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TO OUR FRIENDS.

NOW IS THE TIME TO FORM CLUBS.

With the present number another volume of this journal closes. We appeal to its friends in all sections of the country where mail facilities exist to endeavor to form clubs for the coming year. We feel justified in asserting that no other journal in this country furnishes the same amount of useful reading, and especially at the extraordinarily low price at which it is furnished. The present high price of paper has rendered it necessary that we should somewhat increase the subscription price of the SCIENTIFIC AMERICAN, but by availing themselves of our clubbing rates persons may obtain the journal on very reasonable terms even now. We are obliged to pay more than double the price we did one year ago for the same quality of white paper that the SCIENTIFIC AMERICAN is printed on, while the subscription price to clubs is only a fraction more than formerly.

The long winter evening must be relieved of its dullness, and we must keep reading and thinking, and thus be prepared to overcome temporary difficulties and open new channels of wealth and prosperity. Friends, send in your clubs; at least renew your own subscriptions promptly.

TO OUR SUBSCRIBERS.

The publishers of no other paper in this country have maintained such a friendly relationship with their subscribers, as those of the SCIENTIFIC AMERICAN. Our suggestions and requests have uniformly met with a kindly and hearty response, and we have never forgotten that "one good turn deserves another." The subscription term of several thousands of our readers will expire with this number, and we urgently solicit a renewal of your patronage. On a previous occasion we presented the reasons which compelled us to raise the rate of subscription. We would have preferred to have continued our paper at the former price, but this is impossible under the circumstances. We hope none of our old subscribers will fall off on this account, as our course has been dictated by events over which we had no control. And yet with all the increased price of the SCIENTIFIC AMERICAN, it is still "the cheapest and best mechanics' paper in the world." Taking into consideration its size, the fine quality of its paper, its beautiful illustrations, the peculiarity of its information, and the immense amount of thought and labor bestowed upon it, unquestionably it is the cheapest weekly paper on this continent.

THE PAST AND PRESENT.

This number closes another volume and another year of the SCIENTIFIC AMERICAN. The past year of its existence has been chequered beyond all precedent. The greatest civil war on record has been raging in our country, and the painfully conflicting events of its outgrowth have affected deeply all

classes of our people. Fathers, husbands and brothers have perished in tens of thousands from the bullet and the bayonet, the malaria of the swamp and the exhausting toil of terrible marches. Tens of thousands are also now pining in hospitals from fever and wounds; and tens of thousands of the stalwart and brave have come back from the conflict maimed objects for life. Our land is clothed with mourning; our tears are for the dead; our sympathies for the suffering and bereaved living. And with these dreadful realities of civil war, great changes and vicissitudes in social and business relations have been experienced. Necessarily increased taxation, a depreciated currency and a great advance in the cost of many materials and manufactures have completely changed the condition of both the general and common affairs of life. There is scarcely a family in the land that has not had cause for grief; and yet with all our afflictions, as a people, Providence has been also kind. Never before have our harvest-fields yielded in greater profusion, and we have been enabled to feed the starving thousands of England's toil-worn operatives—a million of whom are said to be subsisting on charity.

In consideration of all our national, commercial and financial troubles, the progress of invention has not been unsatisfactory. Up to the present date, from a similar period last year 3,220 patents have been issued—three hundred more than in the same space last year. Many persons suppose that the inventive genius of the country has been exclusively devoted to implements and vessels of war, but this is not the case. Many very useful improvements have been made in almost every department of art, and a large number of these have been illustrated in our columns. They are various in their nature and character, but the greatest number relate to agriculture, and this is very gratifying, as husbandry is the mother of all the other arts.

We close this year under impending circumstances upon the issue of which are suspended the hopes and fears of millions. Public affairs may now look dark and gloomy, but let us not despond. This is not the time for despair, but determined and patient effort. We know not what a day or a week or a year may bring forth; therefore let us hope for the best, and labor to secure success. It is to our virtuous and industrious yeomanry and mechanics that we look for the salvation of our country.

"A voice speaks within us we cannot control,
Which tells of a time when these ills shall depart,
When knowledge shall win its bright way to the soul,
And virtue, like music, shall soften each heart."

THE MERITS OF VARIOUS KINDS OF ENGINES.

