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Paper on Cotton-Seed Oil
and Cotton-Seed Oil Mills

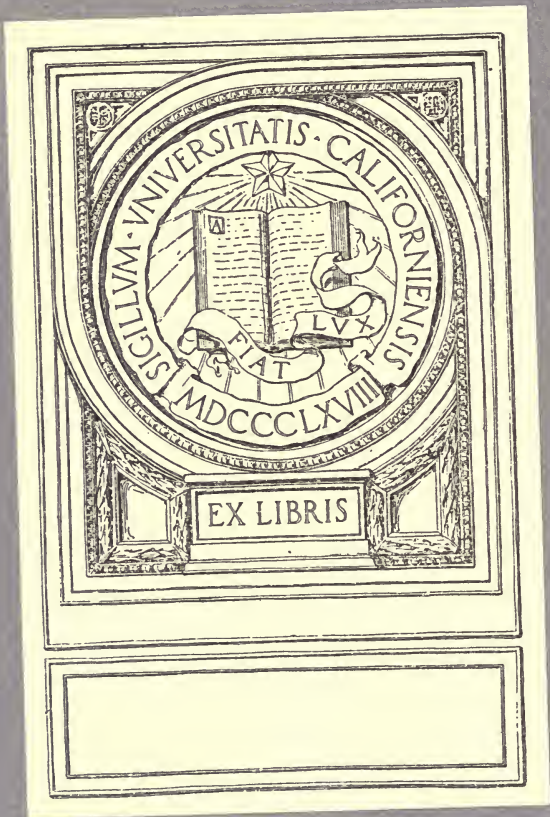
Henry V. Ogden.

