Are you still like Sinbad the Sailor, carrying other people's troubles?
THE PAPERMAKER’S TROUBLE BOOK

Our days begin with trouble here
—New England Primer

If the wind were always sou-sou-west, women could take ships to sea. If it were easy to make good paper, paper-making would be a poor trade. It has become an art because it is beset with difficulties; because even the best paper-makers have their troubles.

Once upon a time, so long ago that he must since have died, there was a perfect paper-maker. Perhaps you knew him. I never did. Of course he knew all about rags, the cost, shrinkage and paper-making quality of thirty or forty grades; where they came from, the difference between city and country rags, the peculiar—where to look for bricks.
ities of Japanese, German and Egyptian. Where to look for bricks, and when to expect rubber boots in the bale, Just how to cook and bleach and beat each kind.

Ever since he was a boy he had studied ground wood and soda and sulphite and sulphate. He knew how the yield was influenced by the specific gravity of the wood, how the power consumption was affected by different dressings of the stones, the relative economy of sulphur and pyrites, towers and absorption tanks, evaporators and reclaiming systems. He could adapt the cook to spruce or hemlock, maple or poplar.

He was an exceptionally good chemist. He knew all about the supplies he used, their source, their composition, their relative money value as compared with other things which he might use, their behavior under varying conditions, how to compare and test them for quality and efficiency. He knew their impurities and the effect of these upon his processes. He was a coal expert. He knew the characteristics of every coal available for his plant. He had been to the mines and studied at each one its methods of coal prepara-

tion. He knew the ash, the sulphur, the burning and clinking quality of every coal which was offered him. He realized that when he was buying coal he was buying heat. He objected to paying good money for slate and sulphur balls. Consequently he bought his coal on specifications which defined exactly the sort of coal he wanted. Then he tested each delivery. It took a lot of time but he knew how and it paid handsomely. He got a hundred cents' worth of heat for a dollar where his competitors paid a dollar for eighty-five cents' worth.

He was a fuel engineer. He knew how to adapt his plant to the cheapest coal the market offered, how to adjust the drafts, the thickness of the fire, the methods of firing, to utilize to the utmost the heating power of the coal he bought. He let no dividends go up the chimney.
Instead, he took temperature measurements and analyzed the flue gases. Then he was also a lubrication engineer. For years he had devoted himself to the study of oils and their behavior under service conditions in plants of every kind. He knew the market and the habits of the trade. He also knew that oils which cost some mills a dollar are bought by others for a quarter. He was too well informed to buy oils by brand names. His specifications stated what he wanted and his tests assured him that he got it. He stopped the needless waste of oil. His lubrication account was one-third that of the mill next door. On the side he had taken a degree in electro-chemistry. He didn’t have to consult anybody about volts or amperes or watts or current efficiencies. He preferred diaphragm cells and he had his reasons. When bleach and alkali went too high he was prepared to make them.

He was an expert microscopist and plant physiologist. Consequently he could identify the dirt in his own papers and analyze the papers of his competitors. He allowed for the difference between bast fibers and seed hairs and tracheids, and appreciated the structural relationships of the fibres of jute and hemp and esparto and sisal and straw. He had studied paper-testing in Germany and water-marking in Italy.

He had inherited an exceptional eye for matching colors and had specialized in the intricate chemistry of dyes, pigments and mordants. He knew all about sedimentation tanks, filtration systems, the destruction of algae, water softening, boiler compounds, the composition and relative efficiency of bearing metals, the best lime for cooking stock, the best ways of making size, mixing bleach and getting retention out of fillers.

Incidentally he was a mechanical engineer with a leaning toward concrete construction, a good all-around millwright, a fiend for hustling repair work, a Napoleon for handling men, and a genius at mill design.

I almost forgot to add that he also knew all about furnishing and beating and screening and putting on wires
and felts, and running the paper over
the machine, and calendering and
super-calendering and friction calen-
dering, and coating and plating and
finishing and twine and wrappers and
discounts and rejections and where to
get the orders.

But as I said before, I am under the
impression that this perfect paper-
maker is dead.

