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

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TO OUR FRIENDS.

NOW IS THE TIME TO FORM CLUBS.

With our next 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.

See prospectus on the last page of this number.

A FEW WORDS TO OUR SUBSCRIBERS ON THE CLOSING VOLUME.

The period has arrived when we are about to close another volume of the SCIENTIFIC AMERICAN. The subscription term of nearly five thousand readers will expire with the next number, and with more than our usual solicitude we request a renewal of their patronage. We feel encouraged in doing this as we have received the most gratifying assurances from all our correspondents, that the SCIENTIFIC AMERICAN has been conducted during the past year with even more than its former acceptability. It has furnished profitable and attractive information, we trust, to all its readers; and its illustrations and typography are unequalled by any other periodical devoted to the literature of the mechanical arts. It has been the aim of its publishers and editors to make it a creditable representative of American invention and enterprise, and it is universally admitted that it occupies this position and stands alone as the popular expositor and repertory of American art and science. It is a periodical respecting which our mechanics generally have said they "feel proud of it, and it deserves the patronage of all." As it is impossible to maintain such a large and cheap illustrated paper without a very extensive list of subscribers, we solicit all our readers to exert their influence and to labor more than usual to obtain for us new subscribers among their acquaintances.

The proprietors of the SCIENTIFIC AMERICAN will spare no effort to render the next volume acceptable to all its readers, and, if possible, superior to its predecessors. According to our established rule, the

paper will be discontinued to all whose subscriptions expire, but we hope to experience the satisfaction of not being required to erase a single name from our mail books.

THE MANUFACTURE OF PRINTING PAPER.

The invention of movable types, stereotyping, the machine for casting type, and improvements in the printing press have undoubtedly tended to advance knowledge by the aids which they have furnished in providing cheap literature; and at the same time, it is equally true that improvements in the art of paper-making have done as much in effecting the same object. But all the improvements in type-making, setting type, and printing would be of little avail in advancing knowledge, if a sufficient supply of paper at a moderate cost was not obtainable. Paper really forms the item of greatest cost in the art of book-making. Improvements in machinery for making paper and in the art of bleaching it, but above all a great reduction in the cost of the raw material—cotton—have reduced the cost of paper so much below what it was during the last century that books and periodicals have of late years been produced at an unexampled and gratifyingly low cost. A change, however, has suddenly come over that state of things. Printing paper which, eighteen months ago, was selling at six cents per pound has advanced in price three-fold; and as a consequence, all kinds of publications must be raised in price also. The causes of this are a depreciated currency, an increase of taxation; and, above all, a scarcity of the raw material—cotton—due to the war in our country, which has of course almost entirely suppressed the Southern cotton trade.

In the year 1857, cotton rags, of which paper is chiefly made, became scarce for a brief period; and paper advanced in price one-half of its former rate. Much excitement was occasioned thereby, and great energy was displayed in making efforts to furnish a substitute for cotton and linen rags. Newspapers and other periodicals then teemed with treatises respecting the manufacture of paper from straw, wood, flax cotton, and numerous other materials. Several good improvements were then undoubtedly made in preparing straw, grasses and wood for making paper; but when the price of cotton rags fell, all the new materials, except in a few cases, were abandoned. The present prospects, however, offer no hope of a sufficient supply of cotton rags being obtainable for several years to come; therefore some substitute is imperatively required, and, judging from the present prices of the raw material, it is reasonable to conclude that many substitutes can be furnished at less cost. Paper can be manufactured from every vegetable substance that contains fiber—the minute threads of vegetable tissue.

The oldest known paper was made of the papyrus, an aquatic plant growing in Egypt. The Chinese made paper from cotton before the Christian era; and the Arabians introduced the art of making paper from cotton and linen into Spain in the eleventh century. In 1719, Reaumer the French scientist, published an essay, in which he stated that paper could be made of wood and hornets' nests; and in 1734, Seba, a Belgian writer on natural history, stated that good paper could be made from the *alga marina* or sea-grass. In 1751, M. Guettard, of France, exhibited specimens of paper made of the bark, wood and leaves of trees, and also from various plants; and in 1756, during a scarcity of linen rags, paper was made of straw in Germany. In 1772, a book was issued in Germany by Jacob Christian Schaffers, of Ratisbon, which was printed upon sixty specimens of paper, made of as many different materials. There is a copy of this remarkable volume in the library of the Smithsonian Institution at Washington. Among the paper materials of which it is composed are hornets' nests, sawdust, moss, beech, aspen, mulberry, pine, hop vines, hemp, leaves of aloes, barley straw, wheat straw, broom corn, thistle stalks, and almost every material which has been proposed of late years as a substitute for cotton and linen rags in paper manufacture. We have adduced these facts to show that printing paper not only can be, but has been made of an innumerable variety of materials. The simple reason why they have not been commonly used is because paper could be made cheaper from

cotton rags, owing to the low price of the latter and because they could be easily reduced to pulp. But this state of things has changed, and a favorable opportunity is now presented for the employment in paper-making of some of the materials above enumerated.