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PAPER

— ON —

COTTON-SEED OIL & COTTON-SEED OIL MILLS,

READ BY

Mr. HENRY V. OGDEN, Resident Secretary,

SOUTHERN DEPARTMENT

— OF THE —

LIVERPOOL AND LONDON AND GLOBE INSURANCE CO,

— BEFORE THE —

UNDERWRITERS' ASSOCIATION OF THE SOUTH,

— AT —

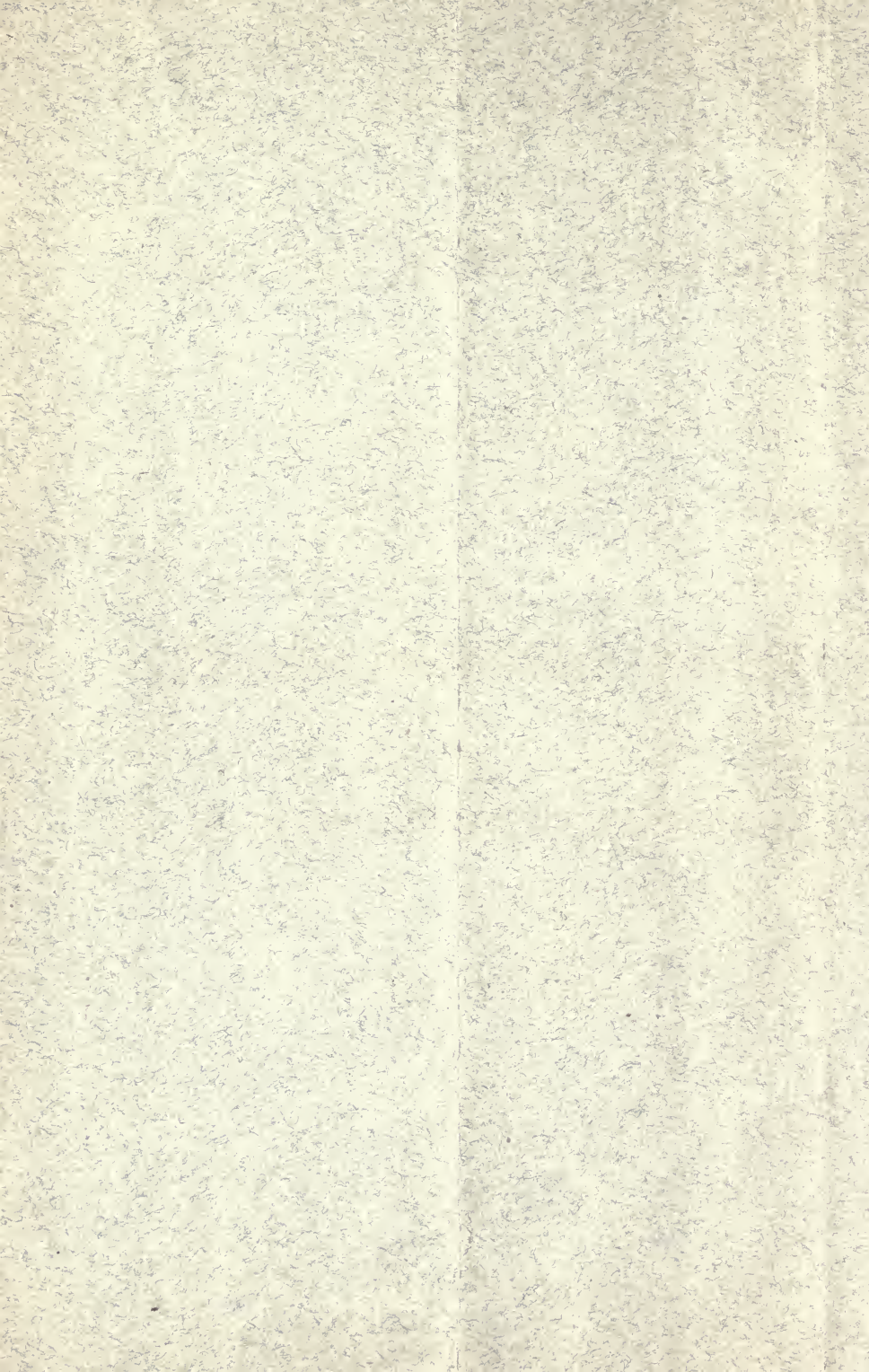
ATLANTA, GA.,

MAY 26, 1880.

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ABSTRACT

(1. E. P.)

CONFIDENTIAL

UNDERWRITERS' ASSOCIATION OF SOUTH.

Cotton-Seed Oil and Cotton-Seed Oil Mills.

HENRY V. OGDEN.

Mr. President and Gentlemen of the Association:

I have been invited to address you on the subject of Cotton-Seed Oil and Cotton-Seed Oil Mills as connected with the business of underwriting. In discussing a subject which might naturally be supposed to excite our interest in proportion only as it concerns our business, I find myself in the presence of so much else of interest to our community as to justify me in giving my investigation a wider range.

The origin and growth of an industry so rapidly expanding in extent and importance, is, in itself, full of interest. The history of its gradual development, its present status, and possible future, rightly claim our attention. Its great value to the country in successfully utilizing a hitherto almost wasted product of our soil, and converting it into articles valuable for export and for home consumption, merits more than a passing consideration.

The utilization of the seed of the cotton plant was a discovery of no slight magnitude and importance; the great value of which was not revealed to us suddenly. It came, as most great discoveries do, accompanied by pecuniary loss, delay and disappointment; and was successfully established only after repeated failures.

It was a memorable day in the history of the South when the value of the seed was first perceived and appreciated. It would ill become us, who now reap the value of the discovery, to omit recording with pride and respect the names of its authors. We ought to pay our tribute of praise and honor to the men who first gave birth to the idea, and afterwards sacrificed so much in

their efforts to give it a practical value. It is none the less to their credit that they failed to make it a pecuniary success for themselves. Such, unfortunately, is the common fate of inventors. They had faith in it, and were sustained by that faith; and wrought on through trials, vexations, and disappointments, and to-day we reap the advantage of their long and dearly bought experience. All honor, then, to those unrewarded pioneers! Most of them realized nothing from their labor. Many of them lived long enough (and some are still with us) to see the final result of their toil and sacrifice—in a country enriched—in a commerce enlarged—and the general prosperity enhanced.

Until the year 1855 cotton seed cannot be said to have had any commercial value. It had in fact lain open to the eye and ready to the hand for generations, yet none saw it for what it was, and none reached out to grasp it. In the greater worth of the fleecy staple the value of the oily seed hidden within its folds, remained unperceived. The genius of Whitney had provided the means of separating the one from the other, but the secret of the wealth stored up in the seed was yet unrevealed. Possibly some one planter, more intelligent or more thrifty than another, had used it to fertilize his fields or feed his cattle. But more frequently it was regarded as useless refuse of the gathered crop, thrown out as such, and, exposed to air and wet, it became not infrequently, by spontaneous combustion, a source of disaster to the slovenly planter, or the more unfortunate underwriter.