Before employing steam power as a motor, the kind of work it is desired to perform as well as the quality and quantity of it should be taken into account. If it is proposed to erect a flour mill, we must project an engine which will transmit a regular and steady motion without cessation; or, in the case of a mill for rolling iron, the automatic apparatus which governs the engine must act instantaneously, so as to prevent the machinery from running away with itself when the strain is removed.

Prejudices in favor of certain patterns of engines will always exist to a greater or less extent. One person may prefer a beam engine, another an oscillator, and another a horizontal one. We propose to show, briefly, the merits of each plan, and then individuals can exercise their own predilections in favor of this or that particular one.

The horizontal cylinder engine has always been in favor with a large class of the manufacturing community from its lessened first cost, as also from the simplicity of its design, and the ease with which it is managed. There are, however, some objections to it, which increase with its size until they become positive evils. These are the position of the cylinder and the space occupied by the parts generally. As to the cylinder the fault is ineradicable; not only is it liable to be scored by the weight of the piston resting upon its bottom, and the accumulation of sediment or scale from the boiler which may be carried over with the steam, but it is exposed to much injury from the waste water which, in nearly all cases, collects at the bottom and sooner or later destroys its integrity. As a means, however, of converting a reciprocating motion into a rotary motion, it is undoubtedly capable of the greatest simplifica-

tion. For light work its value is inestimable, and there are probably more of them built than of any other one kind.

The oscillating engine is very little used in manufacturing; what the reasons are we cannot say; one may be that it is not so economical as other plans from the difficulty which exists of attaching expansion valve gear to it without making it complicated and cumbersome. Of this kind of engine there are a great many in which the piston depends for its impetus upon steam admitted to its alternate sides by the vibration of the cylinder. This prevents any attempt to cause "lead" on the inducted steam, as in order to carry the cranks past their centers, the vapor must come in as soon as practicable after the completion of the previous stroke. The oscillating cylinder engine is used in most cases for navigation, and is in great favor with screw-propeller builders on account of their direct-action and economy of space.

The working-beam engine, or, in fact, all engines with upright cylinders, are the best where they can be employed. The reasons for this statement are the facts that the seat of the power is preserved from injury, from those causes which were represented as operating unfavorably in the case of the horizontal machine, also for the facility with which any modification of the apparatus for working the valves can be applied. We confess to a personal bias in favor of this class of engine; we think that the advantages which result from the ease with which all the reciprocating parts can be balanced, got at and seen at a glance when working, that is, in engines of a moderate size, more than compensate for the number of journals which are a necessary feature of them. Very little criticism can be brought to bear upon the beam engine that will stand when viewed in the light of common sense. The relative value of the three plans is based wholly upon the application of them to the work they are to perform; but we assert that if one individual was to try each separately, he would declare in favor of the vertical cylinder over all others.

Late English papers declare that the horizontal engines in the Great Exhibition recently held in London received the most attention and were the most popular, which we think a little singular in view of the facts above mentioned.

Beam engines may be regarded as the national idea of the proper way to apply steam power. Every nation has its own notions in regard to this subject. The English engineers went to great lengths in the construction of side-lever engines, which are nothing more than the principle of the working beam inverted. There may be a few more journals in the English plan than in ours, but they do not differ essentially. Until very recently these were regarded as the best possible system of propelling oceanships, and all of their large sea-going steamers were supplied with them, as indeed were many of our own, built upon English plans somewhat modified to suit our peculiar valve gearing. Of late years screw propulsion has so much attracted the attention of foreign engineers that the side wheels have not been materially changed as to their propelling machinery. With us, however, the case has been essentially different; beyond the comparatively few side-lever engines built in this country, the national mechanical expression on the subject in question has almost always declared in favor of the over-head beam. All of our river and Sound steamboats are fitted with them, and are celebrated for their speed and economical qualities.

When it was proposed, in view of these facts, to fit out an ocean steamer with the previously specified plan of engine, the projectors were derided both at home and abroad. More particularly were we sneered and scoffed at upon the other side of the water as a nation who knew so little of engineering precedents as not to be perfectly aware that the beam engine was unfitted for sea service. The weight and top hamper would throw the ship on her beam-ends when she labored in the first strong gale of wind; she would part all her holding-down bolts, and that would be the last of the beam engine; besides which all sorts of accidents were predicted, but happily not generally verified. At the first glance it did indeed seem plausible that some of these inconveniences would be felt, and in order to demonstrate it practically the *North Star* (once Vanderbilt's yacht) was fitted out