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O. D. MUNN, S. H. WALES, A. E. BEACH.

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AIR-ENGINES.

IR in a compressed condition has been proposed as a general motive agent by some enthusiastic genius in Paris; and his project having been somewhat publicly discussed, several of our readers have made inquiries of us regarding its practicability. The plan suggested consists in erecting one or more powerful steam-engines in a convenient locality in a city, and compressing air in large and strong receivers for distribution by pipes through manufactories and printing-rooms, to work engines by compressed air instead of steam. The idea is certainly a grand one; the project is worthy of Brunel. Were it carried out, the numerous steam boilers scattered throughout a city like New York, in vaults and shops, with all their attendant dangers, would be dispensed with; and all the trouble involved to operate the engines for driving machinery in shops, would simply be the turning of faucets in the same manner as we are now supplied with water. This plan would be eminently desirable, on account of its conveniences, safety and cleanliness; but two questions meet us on the very threshold of inquiry, viz.: is it practicable? and if so, is it economical? We can operate machinery with electro-magnetism, hot air, gas, wind or water; but dollars and cents, in expenditure and profits, always rule in the selection of the power to be used.

In answer to the inquiry regarding the practical application of compressed air as a motive power, we would state that it is perfectly practical. On page 11, Vol. VI. of the SCIENTIFIC AMERICAN, there is a description of a compressed air-engine, used in a coal mine near Glasgow, Scotland, and with perfect success. The air is compressed at the mouth of the pit by a steam-engine, then forced down a vertical pipe 600 feet deep, then to the air-engine, a distance of half a mile. This engine was applied for winding purposes in a situation where a steam-engine would have been inadmissable, and it has now been in operation for nine years and has been found to answer the purpose completely. The air-engine in this case was once an old steam-engine, and the pressure with which the air is worked is 30 lbs. on the square inch. The heat developed during compression is carried off by a stream of water, so that the air, when exhausted from the engine, is cool and refreshing, and serves the purpose of ventilating the mine as well as operating the machinery. If this has been done successfully for nine years in a coal mine, it puts the question of practicability beyond a doubt; and the same results can be produced anywhere with similar apparatus. It has been objected to this system, that it could not be carried out in a city, on account of leakages in the pipes which convey the air; but do we not convey the gas for illuminating our houses through the streets in this manner without raising the objection of leakage to its use? and gas is certainly far more expensive than compressed air ever can be.

The loss of pressure in conveying the air a distance of half a mile is only one pound; the amount delivered from the steam-engine being 30 lbs. on the square inch, that at the engine, 29 lbs. The loss in this case is very small, owing to the pipes used being very smooth and the valves accurately fitted. Pipes with rough surfaces would never answer; they would absorb the power by the great amount of friction they would cause. This was the case with a compressed air-engine which had been put up in a powder-mill at Constantinople several years ago. The air was conveyed 300 yards to work the engine, but in that short distance almost the whole power was lost.

The other importan question in connection with this subject is that of economy—dollars and cents. Can compressed air be supplied as cheaply as steam for driving machinery? We cannot answer this in a very definite manner. The compressed air-engine we have described involves more expense than a steam-engine, and this perhaps would be the case under almost all circumstances, but more especially in reference to the pipes laid under ground, like those of gas and water in a city. On the other hand, some arguments may be presented in favor of such a system, even making considerable allowance for the leakage of air in the pipes and also the friction. Thus, the power to compress the air by a large engine can be more economically generated and applied than the steam from the numerous small boilers now required in the various shops. Safety from explosions and fires is a great consideration in its favor; but above all, its cleanliness and convenience.

WATER-GAS

On another page we have given the specification of Professor Sanders' patent for making water-gas; also a letter from him, and one from a correspondent on the subject. The views of the patentee and those of our correspondent do not seem to be based upon the invention as set forth in the patent. The process, as stated, consists in mixing water and coal-tar, or turpentine, &c., in a boiler, applying heat to it, and making the vapor so produced pass through the red hot charcoal in a retort. The gas thus obtained is that regarding which Professor Mapes has made such remarkable statements, according to our correspondent. The subject of water-gas is quite old, and White's method, patented Jan. 29, 1850—although somewhat different—appears to be superior to that of Sanders. In the use of coal-tar with water, to produce gas, a very small portion of hydro-carbon vapor can pass over by Sanders' method, and turpentine is too expensive to use. The process as described in the patent is almost impracticable for useful purposes, as the water and tar, or whatever may be used, should be first exposed in a retort in the method pursued by White. His plan consisted in using two retorts; water was admitted to one in small quantities by a siphon, and falling upon red hot charcoal, and scraps of iron, it was decomposed, some passed off as carbonic oxyd (CH), a portion as hydrogen, and some as steam. These products were then passed by a pipe into the other retort containing resin, and there united with the resinous gases, forming the hydro-carbon, or water-gas. Gas obtained from the destructive distillation of resin is a compound of olefiant and carbureted hydrogen ($C_2H^2+CH^2$) and is highly luminous. Gas obtained from the vapor of water passing through red hot charcoal is a carbonic oxyd and hydrogen (CO+H). According to Dr. Frankland, of Manchester, England, no portion of the hydrogen from water enters into chemical combination with carbon vapor in a retort. As neither carbonic oxyd nor hydrogen gas possesses illuminating power, of course we must consider that when these gases are mixed in any manner with illuminating gas, it is only for the purpose of dilution, not illumination. It is stated by Professor Sanders that he prefers to use coal-tar on account of its great cheapness; but if his invention is to supersede gas made from coal, as is contended by some, where can he get his coal-tar—this being the refuse of our coal gas-works? The Philadelphian correspondent of the *New York Tribune*, in the issue of the 19th inst., gives a very unreliable account of this water-gas, and the process by which it is made. He states that the patent rights for eight States have been sold by Dr. Sanders for $80,000, and that good gas can be supplied for 30 to 50 cents per 1,000 cubic feet. Such statements are calculated to deceive the people and do great injury.