There is every reason to believe that the first move toward the extraction of oil from cotton seed was made at Natchez, Miss., in the year 1834. So far as we have been able to ascertain, the great honor of this first attempt belongs to Messrs. James Hamilton Couper and Samuel Plummer, of Georgia, and associated with them were Mr. Follett, of Norfolk, Va., and Major Anderson Miller, of Louisville, Ky. The late Archibald Dunbar, and other prominent citizens of Mississippi, invested liberally of their means, and shared the pecuniary loss that followed. The few who remember Mr. Couper speak of him as a man wonderfully gifted in general intelligence and business capacity. His large resources gave an impulse to the enterprise, and resulted in the putting up of the first mill and machinery. In

every respect, so far as known, the attempt was a disastrous failure. We will not speculate on the fact that the machinery was inadequate, or the process defective, or that there was no general market for the products.

When you are told that in this first mill the pressure to extract the oil was obtained from the simple wedge principle, you can easily imagine how rude and inadequate to success were all the other appliances. At this safer distance of time, and guided by the clear, cold light of experience, we recognize a fact that seems to hold good, alike in the moral and physical world, that great ideas or great results are seldom either hastily or easily realized.

There is too often a tinge of sadness and romance in the history of inventors. They sow, but they seldom reap; they conceive the idea; they launch the thought; but in striving for practical results, they are generally lost in the stormy waters of experience. It was so with those who first engaged in the manufacture of cotton-seed oil. As has been truly said, it is always the first step that costs. However, a beginning had been made, and the remembrance of failure in this case had at least served to keep the idea alive.

In the year 1852, just eighteen years later, it attracted the attention of Wm. Wilbur and Frederick Goode, citizens of New Orleans. These gentlemen, as strong in their faith in the original idea as their predecessors had been, embarked their all in a new attempt to give it practical value. They conceived and carried out the plan of a mill, machinery, and process of extraction, crude and imperfect, perhaps, but still a great improvement over the Natchez mill of 1834, and which has been the inspiration of much that has followed. Their improvements enabled them to make oil and clarify it; they made the first soap and sold the first oil cake, but they did so only to share the fate of their predecessors of 1834, for, like them, they were pecuniarily ruined. They had, however, succeeded far enough to convince themselves, and demonstrate to others, the possibility of the industry.

In the year 1855, Mr. C. W. Bradbury, of New Orleans, engaged in the enterprise. Energetic and intelligent, he was notably the first to demonstrate, beyond any question, the feasibility of the manufacture. Laboring under many disadvantages,

not the least of them the lack of capital necessary to efficiently carry out his own ideas of the business, he was unfortunately obliged to suspend operations for the time being, resuming again under better auspices, only to be interrupted and ruined by the breaking out of the civil war.

No doubt most great enterprises begin with brains rather than with capital, and they are most successful when their growth, though slow, is strengthened and supported by the experience and the profits of each successive year. This has been fairly illustrated in the success of the manufacture of cotton-seed oil in the South.

Happily for New Orleans, there were a few men endowed with the foresight and intelligence that enabled them to recognize the great value and importance of the industry. Among them may be named Messrs. Paulin Martin, F. M. Fisk, Paul Aldige and A. A. Maginnis. These gentlemen took up the business where Mr. Bradbury left it. They had the resources of capital and credit; and, with the experience of others to assist, they operated successfully up to the breaking out of the war in 1861. Again there was a pause in the onward movement. But with peace came fresh capital, and the permanent revival of the industry. Each succeeding year has witnessed a steady increase in the capacity and number of the mills, with a corresponding improvement in machinery.

To-day, statistically speaking, the situation is this: There are forty-one mills operating in the Southern States, distributed as follows: Mississippi, nine; Louisiana, nine; Tennessee, eight; Texas, six; Arkansas, four; Missouri, two; Alabama, two; and Georgia, one. A complete list of the mills, and their location, will be found appended to this paper.

As preliminary to a short account of the different processes involved in the manufacture of cotton-seed oil, it will be well to consider for a moment the seed itself. The area of its production may be briefly comprehended as lying between the 30th and 36th parallels of latitude, bounded on the east by the Atlantic ocean, and on the west embracing all of Texas and Arkansas. The line of perfect growth, so-called, having regard to climate and soil, being parallel thirty-two. The quality and quantity of the seed are greatly governed by the character of the season.

