all night on the fuel mentioned, and that the net consumption for 24 hours is 12 tuns.

The trouble in regard to double beat valves is overstated. Such difficulties formerly existed, but are measurably overcome. Of course if the metals composing the valves and chest are alike the expansion will be the same. For running in fresh water the valves and chest are generally made of cast iron, for little or no corrosion takes place; but for marine engines the case is different, and brass must be used for the valves and seats. It was formerly customary to use disks wholly of brass for the valves, which were bolted to columns in form like spools. This practice is now obsolete in the best shops, and the "spool" is very greatly enlarged, so that it is nearly the size of the valve itself.

In an 18 or 20 inch poppet valve, for we have some of this size, the brass seat is not more than an inch thick in the average, considered through the diameter of the valve. The difference in the rates of expansion is therefore very little. It may be here remarked that most of the complaints from poppet valves arise from defective workmanship. Most engineers and lathemen fancy it is an easy thing to make a pair of poppet valves, whereas there is no detail that requires nicer adjustment and closer attention. In shops where beam engines are built one man is kept on this work continually, and he soon acquires great proficiency in it.

Where the valves are taken apart in order to get them out of the chest, the exhaust valve for instance, it very often happens that the engineer is at fault and not the valves; for it is an easy matter to throw one of the disks out of line with the other by screwing up the bolts unequally, or allowing dust or dirt to fill in.

The writer quoted at the commencement of this article says in relation to beams:—

"Beams of cast iron are generally adopted for two reasons: first, simplicity of manufacture, and secondly, symmetry and cost, all of which are certainly matters of great consideration to the contractor. The chief object to be sought after in the manufacture of cast iron beams is an even diffusion of the material, so that, in cooling, the fiber of the metal can contract equally. In order to maintain lightness combined with strength, in large engines beams are in halves or sides, connected by distance pins. It is a rare occurrence for beams so constructed to fracture. The gudgeon bosses of cast iron beams would, if embraced with wrought iron bands shrunk on, be greatly strengthened. Beams of wrought iron plates and angle iron are coming much into use; but the cost is the greatest barrier to their general adoption. The presumed unsightly appearance of the rivet heads, angle iron, and laps of plates—each of these eyesores—is soon healed by the conviction that safety is guaranteed."

Beams to our engines are known as skeleton beams. The form is that of a diamond; the breadth being equal to half the length. The strap is wrought iron, and the center or skeleton cast. The two parts are firmly keyed together. Accidents have happened from breaking the strap; when this occurs a general smash up is the result. Ten years ago these occurrences were frequent, but they are now rare, for the dimensions of the straps have been much increased.

Ideas vary with localities. Our engineers think there is nothing more uncouth and lubberly than the solid cast iron beam, and they are termed by the irreverent "grate bars," from a remote resemblance to that useful appendage to a boiler. The cost of construction is certainly in favor of the solid beam; it has no advantage in weight, is unquestionably weaker, weight for weight, than the composite beam, and in point of appearance there is no comparison. The Stevens beam was complete from the hands of its designer and no material improvement has been made in our day.

A Mechanical Problem.

Make two broad-faced wheels of precisely the same size, weight and form. Let them be composed of wood and iron, but have the iron in one disposed around the perephery, and in the other at the center. Allow the wheels to start together and roll down an inclined plane; what will be their relative velocities? If on coming to the bottom of the plane they roll along a level floor or track, what will be their relative movements throughout their course?

PROFESSOR GROVE ON LIGHT.

In our last number we made a brief statement of Professor Grove's views of heat, as set forth in his treatise on the Correlation of Forces. The principal point of difference between him and some other writers on this subject, is in relation to the nature of the all-pervading ethereal fluid which fills the vast spaces between the planets and the stars, and which by its undulations, vibrations, or motions, conveys the forces of light and heat across these spaces. In his chapter on light, Professor Grove sets forth his views of this fluid more fully, and it seems that the point on which he insists is, that it is ponderable, or subject to the attraction of gravitation. He argues the point at great length, but the following paragraphs contain the substance of his conclusions:

"An objection to which the view I have been advocating is open, and a formidable one, is, the necessity involved in it of an universal plenum; for if light, heat, electricity, &c., be affections of ordinary matter, then matter must be supposed to be everywhere where these phenomena are apparent, and consequently there can be no vacuum.

"These forces are transmitted through what are called vacua, or through the interplanetary spaces, where matter, if it exist, must be in a highly attenuated state."

"The difference between the view which I am advocating and that of the ethereal theory as generally enunciated is, that the matter which in the interplanetary spaces serves as the means of transmitting by its undulations light and heat, I should regard as possessing the qualities of ordinary, or as it has sometimes been called gross, matter, and particularly weight; though, from its extreme rarefaction, it would manifest these properties in an indefinitely small degree; whilst, on the surface of the earth, that matter attains a density cognizable by our means of experiment, and the dense matter is itself, in great part, the conveyer of the undulations in which these agents consist. Doubtless, in very many of the forms which matter assumes, it is porous, and pervaded by more volatile essences, which may differ as much in kind as matter does. In these cases a composite medium, such as that indicated by Dr. Young, would result; but even on such a supposition, the denser matter would probably exercise the more important influence on the undulations. Returning to the somewhat strained hypothesis, that the particles of dense matter in a so-called solid are as distant as the stars in heaven, still a certain depth or thickness of such solid would present at every point of space a particle or rock in the successive progress of a wave, which particles, to carry on the movement, must vibrate in unison with it.