Paper-making used to be a simple
business. Of course it always had its
troubles, but they were of a kind to be
met by the individual knowledge and
skill of the man who made the paper.
They were, so to say, all in the day’s
work. But paper-making nowadays has
become altogether too complex a busi-
ness for any one man to know through-
out; its troubles altogether too many
for any one man to carry. So it has
come about that the best paper-maker
to-day is the one who, thoroughly versed
in the fundamental technique of
paper-making, devotes himself to mak-
ing paper, calling to his aid as occasion
arises, the specialized knowledge of
experts. He still has and always will
have troubles of his own, but he puts
the troubles of other people upon the
shoulders which ought to carry them.

Are you still carrying other people’s
troubles? Wearing yourself out with
them during the day, taking them home
at night, bringing them to your work
in the morning? If so, the first thing
to do is to recognize that they belong
to other people, and the next thing is to
put them where they belong. Then you
can go about your own business, which
is paper-making, free to cope with the
troubles which belong to you.

Suppose we begin to sort these
troubles out now.

First of all, there are a lot of troubles
with water. Perhaps it is hard or the
color is bad. Evil-smelling floaters
come down stream. Pipes clog up,
the paper is dirty, there is scale or
foaming in the boilers, worse still,
the boilers may begin to sag. It is
hard to keep the paper up to color
or to size the sheet well. There are
charges of nuis-
ance from the
waste waters of
the mill. You
know yourself that these waste waters are carrying away fiber, filler and color which cost good money and which ought to be in the sheet. Surely all this is something to worry about; and so it is, but the chemist ought to do the worrying while the paper-maker makes paper. If the chemist is any good he will quickly tell you, not only what causes, but what will cure these troubles.

Then there are all the troubles that have to do with coal. No wonder there are so many when coal is such a variable thing. There is more difference in coal than there is in paper. It varies in moisture, ash, sulphur, heating power, burning quality, tendency to clinker. Not only will coal from the same field vary, it even varies when coming from the same mine. How shall one tell that he has selected the best coal for his particular plant and be sure he gets what he pays for? Even if the coal is all right there may be wasteful methods in the fireroom, too thick or too thin a fire, poor draft regulation, half-burned gases going up the chimney, smoke, irregular, wet or insufficient steam. All this means trouble and it also means lost dividends.

Fortunately it is easy to determine the exact quality of any coal by chemical analysis; no need to worry long about that. In the same way temperature measurements and flue gas analyses quickly point the way to improved fireroom practice. It is the business of the fuel engineer to make these tests and to interpret them when made. He makes coal a profession and you are simply carrying his burdens when you let coal troubles trouble you.

Oil makes no end of trouble. Sometimes oil salesmen make more trouble than the oil. They have so many prices for the same oil that one is reminded of the two ladies who upon arrival at a little country town found a 'bus and a carriage waiting at the station. The carriage was in charge of a negro driver, who in answer to their inquiry said his price for taking them to the hotel was fifty cents. "How much is it by 'bus?" they said. "Twenty-
five cents, lady.” “In that case I think we would rather go by 'bus.” “Don't you do it, lady. Step right in de carriage. I'll take you up for twenty-five cents. You see der is some folks as prefers de carriage, and I has to charge dem fifty cents.”

Perhaps you are paying double price just because you prefer some brand name. You can get just as badly stung by a barrel of oil as by a swarm of bees.

The simplest way to avoid oil troubles is to divest oil buying of all mystery and put it on a basis of plain business by having some disinterested lubrication engineer draw up specifications which describe exactly the kinds of oil required by your plant. You then buy these oils in the open market at the market price. Your chemist tests deliveries and rejects any which do not pass the specification. You get what you pay for, namely good lubrication at the right price. Only don’t waste the oil. Most paper-makers do.

Most of the troubles with stock are up to the paper-maker, but even with these the chemist who knows enough paper-making to interpret his own results can often lend a helping hand. You can’t expect to cook stock properly unless you have good lime. If the lime you are using contains much magnesia or iron, if it is air slacked, or only partly burned, good results are impossible. It is a good plan to avoid trouble by having the lime analyzed before you use it.

Oftentimes a trace of sulphur in sulphite or of sulphides in sulphate pulp makes a lot of trouble for everybody. Doesn’t it seem foolish to involve oneself in all that loss and worry which can be prevented by a simple chemical analysis?

