Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year $3 00
One copy, six months 1 50
CLUB RATES { Ten copies, one year, each $2 50 . . . 25 00
CLUB RATES { Over ten copies, same rate, each . . . 2 50

TO BE HAD AT ALL THE NEWS DEPOTS.

VOL. XXVII., No. 13. [NEW SERIES.] *Twenty-seventh Year.*

NEW YORK, SATURDAY, SEPTEMBER 28, 1872.

Contents:

(Illustrated articles are marked with an asterisk.)

BINARY VAPOR ENGINES.

There are few experienced engineers who have not noted the fact that nearly every recent advance in engineering practice is due to the finally successful introduction of some device which had long been known, and whose success at last has been attained through the persistence and ingenuity of an inventor who has fortunately hit upon some minor yet essential improvement in detail, or whose business capacity and opportunities have placed him in advance of his fellows.

Twenty-five years ago a French inventor, M. Prospère Vincent du Trembley, brought into notice what is now known as the "binary vapor engine," or the "combined vapor engine." He constructed a number of these engines, and published a work describing their peculiarities and their operation.*

In this class of engines, one cylinder has its piston impelled by steam, usually, and the fluid, having done its work there, is exhausted into another part of the apparatus where it is allowed to communicate its unutilized heat to some liquid volatile at a lower temperature; and the vapor of this second liquid, by its expansion in a second cylinder, yields additional useful work. Ether, chloroform, and carbon bisulphide, or, as the latter is popularly termed, bisulphide of carbon, have all been tried without permanent success. Du Trembly used the vapor of ether.

Could an absolutely perfect binary vapor engine be constructed, its performance would exhibit precisely the same economy of fuel as would a perfect steam engine working between the same limits of temperature. There is, therefore, no purely scientific reason for anticipating economical advantage from this form of prime mover. There are, however, some practical considerations which would, at least, make it appear possible that the introduction of this form of engine may ultimately occur as a consequence of a superiority in economy over even the best of modern engines. It is evident that a wasteful steam engine may be converted into an economical binary engine in which a large amount of the heat, formerly wasted, may be successfully utilized; and, in all non-condensing steam engines, some considerable portion of the heat of the exhaust steam may be saved by such a change. Could the additional engine be constructed and operated at a moderate expense, it seems very certain that the binary plan would, in very many cases, be certainly advisable. Even with the best of condensing steam engines, it is by no means certain that the heat abstracted in the condenser might not be more economically removed and made useful by a fluid whose vapor has a higher tension than that of water at the same temperature.

It may possibly be yet learned that, upon the whole, the leakage of air into the condenser is a more serious evil, and that the power absorbed by the air pump and the use of condensing water in such large quantities may be more objectionable than the leakage outwards of minute quantities of vapor and the other difficulties attending the use of a really well designed and carefully constructed binary engine doing similar work. There remains much to be done in the way of experimental investigation before the subject can be treated of fully and intelligently, and we are hoping that valuable information may be derived from experiments in progress with the bisulphide of carbon engine of Mr. Ellis (of which we gave an illustrated description in the SCIENTIFIC AMERICAN of January 13, 1872), and from independent research. Mechanical difficulties have hitherto prevented the success of this form of engine, but it cannot be pronounced unlikely that coming inventors may make the system commercially valuable. Tight joints and good packing will do much toward making it a success, if success be possible, and a method of producing the volatile fluid at smaller cost is hardly less essential.

Both of these requisites are said to have been attained by Mr. Ellis, who also claims, in the Boston *Daily Advertiser*, to be able to get an indicated horse power with the consumption of 1·6 pounds of coal per hour, an extraordinary performance if the statement be correct.

A steam engine of large size, if non-condensing, is considered to do exceedingly good work when consuming less than three pounds of coal per horse power per hour; the best marine compound condensing engines require about two pounds, and, although Professor Rankine reports the British ship Thetis to have consumed but one pound of fuel per horse power per hour, there are reasons for doubting the accuracy of the data quoted by him. If Mr. Ellis' little engines have approached the figure stated, they have done better than any steam engine of the same size has yet.