"At the utmost, our assumption, on the one hand, is, that wherever light, heat, &c., exist, ordinary matter exists, though it may be so attenuated that we can not recognize it by the tests of other forces, such as gravitation, and that to the expansibility of matter no limit can be assigned. On the other hand, a specific matter without weight must be assumed, of the existence of which there is no evidence, but in the phenomena for the explanation of which its existence is supposed."

PAPER FROM CANE.

Our old subscribers will remember that a good deal was said a few years ago about Lyman's process of preparing wood fiber for paper making. A long cannon was fitted with a steam-tight valve over the muzzle, the valve swinging on hinges and being closed with a latch. The cannon was filled with logs or sticks of wood, and steam was forced in under a very high pressure till all the pores of the wood were filled with it. The latch was then struck up, when the valve flew open, and the wood was shot out by the force of the steam. The pressure of the steam being removed from the outside of the wood, that within the pores expanded, and split the wood to shivers. The labor of cutting and trimming the sticks to prepare them for entering the cannon prevented the process from being economical, but it was thought that the cane of the southern cane brakes, being straight and free from limbs, might be worked with advantage. The following letter gives the result of the trial with cane.

MESSRS. EDITORS:—My father, believing that in the great cane brakes of the south-west there was an inexhaustible source of supply for paper—provided the cane could be disintegrated, and the fibrous portions of the plant so cleaned as to leave it a pure cellulin, without too great an expenditure of fuel or chemicals—about three years since turned his attention to that subject. He thought that Lyman's steam explosive process was a step in the right direction for the preparation of the material for chemical treatment.

With this belief he leased of the owners of Lyman's patent the exclusive right to its use in the western and south-western states. To fully test its value—previous to erecting more extensive works—we had two of the Lyman disintegrating guns made at the Novelty works, New York, and put them in operation at this place in July, 1863. We continued to operate with them on cane until reluctantly convinced that the process was not only extravagantly wasteful of fuel, but dangerous to operate, and uncertain in results; the disintegration was not into ultimate fibers, but into long bundles of fibers, which to separate had to be treated with caustic alkali under pressure, precisely as straw is treated, and then again blown through a small opening by steam power. We did not abandon the use of the guns on hasty trial, but used them until we had expended many tons of coal and cane, keeping account of the cost. We then threw them out as utterly worthless in a commercial point of view; we, however, never abandoned the hopes of so freeing cane fiber as to make a good quality of paper.

My father went through an elaborate and analytical series of experiments which have resulted in perfect success. We are regularly producing paper like the enclosed which is three-fifths cane.

The process of disintegration and cleansing is effected without the use of alkali or any other chemicals, but by a system of sap volatilization which by active passing steam prepares the cane for any simple and cheap mechanical treatment which is certain in its results.

The steam that is used in volatilizing the sap and cementing principle of the plant is utilized in heating wash-water and the condensed steam is evaporated leaving a residue resembling burnt sugar (caromel), but more bitter, which when used for coloring liquors gives to them a delightful aroma; but we are now preparing to use it for a more utilitarian purpose.

By my father's process there is little of the plant wasted. By a simple machine of his invention we strip the leaves from the cane, which, when cured, make a most excellent food for cattle; our stock are kept on it and eat it with a relish. The non-fibrous portions of the plant are separated by washing and are also utilized. F. H. SELLERS.

Sellers' Landing, Hardin Co., Ill.

[The sample sent us is a very fair article of wrapping paper, smooth and strong enough for most purposes for which wrapping paper is employed.—EDS.

SPECIAL NOTICE.

SILAS S. PUTNAM, of Dorchester, Mass., has petitioned for the extension of a patent granted to him on April 15, 1851, for an improvement in window-curtain fixtures.

It is ordered that the said petition be heard at the Patent Office, Washington, on Monday, March 27, 1865, at 12 o'clock, M., and all persons are notified to appear and show cause, if any they have, why said petition ought not to be granted.

VEHICLE FOR MEDICINE.—According to the *Chemical Gazette*, wafer paper is much used in France as a vehicle for powders. It may be made by heating two common smoothing irons and touching their surfaces with butter, and then pouring on one of them a small quantity of thin paste, made of rice or wheat flour, the other iron being instantly applied so as to press the water between the two faces and cook it sufficiently. The iron must not be hot enough to scorch it. In using the wafer cut it of the proper size aud dip it in water; place the powder on it and wrap or roll it up. It is said to go down like an oyster.

BONES are brittle in cold weather; a slight misstep may cripple a person for life.