When it comes to bleaching, we are dealing with a chemical process, and the wise paper-maker transfers his bleach troubles to the chemist as quickly as he can. First of all, bleach itself is liable to great variation in strength, it deteriorates rapidly, sometimes it settles badly, and it often contains dirt. It is better to find these things out before you use the bleach, and the way to do it is
to use no bleach that has not first been tested. The chances for loss in bleach mixing are great and ever-present. Sometimes a third of all the bleach is lost right here. With a little help from the chemist this loss can be brought down to almost nothing. There are other large and equally preventable losses in washing bleached stock or in the drainer. Worse still, perhaps the pulp becomes chlorinated, or it may be tendered by formation of oxycellulose. A little iron may prevent good color or the antichlor may be one which sets free sulphur. Hot bleaching and acid bleaching are ticklish jobs at best. They are almost certain to cause trouble unless controlled by chemical tests.

Every now and then there is Trouble — with a large T — in the mill because something has gone wrong with the size. Perhaps there are spots in the paper, or foam on the machine, or a sheet that is almost waterleaf. Too much alkali in the size makes trouble; so does too little. There are sizing troubles due to water and stock and filler and alum. You don’t have to look for trouble with animal size either. There is grease, for instance, and hot weather troubles, and the danger of forming peptones by overheating. Whatever these sizing troubles are, you may be sure that they are chemical troubles. So are the 57 varieties of trouble due to froth and foam. Why not put them all where they belong?

In spite of some prejudice against it, loading is generally a commendable operation, but it often lands the paper-maker in trouble just the same. He may be paying for a lot of water in the filler. A good paper-maker hates to feel that he is losing four or five times his wages that way. You are a good paper-maker of course, but do you buy your filler on a guarantee as to the water it contains and have deliveries tested? While
you are doing that you can avoid a lot more trouble by having the tests extended to include mica and grit and color. Blued clay and clay of irregular color looks better going out of the mill than it does coming in unless it gets into the paper.

When retention is at best so low, every paper-maker ought to know what results he is securing and be able to account exactly for his losses. Of course he can readily do this himself if he has the time and the equipment, but the easiest way to obtain the necessary data is to send a few samples of paper and waste waters to the chemist whose business it is to make such tests.

Coloring is a prolific mother of troubles, and no wonder! No branch of chemistry is so complex, none more highly specialized. The alphabet of coloring may be acquired with knowledge of a few formulas, some dyes and fewer pigments, but there is still the dictionary. The really wise paper-maker will confess his limitations and lose no chance to learn. He is liable to find himself in troubles from changes in paste colors, imperfect solution of dyes, variation in color strength of dyes and pigments, improper mordanting, irregularities in the dyeing properties of stock. He is called upon to select from thousands of available colors those which are strongest and most permanent. He must consider money value in terms of tinctorial power, and with it all and above all, he must match the sample. Life will be easier for him and profits larger, in proportion as he learns to utilize to his own advantage the specialized experience of the trained color chemist.

In one way or another all the paper-maker’s troubles finally culminate in his product—the paper he turns out. They focus in the quality, output and cost of that. Poor coal, bad fire-room practice, wasteful
lubrication methods, bleach losses, water troubles, size troubles, all get together in the finishing room to jack up the cost of paper. They meet there a lot of other troubles which are just as busy pushing the price down. Between them, the paper-maker often has a hard time. So do his stockholders.

Such troubles as irregular weight, felt, wire and calender marks, poor finish and many others are the paper-maker’s own. If he can not cure them nobody can. But a little good work by a microscopist will often identify dirt, point out the cause of spots, give the furnish of a competitor’s satisfactory paper or disclose defects in beating. Modern paper-testing machines and methods are of the utmost help in standardizing product and in defining exactly the properties required in a sheet. They eliminate guesswork and save a lot of trouble.

But paper testing has become almost a science in itself. A simple pop test which all mills are equipped to make is often helpful, but it does not begin to tell the story of the real properties of the sheet. To do that requires an expensive equipment of delicate special machines and apparatus and constant familiarity with their use. It is therefore wise to turn this work over to those who make a business of it while you devote yourself to making paper.

Just a word more about that perfect paper-maker. Perhaps he died of doing too many things at once. It is hard to blow and swallow at the same time even if one knows how. It is harder still to be paper-maker, chemist, coal expert, microscopist and fuel engineer all
for the same salary. Isn't it foolish to try?

*Up! Up! my friend, and clear your looks!*
*Why all this toil and trouble!*  

*Wordsworth*

*All's well that ends well.*