A few weeks ago, we published some account of the progress made in Austria, in the manufacture of paper from the fibers of maize-corn. We may learn something from Austria in the manufacture of both cloth and paper from maize fiber, as a substitute for cotton. We have lately examined a very beautiful pamphlet prepared by Professor J. Arenstein, and printed on paper composed of pulp made of maize, cotton and linen fiber. The quality of this paper resembled that of the fine "Indian wove" that is used for the prints of steel engravings. We are informed that a great number of works in the German language are now printed on maize paper at the Imperial Printing Office in Vienna. There are also establishments at Vienna and Schloglmule, where maize flax is spun and woven into cloth in considerable quantities. It is to this substance that we wish to direct particular attention at this time. There is no country in the world where the raw material for maize paper can be obtained in such abundance and perfection as in the United States. Its fiber—unlike that of cotton—is not free, but is cemented and imbedded in vegetable gluten and albumen, which require to be removed by chemical and mechanical processes before it is fit for making paper. What the expense of these processes may be we are unable to say; but the present high price of cotton rags warrants us in urging experiments with this material, in the confident hope that it may be economically employed in the manufacture of paper.

RELIEF FOR ENGLISH OPERATIVES.

Subscriptions to the fund for the relief of the working-classes thrown out of employment in Great Britain by the failure of the cotton supply are coming into the committee very rapidly. We are not of that class who are fond of doing a good deed and then publishing it, but we cannot help saying that the action of the Chamber of Commerce and Corn Exchange, in this city, is in striking contrast to that of many of the British merchants abroad, who seem to have let no opportunity slip to inflict injury and damage upon our commercial interests. The sum of \$100,000 has already been subscribed for this noble object, and Messrs. N. L. & G. Griswold have generously tendered a new ship of large capacity, to carry abroad such provisions as may be contributed or purchased with the money collected toward relieving the suffering poor of Lancashire and other manufacturing districts in England.

Many of the railroad companies whose lines lead into New York have consented to transport over their respective roads corn, flour and other provisions, from the West to this city, free of charge; and it is expected that most of the Western roads will not be behind the Eastern lines of transportation in carrying forward this humane work.

It is hoped that half a million of dollars' worth of the products of the country may thus be poured into the lap of the suffering operatives of Great Britain. One of the publishers of the SCIENTIFIC AMERICAN is on the committee for receiving subscriptions to the "International Relief Fund;" and any contributions remitted to this office for the cause will be acknowledged, and the amount handed over to A. A. Low, Esq., the Treasurer of the fund in this city.

NATIONAL WORKSHOPS.

The Secretary of the Navy, in his recent report to Congress on the condition of affairs under his supervision, urges, among other matters, the establishment of national foundries and forges, wherein a heavier class of wrought and cast-iron work can be made than it is possible, in his opinion, to do in our private shops. We cannot see the utility of such a measure. It is true that at present the rolling mills and foundries of the country are urged to their utmost capacity in order to meet the demands made upon them for plating, &c.; but this is owing to the limited time allowed to the proprietors to fulfill their contracts, as also to the imperative needs of the country. To build and fit out a fleet of from forty to fifty

iron-clad vessels and batteries might well tax the energies of any nation unburdened by war and with all its departments of government in a prosperous condition. How much more difficult is it, then, to do so when its force is paralyzed, and its energies are benumbed by the rampant treason and insubordination which is detected on every side! If it were a paramount object, in founding such national establishments, to secure a better and more thorough class of workmen than could otherwise be obtained, we could most heartily co-operate with the Secretary and second his efforts in all possible ways. Such is not the case. No better workmen can be found in this country, or in any other, than those which through our private foundries; it is immaterial whether they be native or foreign. If they are exotic, they have been attracted hither by the superior wages they receive, as well by the increased social and political privileges they enjoy.