As it falls from the cotton gin of the plantation it is not entirely divested of its fibre, and though, at first sight, the little left would seem scarcely worth the manipulation necessary to secure it, yet, as will be seen later on, it is an important factor in the profits of the business. Much depends upon the care of the seed, both in the hands of the planter, and after it has passed into the charge of the mills. From its oily nature it is inherently predisposed to heat, and this, if permitted, materially injures all its products, and practically the same result follows if exposed to dampness. Fortunately the expanse of territory over which the growth extends is so wide, it is seldom that a fair average of quality is not secured. The seed is gathered from the plantation in sacks, and when so stored may, with a reasonable amount of ventilation, keep sound a twelve-month, but in some seasons, with the best of care, unaccountably fails to do so. Stored in bulk, it is still more liable to become heated, and requires more than ordinary means of ventilation to prevent damage. It is purchased deliverable in New Orleans, this season, at the rate of ten dollars per ton of two thousand pounds. To the experienced operator, an examination by the naked eye will not always detect deterioration; but if subjected to the microscope, however, and found bright in color, it is sound; if in the least discolored, it has probably been heated or frosted.

Having brought the seed to the mill, we will now follow it through the various processes of the manufacture. After a thorough sifting to free it from dust and other foreign substances, it passes to the linters. These are very similar to the country gin-stand, differing mainly in this: that, instead of having sixty or eighty saws, they have one hundred and ten, bringing them closer together, say about one-half inch apart, and the teeth very finely set. The linters *partially* divest the seed of the fibre that has escaped the planter's gin. We say *partially*, for as yet no process has been devised that will divest the seed of all fibre. The operation is rapidly performed; and from the linters, through condensers, there rolls out a continuous flow of cotton, very short in staple, but generally clean and white. From every ton of seed thus treated there is realized about twenty-two pounds of cotton, known in commerce as linters, generally considered too good for paper stock, but much used in the manufacture of cotton-batting. From the linters it goes to the press, and is

made into bales of from five to six hundred pounds each, and is then ready for market, the best grades selling at from eight to nine cents per pound.

Having disposed of the cotton gained in the linting process, we will return to the seed, which, as it is dispossessed of its fibre, falls from the linters, and is automatically carried to the huller or decorticator, where in turn it is as rapidly divested of the hull protecting the kernel, as it was of its fibre by the linters. As this is being done both kernel and hull fall into screens, and are separated; the hulls, automatically carried to the furnace, supply all the fuel needed, and may be further utilized by leaching the ashes—making lye, which is sometimes used to clarify the oil.

To go back to the seed in the screen. After separation from the hulls, and divested of both fibre and skin, the kernel passes through rollers which crush it very fine. Thus crushed, it passes into steam heated cylinders, wherein are revolving arms to agitate the crushed seed, giving it an equal exposure to the heat. When it has attained the stage of temperature best calculated to make it yield up its oil, it is put into small woolen bags, and placed between horse-hair mats, backed with leather, having a fluted surface inside, to facilitate the escape of the oil under the hydraulic pressure, to which it is now subjected in the boxes of the presses.

Each box compresses one press bag of crushed seed at a time, the operation lasting about fifteen minutes. After the immense pressure in the boxes, the residuum, known as the cotton-seed-oil-cake of commerce, is left quite solid and almost free from moisture, becoming entirely so after exposure for a day or more on racks, preparatory to putting it in sacks of about two hundred pounds each.

When not thus put up for export, it is dried and crushed into a fine meal, and put into sacks and sold for fertilizing or feeding purposes. As a fertilizer, it compares favorably with guano or any of the phosphates used for that purpose. It is in high favor with, and much used by, our sugar planters, who agree that it gives a rapid and vigorous growth to the cane. In this connection there is the promise of a large outlet for its consumption in Louisiana. For the cake there is always a steady demand for export; the large European consumption

is the best evidence of its value for feeding stock. It is classed as follows: "Choice," "Prime," "Fair Average Country," "Ordinary" and "Dark," and is sold according to quality or upon the reputation of the brand of each particular mill. The total amount exported for the nine months ending, April 30th, was 56,000 tons.