There is a great amount of ignorance prevailing regarding gas for illuminating purposes, many supposing that equal quantities of every gas are of equal value, which is far from being the case. Gas made from solid hydro-carbons, such as coal and resin, is chiefly valuable according to the amount of olefiant gas which it contains. Resin is superior to coal gas in quality, just because it contains far more olifiant gas; and cannel coal makes more olefiant gas than common bituminous coal. The value of gases can only be determined by experiment, not by the inspection of a gas-burner. The quantity of olefiant gas present is ascertained by mixing chlorine with this gas in a dark place. The chlorine and oleffiant gases unite and form a yellow oily fluid consisting of one atom of chlorine and one of olefiant gas, the equivalents being $36 + 14 = 50$. Hence fourteen-fiftieths of the product will be the weight of olefiant gas combined. It is probable that the amount of olefiant in the gas with which this city is supplied is not above 5 per cent, the remainder being carbureted hydrogen. The density of this gas is .981, and 100 cubic inches weigh 30.57 grains. This information, we believe, will be found very useful to many of our readers.

THE CURIOSITIES OF THE SUNBEAM.

Simple as a white ray of the sun's light appears, it is found, on close observation, to be composed of at least three distinct elements, and to possess many curious and wonderful properties. The three elements of which we speak, are light, heat and chemical force; and they may be separated from each other by means of a very simple instrument. Darken a room, and bore a small hole through one of the window-shutters, so as so admit a ray of light from the sun. Place a triangular prism of glass horizontally across the ray, with one edge down, so that the light may pass through it. The ray will be bent upward, and will strike the wall at a higher point than it did before the prism was interposed. It will not, however, all be bent equally, so as to make the round spot it did before, but will form an elongated image of seven brilliant and most delicate colors, which shade into each other and fade away indefinitely at the ends of the image. The lowest of these colors, when the prism is placed as directed, is always red; and the others, in order as we ascend, are orange, yellow, green, blue, indigo and violet. Suspend a delicate thermometer in each of the colored rays, and it will be found that the violet ray imparts the least heat, and that the heat increases as we pass down through the several colors. If we continue our observations with the thermometer down beyond the red ray, we find a point, where no light falls, where the thermometer receives more heat than it does anywhere within the light. The rays of light are separated by the prism from those of heat.

Another curious fact which has been observed also proves that the light and heat of the sunbeam are distinct elements. If we suspend a thermometer in the vicinity of a close stove, which emits heat but not light, the heat radiating from the stove will raise the mercury in the thermometer. But if we interpose a plate of transparent glass, none of these dark rays of heat pass through it; it is entirely opaque to them. If we now increase the temperature of the stove until it becomes red-hot, the rays of heat begin to pass through the glass and affect the thermometer; and if we raise the temperature to a white heat, the rays pass freely through the glass. If we vary the experiment, and use crystals of rock salt, instead of glass, we find that the dark rays of heat pass out as freely through the salt as do those which are accompanied with light.

Some of the alchemists discovered, centuries ago, that the chloride of silver, which is as white as snow, turns black on exposure to the light; and more recently it has been found that a large number of bodies are thus affected by light. It is this power of light which is used in the daguerreotype and photograph processes. By more than one means, the force of this element can be measured in the several parts of the spectrum, and it is found to be most powerful in the violet ray, and to extend entirely beyond the light. It is not visible to the eye; it does not affect the thermometer; and it is therefore neither light nor heat. It is easy, after thus dividing the sunbeam, to re-combine its parts, when the white ray will produce the several effects of light, of heat, and of chemical change, which are produced separately by its several elements.

PATENTS TO NEW YORK LADIES.—The laws of the State of New York provide that every married woman who obtains a patent for her own invention, pursuant to the laws of the United States, may hold and enjoy the same, and all the benefits, proceeds and profits thereof, to her own separate use, free and independent of her husband and his creditors. The statute also authorizes her to transfer and sell the patent, entirely "on her own hook." Come, ladies, wake up, and bring forward your inventions! Your fertile intellects should never be allowed to rust under liberal enactments like the above.