To establish national workshops is to offer a premium for all sorts of incapables, who may have political influence; and it is now, or has been until very recently, as difficult to obtain employment in Government yards as if there were no especial hurry or urgency. We have this statement from good mechanics who have sought for work and not found it, owing wholly to their being unacquainted with "some influential man in their district," or their entire ignorance of all kinds of political machinery. Not only can these facts be established, but it is also true that, at a period when the Government required the services of engineers of experience to fill acting appointments on the transport, dispatch, and iron-clad vessels and batteries which it was constructing, this same political shibboleth presented itself and became a grievous stumbling block in the way of men who really desired to serve their country. This error has been practiced to the injury of the acting navy appointments.

National workshops would not obviate the difficulty alluded to, by any means. How vast or how great would the Secretary have this or these establishments? Or how large a sum would he be willing to recommend Congress to appropriate for the purpose? How long would it take to build such a national workshop or shops, and how many subsidies would have to be provided for friends of the contractors? What length of time would elapse before the shops were stocked with tools, and what eminent firms would receive the whole contracts for supplying them? What antediluvian systems and what crab-like progression would be inaugurated in spite of the protests of the mechanical world outside of these fostering Government yards! It is not chimerical, in view of former experience in these matters, to assert that favoritism could be the rule, and that manifest injustice to a deserving class of men would be practiced.

It is hinted that the private establishments cannot turn out sufficient work to answer the demand, as also that they cannot make as large a class of forgings or castings as might be desirable. These are singular assertions in view of the facts. At this writing, all the foundries in the country are busy on the heaviest kind of work—shafts, cylinders, boilers, all of the first class in respect to dimensions, are going forward on every hand. What Government could do more? There are steam hammers and foundry floors that will, in respect to the former, fabricate armor plates or shafts that no ship in the navy could carry; and as to the latter, there are pits where such slight things as condensers weighing thirty-five and forty tons can be constructed. If there is any especial need for more massive products of better material than are now furnished, we are much in error.

But there is yet another point which would, we think, act materially against the successful operation of national workshops. And this is the contract system which the Government observes toward private establishments, and is properly insisted upon to guard against fraud and delay. How can there be any guarantee to the public, in a time like the present, that their interests are consulted as far as possible, equal to that now afforded by the spectacle of the private workshops in the various States in full blast night and day? Not only this, but heavy forfeits are insisted upon from the contractors, both as a spur to them and a remuneration to the people in case of

non-compliance with the provisions of their pledge. How can a Government exact forfeit from itself?

We repeat that, in our opinion, the country has no need of national shops at this or any subsequent period, further than those which are necessary to complete repairs upon ships already in service; and we doubt very much whether these could not be better accomplished in private shops. The work which has been done for Government by first-class companies of the kind just alluded to, has always, or in most cases, been up to the mark, but can as much be said for those engines which have been remodeled under Government supervision?

An example of the incompetency of the Government to carry on such great undertakings is well attested in the miserable war-vessels which it has hitherto built. It is a fact that the best war-vessels now in the service were built by contract with eminent ship-builders.

BRING ON THE PAPER STOCK!

So earnest and pressing has become the demand for paper, and so imperative are the public needs, that the attention and ingenuity of nearly every interested person in the community is turned toward this subject. The high price of cotton and the scarcity of rags are urged by dealers as legitimate excuses for enhancing the cost and diminishing the supply of the manufactured article. We are inclined to think, however, that one very strong reason can be adduced for the increased price, which has been carefully kept in the background; and that is, the mania for speculation with which the nation is bitten, and which has infected this branch of commerce in common with most others.

Nine cents per pound are now paid by dealers for old newspapers, pamphlets, and, in fact, waste paper of all description, and we urge all who have, at this time, any store of the above articles, to bring them forth and consign them to the warehouse. Authors who may have on their hands tons of unsaleable editions, the merits of which the public obstinately and mulishly refused to see, can now recover their expended time and treasure by retailing their brains, like beef or pork, at so much per pound. Let not these gentlemen imagine that their flowers of rhetoric will be lost, their sonorous periods fall dead and still-born, or that their passionate and eloquent appeals will be lost to fame. No! They will all be merged into one grand chaos, in common with thousands, yea, millions of others. Where is Train and his pamphlets? Now is the time for him to reap glory and profit—twin honors that seldom go hand in hand.