It is to be hoped that the new engine may be thoroughly tested and reported upon by known experts and recognized authorities, and that we may be given statements of power developed, fuel consumed, loss of bisulphide by leakage during a period of considerable length, together with a statement of actual costs in dollars and cents.

The public are greatly interested in every promising project for economizing fuel in the production of power, and every professional engineer will be anxious to learn whether the binary vapor engine has at last proved itself capable of superseding the steam engine where the latter is really well designed, properly constructed and skillfully managed.

*"Manuel du conducteur des machines a vapeur combinees ou machines binaires;" Lyons, 1850.

ANOTHER GREAT ENGINEERING WORK.

A contract has lately been signed between the directors of the St. Gothard Railway, Switzerland, and M. L. Favre, of Geneva, for the boring of a new railway tunnel through the Alps, which promises to surpass anything of the kind yet attempted. The length of the tunnel will be a little more than nine miles. Cost $10,000,000. The work is to be finished within eight years; and if sooner finished the contractor is to receive $1,000 a day for each day in advance of the contract time. If the completion of the work is from any cause delayed beyond the contract time, $1,000 a day are to be forfeited. If the delay reaches beyond six months, the forfeit is then to be increased to $2,000 a day. The contractor deposits $1,600,000 as security for the faithful performance of the work. If the delay exceeds the contract time beyond one year, the contract is to be broken and the company take possession of the security money. The contractor is an eminent civil engineer, and a man of rare abilities. He was formerly a journeyman carpenter in Paris.

FAST CANAL STEAMING.

Mr. Simon Stevens, President of the Tehuantepec Railway Company, has written a letter to the Canal Commission of the State of New York, in which he gives some useful information in respect to steam transportation on canals. He thinks that the only way to obtain speed and economy, by the use of of steam power on the Erie Canal, is to line the banks with stone, in order to prevent damage by wash, which he says can be done for $2,000 per mile; the canal would then be rendered available for steamboats of suitable dimensions, running at the fastest speeds.

He instances the success of the Caledonian Canal in Scotland which, in 1838, was lined with stone throughout, and says that the system "is brought to such perfection that steamers drawing seventeen feet of water ply daily through the canal at an average speed of from seven to eleven miles an hour without injuring its banks. The same system is perfectly feasible for the Erie Canal, and, if adopted, would enable the ordinary towboats, similar to those in the New York harbor and elsewhere, to be used with perfect safety and economy at a speed of from four to six miles per hour.

After the inner slopes of the banks of the Caledonian Canal had been thoroughly pitched with rough, irregular quarried stones, the annual expense of dredging the bottom of its channel was materially reduced. That canal is 110 feet wide at the top, 50 feet at the bottom, and 21 feet deep. The Suez Canal was made 320 feet wide at top, 60 feet at bottom, and 26 feet deep. Nearly the entire amount of dredging in the Suez Canal is required, not because of the drifting sands, as heretofore supposed, but because the washings of its banks are constantly filling its channel."

THE CAUSES OF EXTRAORDINARY CONDITIONS OF WEATHER.

Nothing is easier than to invent an apparently very scientific cause for any natural event, and this is the simple reason why so many people indulge in this kind of mental exercise. When the winter is severe in the Eastern States of the Union, we hear of a change in our climate by a change in the direction of the Gulf Stream; when the summer is a little hotter than usual, we hear of great discoveries having been made, with the spectroscope, in the sun, where immense masses of burning magnesium have been seen; when we have a rainy season, it is due to an extraordinarily great number of sun spots; when we have a dry season, it is that the sun is free from spots, or it is advised that we may produce rain by firing many guns or setting the woods on fire. And notwithstanding that these reasonings are always afterwards annihilated by facts, people will go on in the same way to argue on points on which their information is necessarily very limited, and editors will publish all kinds of crude notions, which appear especially welcome to the daily papers, for the simple reason that they fill up the columns with a topic in which every one is more or less interested, namely, the weather.