We will now return to the oil, which, under the hydraulic pressure, has been running from the boxes into a tank prepared to receive it. If intended for sale or export in the crude state, it is run directly thence into barrels. Far the largest proportion, however, is transferred to other tanks for clarification. This is chiefly effected by precipitation, a strong alkali being used, generally caustic soda. Every oil refiner has his own peculiar process—supposed to be known only to himself—for this part of the manufacture. The deposit resulting without the use of alkali, is termed "foots;" the precipitate obtained with it, is known as "soap stock." After the process of precipitation, the oil becomes the refined Cotton Seed Oil of commerce, and classes, "Prime" and "Off Oil." The crude oil classes, "Choice," "Prime," "Numbers One and Two," "Foots" and "Soap Stock." The soap stock meets with a ready sale for domestic consumption, as well as for export; not infrequently the mill is lighted with a gas made from it on the premises.

The oil is the most important and most valuable product of the cotton seed, one ton of seed giving thirty-five gallons of crude oil, about eighteen per cent. of which is lost in the refining process. The oil is said to be largely used by painters, but is not considered desirable, as it dries too slowly; nor is it used as a lubricator, being too gummy for the purpose. Of all the vegetable oils known, cotton seed oil is the most available substitute for the olive oil of Italy, France and Spain. To those countries is exported a large proportion of our production. For the year ending August 31st, 1879, there was exported to the Continent, from the port of New Orleans alone, seventy-three thousand seven hundred and eighty-two barrels of Prime, refined, and Off cotton-seed oil (of which Italy took 40,000 barrels), and to Liverpool, eight thousand four hundred and five barrels, and coastwise only fifty-two hundred and sixty-three barrels. From the 1st of September, 1879, to April 24th, 1880, say nine months, the exports from this port were: to the Conti-

nent, sixty-six thousand six hundred and seventy-three barrels of prime and off oil, and coastwise, fifty-two hundred and twenty-seven barrels. Now it is not for us to assert that Italy converts our cotton seed oil into a spurious product of the olive, but the suggestive fact remains that she takes annually forty to fifty thousand barrels of it from us, and the world must draw its own conclusions. We, of Louisiana, have a shrewd suspicion that from the Continent it is distributed over the world as "Olive Oil," and truly it seems such in color, taste and excellence. Fortunately for the South, olive oil is one of the few articles of commerce, the demand for which has exceeded the production. Cotton seed oil comes in very opportunely to fill the gap; takes a new name, serves a useful purpose; tastes well, and is unconsciously, if not cheerfully, accepted everywhere as the genuine article. The world should be thankful that it can be cheaply supplied with so desirable a substitute. Our monopoly of it as such is likely to be a long one, our only competitor in the industry being that far off ancient land, Egypt; but her production is comparatively limited, and never likely to injure the business in this country. I am, however, able to say that another and more legitimate demand for our oil is beginning to make itself known, and bids fair to become an increasing one. It originates in the needs of the world for the glycerine of commerce, extensively used by the manufacturers of tobacco and cigars, by compounders of liquors, medicines, and ointments, and by the manufacturers of toilet soaps. It is one of the properties of glycerine never to become hard, and it is, therefore, used in printers' rollers or any elastic substance requiring to be kept in a pliable condition. It is also the basis of nitro-glycerine and of various other explosive compounds. Cotton seed oil is the best material known for making glycerine. One gallon of crude oil returns three and one-half pounds of pure glycerine. With the best material at our door, and with the finest climate in the world to work it up, New Orleans should become the chief seat of its manufacture, and control the markets of the world.

I am indebted to Mr. Edward Atkinson, of Boston, for the following item regarding a new process to extract oil from cotton seed:

"The latest treatment of cotton-seed kernel is to leach it

with naphtha, by which method ten to fifteen per cent. more oil is extracted than can be had by pressing; the naphtha is distilled off, to be used again, and the kernel is then treated with super-heated steam, which leaves it a perfectly dry, sweet, nutritious and digestible food for animals. It is alleged that in France methods have been discovered for procuring a valuable blue dyestuff from cotton-seed."

I am in duty bound to say that our best authorities, in the South, do not regard it as likely to prove successful.