We heard, but the other day, of some persons who realized about seventy-five dollars as the proceeds of the sales of numberless books and waste papers of all kinds. In fact, for all we know to the contrary, there may have been some love-letters among them—some tender missives full of pathos and bathos—letters, yellow and dim with age, written over on all sides, crossed and re-crossed, signed with all sorts of romantic titles, breathing vows of affection unchangeable—epistles, in short, which were once priceless but are worth at this time—just nine cents per pound! It is well to be careful, however, in pulling out and selling this rubbish, as there is one instance on record, which occurred in Philadelphia, of a valuable ledger belonging to a merchant being found among a lot of old books sent to the paper dealer. Persons who live at a distance can collect all their stores of this kind, put them in a large washtub, wet them and mash them into a pulp or nearly so, then drain them entirely dry and send them to market. It is not necessary to put in anything beside paper—sand does not add to the value of the stock, nor, in fact, does any foreign matter, and dealers will rigidly reject all such as has the appearance of being adulterated. The old paper is put into the picker and torn to pieces the same as rags; the ink is then bleached out of it, and it is worked over in the usual manner. Probably no better opportunity will be offered in many years than is presented at the present time to dispose of lumber of this sort. It is a good time to clean the literary house.

White rags, at the present time, are worth twelve cents per pound and colored rags eight, and every scrap and thread that can be put in the market goes just so far toward answering the demand and consequently diminishing the price.

Bring out the rags and papers, then, and let us retain our reputation as a nation of readers!

ORDER IN THE ENGINE-ROOM.

There is much force in the old saying extant that "order is heaven's first law." We can testify to this virtue as being a most excellent one in conducting sublunary affairs. Most especially is it needful in places and situations that are full of complicated and costly machinery.

The duty of the engine-room consists of a certain fixed routine, in ordinary cases. In the morning the water is tried in the boilers, the fires are lit, the pressure evolved, and the engine or engines set in motion; supposing them to be in good order, they run without cessation, except such as may naturally arise in the operations of the workshop; it may be that a belt runs off, gets caught in the shafting, or similar occurrences. Now in all these details, from the first to the last, we must have order and regularity. If an engineer comes in of a dark winty morning and has to light his fire, he must know exactly where to lay his hand on the match box. He must know where the lantern has been left, in what particular corner the shovel stands; in fact, possess that intricate knowledge of the situation which a blind man seems to have, intuitively, of his surroundings; only where the latter gropes, the engineer must use the means nature has furnished him, eyes and brains, and rely unhesitatingly upon them.

A well-ordered and well-kept engine-room is remarked at once by all persons, and the conductor of the machinery praised accordingly; but the sloven meets only with contempt. When we see the screw wrench kicking around under foot, the hammer half in the bedplate and half out, a flat chisel or two laying just where they will soon roll off into some part of the valve gear, half a dozen washers, some lamp wick, a little red lead, and ends of india-rubber in a heaped-up mess in one corner, intermingled doubtless with two or three old pipes—we have the key at once to the way in which business is carried on in that place. Such sights as these are by no means uncommon, and upon viewing them, we generally go to the cylinder, and it is oftener the case than otherwise, that we hear the rings *slating* back and forth with each alternate stroke, or else giving the peculiar excruciating grunt that a cylinder emits when requiring lubrication. We assert, unhesitatingly, that an engineer who is careless of externals will be reckless of the internal condition of his engine and machinery. Read the papers unquestionably, when you can do so without interfering with your business; but do not sit down to do so with this or any other article in your hand before you have put things to right first. Slovenliness makes waste, and waste makes want—if not to you in one shape, it certainly will in another; and we would impress upon the engineering fraternity in general to keep their room and tools neat and in good order. There are many advantages arising from it which will be felt not alone in comfort and convenience but in the moral value of the lesson. Many and many a serious accident has been averted by reason of the engineer's knowledge of the situation of his tools. Many shipwrecks and breakages generally have been prevented by having the axe or hammer at hand, the chisels in the rack, the screw wrench in the locker, just where they can be reached at a moment's notice; instead of their being down in the coal bunkers, left in the boiler when the man-hole plates were last taken off, or indeed thrown down in one corner so dark and unexplored that the tools never see the light of day again. Let us have order and regularity, and our predictions of disaster will rarely, if ever, be verified.

MUSK-RAT HOUSES.—It is generally believed by "old trappers," who ought to know more about it than any body else, that the formation, strength and height of the musk-rat houses is a sure precursor of high or low water during the spring succeeding their construction. Now, if there is any truth in this, then we may expect a raging high flood next spring, for it is a fact that the average height of the musk-rat houses is at least two feet higher than for several years past. We leave the subject for naturalists to investigate.—*St. Paul Union.*