be used in connection with its ordinary furniture by putting in the proper partitions under the top plate, and altering the pattern of the top plate so that one side of the hole is cut out as shown at K, Fig. 3, say, one quarter of an inch. This amount of cutting will not unfit the hole for the common furniture, while it will allow the flue kettle and damper rings to operate.

Patented, Jan. 25, 1870, by Charles Van De Mark, whom address for further information, at Phelps, N. Y.

**Iron Girders.**

Beams or girders of any kind are acted on by weights placed on them at stated places, inversely as the square of the distances of such places to the supports; thus,

taking a length of 6 feet and another of 12 feet from one common support to one girder, it will (supposing it to be equally strong throughout its length) support more on that place the position of which will, when squared, be less than the square of the other place, having its distance from the nearest place of support greater. As, for instance, the one being 6 feet, which, when squared, is 36, and the other 12 feet, which, squared, gives 144, and 144 being four times 36, then, as these are to be taken inversely, the place that gives 36 will bear four times the weight that the place squaring 144 will do.

Now, commencing with the unit one, and taking a piece of iron which shall be two feet long between its supports and one inch square, and, say, that will sustain at one foot from its supports four tons (breaking weight) then the square of one is one. Then, suppose we want to support the same weight at, say, 10 feet from the supports, then the square of 10=100, and, as we have seen, the square of one is one; therefore, on the inverse principle, our one inch square iron will be of  $\frac{1}{100}$  the necessary strength. Now, it also happens that the strength of beams increases as the square of their depths; and so, if we make the depth of our beam so that it shall square 100 times its present square, we shall, so far as strength is concerned, have effected our object, making in this the one inch deep the unit, then the  $1^2=1$ , as before,

and  $10^2=100=100 \times 1$ , which gives us our original strength, theoretically, but not necessarily practically; for it would require some means to give it lateral stiffness; this must be done by reducing the depth and increasing the breadth, so as to retain the same strength. Now, it is evident that if two separate beams of the same dimensions be placed side by side, they will bear twice the weight that one will; and, therefore, one beam equal in size to the two will bear the same weight, provided there be not a faulty place in such beam, which, were it to occur in one of the two smaller ones, could not reduce more than half the strength of the two taken together; and consequently a beam will increase in strength in proportion to its breadth.

Now, as a beam increases in strength as the square of its depth, it will be found that doubling the depth of any beam

out of a bottom flange of say two inches in thickness; it would appear, however, that the lower flange, when carrying the weight, should first be made to sustain its weight, and the upper one made to correspond to the usual proportion, which would appear in that case to necessitate a larger area of section. But in using any formula we should remember that the varieties of iron are widely different in their properties.—*The Builder*.

**Steam Road Rolling in England.**

The steam road-roller, says the *Engineer*, has now been more or less in use in Paris for the last ten years. In carrying out their six years' contract with the Paris municipality the engines of the contracting company there have already rolled down nearly half a million of cubic yards of road metalling. That the interests of the users of the roads whether human or equine, are fully served, is evident to the most casual observer amongst the visitors of that beautiful city. Knowing many European capitals, we feel free to say that the Paris roads are unequaled, whether for their regular and smooth surfaces, their precise contours, or their freedom from mud in winter and dust in summer. It has been officially estimated that the diminution in draft due to the steam rolled surface saves an enormous annual sum to Parisian owners of horses and vehicles. This is easily accounted for when we remember that the draft on loose metalling is five times more than where the stones have been "run in" by the traffic; and that draft progressively rises to this five-fold amount on patches in varying states of consolidation.

Apart from equine and vehicular wear and tear caused by increased draft, it continually happens that horses are injured on the loose sharp stones by spraining the joints of their legs; especially on stones of too large a size to be consolidated by the comparatively narrow and light fellies of ordinary vehicles.

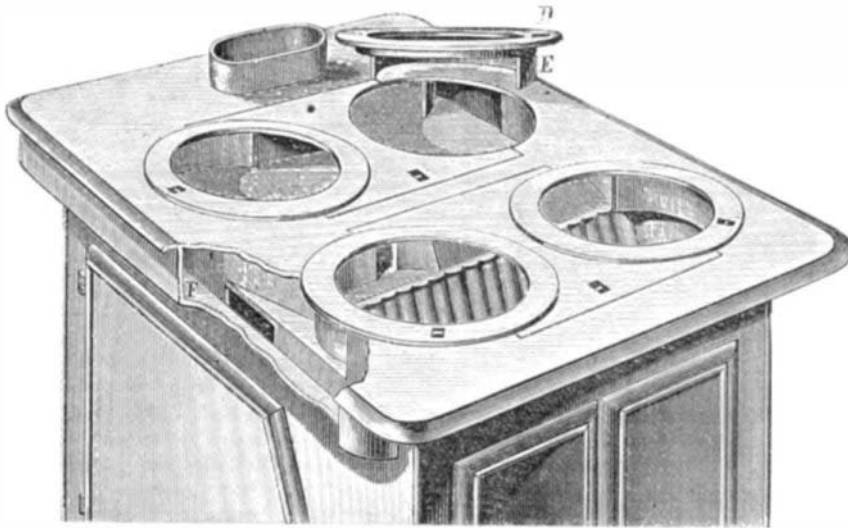
During this very season we know that more than one wealthy carriage owner proposed to bring actions for damage done in this way to horses passing on the macadamized part of Piccadilly. Still, much as West-end people object to loose metalling, they prefer its occasional appearance to the dangerous slipperiness of stone sets. No rider with any care for his own neck or his horse's knees will, if he can help it, ride over pavement. There are qualities in which a macadamized road must always excel paving. It is cheaper to lay down, it gives a better foothold, and it is free from the fearful noise of paved sets.