The idea of a change in the direction of the Gulf Stream is pretty well exploded at the present date; while that of the great heat of the sun during this summer ought at once to have been set at rest by the reports from New Zealand; as the telegraph informed us that at the same time the winter there, which falls in July and August, was of extraordinary severity, so that heavy wagon loads crossed the frozen rivers, which has seldom, if ever, been the case in other winters. That large island is surrounded by currents from a kind of Pacific Gulf Stream, which make its winter climate ordinarily equal to that of Florida, notwithstanding it is at about the same latitude as New York, 40°. If now, the sun were so much hotter than usual, it would have been also hotter in New Zealand, where it shines during our night, and the winter there would then have been unusually warm, in place of unusually severe. People, in giving reasons for peculiarities of the weather, should first ask if that peculiar feature has been observed over the whole globe, as in that case only could it be ascribed to so general a cause as the sun. It was the same when, in the summer of 1870, a great deal of rain fell, and while this was being ascribed here to the prevalence of sun spots, making the sun less hot and the weather cold, we received the following telegraphic report from England: "A panic prevails among the farmers by the continued dry weather." When, the year before, the weather was exceedingly dry out west, and it was asserted that a great fire in the woods would produce rain, a great fire took place shortly afterwards without any such result.

In regard to the influence of sun spots, it should be kept in view that, the heat of the sun being the cause of all evaporation and therefore of all rain, an increase in that heat will increase the evaporation and consequently the rain, and a decrease must do the reverse; so that, if it be supposed that the sun is so covered with spots that half its heat is taken away, half its evaporating power would be lost, and when only half as much water goes up as vapor, only half as much can come down as rain. Thus sun spots, so far from increasing rain, tend to diminish it.

If we look intelligently about us, and make use of the reports reaching us from all sides by means of the telegraph and the newspaper, we find out that the weather is constantly different in different localities. Everybody knows of course that it is always cold at the poles, and hot at the equator; everybody ought to comprehend that it cannot possibly rain everywhere at the same moment, and also that it is improbable that the sky is ever clear over the whole earth at the same time; that, on the contrary it is always cloudy or ever perhaps always raining somewhere, or a thunderstorm is going on in some locality or other. And further, if one locality has much rain for a time, it is at the expense of some other locality which is deprived of its usual allowance. In short, we must come to the conclusion that on our earth's surface there is always every possible kind of weather prevailing somewhere. Consequently nothing is easier than predicting the weather, for any given day or hour, if only care is taken not to mention the place where the predicted weather is to prevail, as it is sure to prevail somewhere.

In regard to the high temperature prevailing during several days in July and August, it must be kept in view that local circumstances, such as direction of wind, barometric pressure of atmosphere, hygrometric condition of the same, when acting in the same direction, are amply sufficient to raise an ordinary summer temperature a few degrees, so as to produce an uncomfortable condition of the atmosphere. Such an explanation is more satisfactory than the far fetched attempts at explanation by assumed solar disturbances, which could not affect alone New York city with a few hundred miles around without having effect on the rest of the globe.

THE GOVERNMENT EXAMINATION OF BREECH LOADING ARMS.

The Board of Army Officers, ordered by the government to examine into the various inventions in breech loading small arms, convened at the army head quarters in New York on the 4th ultimo. As the important duty of selecting a weapon for the equipment of the entire army devolves upon the officers detailed for this service, their investigations will be conducted with the utmost thoroughness and impartiality. For the information of all interested in the small arms industry, the following is published:

OFFICE OF THE BOARD ON BREECH LOADING SMALL ARMS,
4th STORY ARMY BUILDING, COR. HOUSTON AND
GREENE STS., N. Y., September 4, 1872.

Notice is hereby given to all persons who desire to submit samples, or to appear in person before this Board, that it is now in session at the above-named place.

All written communications will be addressed to the Recorder of the Board, and samples of arms will be received at the Board rooms between the hours of 10 and 3 daily, until further notice.

HENRY METCALFE, Second Lieutenant, Ordnance Recorder.

We learn from the *Army and Navy Journal* that a petition is being circulated among inventors, requesting the Board to hold its sessions and trials on the grounds of the National Rifle Association at Creedmoor, which, from the practical advantages presented by the change of site, will probably be granted.

A large entry of inventions is anticipated. The Board, desiring to show every liberality, will receive arms not as yet completed, but in course of construction up to the last day of trial. This gives at least five weeks' additional time for the completion of models.