At first sight it might be expected that such roads as in Paris must be dearly paid for in maintenance. In England, at any rate, consolidating roads by rolling is looked upon as merely a luxury for parks and pleasure grounds; as it is believed that common vehicles roll roads down at no cost to road maintainers. In all probability road rolling was thus regarded when first used in France and Prussia; or, at the most, it was hoped to prevent injuries to horses, vehicles, and harness. But the virtue here displayed was found to be its own reward in the form of much saving in maintenance. It was in our pages that attention was in England first markedly drawn by Mr. Paget to the waste of metalling on unrolled roads, and generally to the great economical advantages of the process. From seven estimates, formed at different times, under the most varying circumstances, among whom are Field-Marshal Sir John Burgoyne, the engineer of the Seine Department, and Mr. Holmes, the Sheffield borough engineer—an average of 40 per cent saving in metalling can be proved to be produced by the imperfect process of horse road rolling as against traffic rolling.

Now the experience of the last ten years in Paris, as compared with the experience of the previous thirty years or thereabouts, since horse rolling was adopted, has shown the French engineers that the steam rolled roads last twice as long as horse-rolled roads; or, in other words, while the horse roller diminishes road maintenance by 40 per cent, the remaining 60 per cent of any total to be expended, when no rolling is used, is itself brought down by one half where the steam roller is applied.

AN IMMENSE IRRIGATING CANAL.—The *Colorado Tribune* of September 7 says: "Engineers go out on Monday to commence the surveys of one of the grandest enterprises for the improvement of an unsettled country that ever secured the attention of man. This is no less than the building of a gigantic irrigating canal, more than 100 miles in length, commencing in Platte Cañon, before the river debouches upon the plains, and extending to the head of the Republican River, in the eastern part of the territory. This immense canal will irrigate no less than three million acres of land, now useless except for stock purposes, and will be, if constructed, the means of making a place where a million people may find homes. The money to pay for the survey is raised, and the parties pushing it on can control the means to build the canal."

Fig. 1



VAN DE MARK'S DAMPER RINGS.

Fig. 2

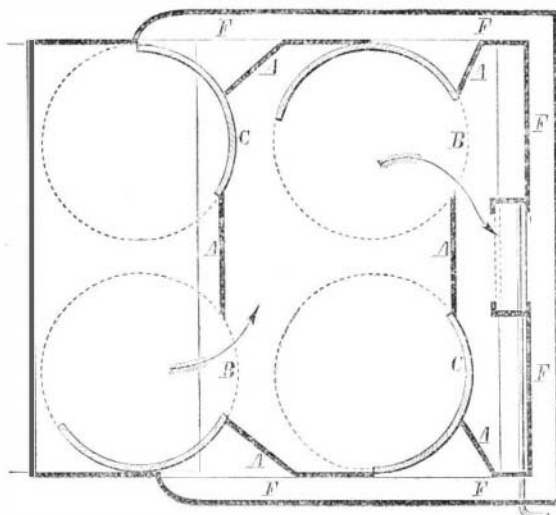


Fig. 3

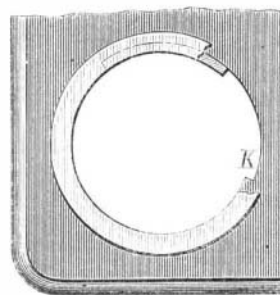


Fig. 4



bottom, being in form like a perpendicular section through the imaginary apex of a truncated pyramid, but here we should have a great quantity of metal in the center doing little or no service. It will be economy to remove it, and to have the usual form of top and bottom flanges—the bottom being six times the area of the top; but then, this is to carry a load on the top, but when it becomes desirable to place the load on the bottom flange, then that flange would be liable to be broken off sideways from the web unless it would resist a pressure in that way greater than the strength of the girder; and when we come to consider that this flange will be acted on only in places, and in these with a corresponding increase of weight, we shall at once see that, to prevent portions of the bottom flange from being broken out at those places, an increase in depth or thickness of the bottom flange must be necessary; but, at the same time, it would appear probable that the counteracting influence of the two flanges would remain undisturbed by the weight being on the lower instead of the upper flange, provided that the lower flange remained uninjured by the weight; and if this be so, then it is probable that the differences in proportion of the flanges under the differing conditions of the weight being on the upper or lower flange, is a question deserving of actual trial and experiment, to enable us to know what weight would really break a piece