Let us now consider and estimate the value of the whole product for the year ending, September 1st, 1880. From data in my possession it appears that the forty-one mills, now in operation, have the capacity, and it is estimated will this year consume an average of ten thousand tons of seed each. This will make their combined consumption four hundred and ten thousand tons, paid for at the rate of ten dollars per ton. Here, to begin with, is an increase of national wealth, amounting to four millions one hundred thousand dollars, and all secured without the addition of a single expense that would not have been incurred had the extraction of cotton-seed oil never been known. Taking my estimate of the consumption of seed by the forty-one mills this season as a basis, the proportion and value of the total product may be summed up as follows :

410,000 tons seed yielding 35 gallons crude oil to the ton, is	
14,350,000 gallons, worth 30 cents per gallon	\$4,305,000
Same amount seed yielding 22 lbs. cotton to the ton, is 9,020,000	
lbs. cotton, worth 8 cents per lb	721,600
And yielding also 750 lbs. oil cake to the ton, is 137,277 tons of	
cake, at \$20 per ton	2,745,540
<hr/>	
Makes the total value of the manufactured products	\$7,772,140
Deduct the sum paid for the seed, say	4,100,000
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And there remains for value gained in manipulation of seed. . . \$3,672,140

Though a large portion of this sum has been disbursed in the process of manufacture, it is none the less a positive gain in wealth, and, with the sum paid for the seed, makes a grand total of seven millions seven hundred and seventy-two thousand one hundred and forty dollars as the result of the industry.

This does not include the gains arising from the almost endless ramifications of the manufacture, Let us enumerate some

of them. There is the freight paid to railroads and steamboats; the increase of marine tonnage brought to our wharves; and in one way and another the wages paid to thousands of laborers; besides the large demand created for sacks and bagging, it being not unusual for one mill to have in use 300,000 sacks at a time. Much more might be specified, but we think enough has been said to convince the most skeptical of the far-reaching importance of the fabrication.

Turning to the future, let us see what of promise there is in it. Estimating the cotton crop of 1879-80 at five millions five hundred thousand bales, averaging four hundred and fifty pounds each, and you have two billions four hundred and seventy-five millions of pounds of cotton. Now as every pound of cotton on an average infers three and one-half pounds of seed, the arithmetical sequence is eight billions five hundred and sixty-two millions pounds of seed. Allow for planting, feeding, fertilizing and waste, one-half—an exceedingly liberal proportion—and there remain four billions two hundred and eighty-one millions pounds of seed nominally available for the manufacture of oil, equal to (less the estimated consumption of the year) one million seven hundred and thirty thousand tons of seed, an apparent surplus sufficient for the wants of one hundred and thirty-seven additional mills. I am the more careful to say *apparent* surplus, because, while figures may not lie, they are often fallacious. What is true in the abstract may be false in the concrete. There is in fact this surplus from the territory as a whole, but it is not practically true as applied to Louisiana and to the valley of the Mississippi, the mills there not having hitherto been able to secure seed sufficient to run them more than eight months of the year. The fallacy involved in the surplus of one million seven hundred and thirty thousand tons is neither hard nor far to find. It is in the lack of transportation facilities and their unequal distribution over the broad area of cotton culture. Sooner or later this difficulty will be remedied. When the South becomes netted and fretted with railroads, then we may expect that every ton of surplus seed will be utilized and help to swell the tide of general prosperity. The Mississippi River, with its navigable tributaries, provide the fullest and cheapest transportation for all the products of the great valley they drain. Hence the larger proportion of the mills are found clustering on

her banks, and if, with such water and railway facilities, the mills have not been able to fully stock themselves, it may be true that, for the present, the industry has attained the maximum of its production in Louisiana and Mississippi. It, therefore, behooves capitalists to be cautious, at least for the present, where they invest their means in the manufacture of cotton-seed oil. We know that where there is gold, no matter how great the difficulties, men will seek it. As the products of cotton seed come into more general use they will increase in value, and as soon as they do so, railroads will be built to bring them to a market.

I come last to consider the subject as connected with our profession. Viewed from this standpoint, we are more immediately concerned with the average mill of to-day, but in discussing it, the drift of my remarks will naturally tend toward the ideal mill of the future. As regards precautions and appliances tending to improve the physical hazard, it is well we should know all about them, and keep abreast of every invention in that direction.

The consideration of the mill itself, as well as the discussion of precautions and appliances, will afford us the opportunity of putting on record a few suggestions that may be useful to our profession, and perhaps may benefit those who may invest their capital in the business hereafter.

The buildings and machinery, representing a large pecuniary value, should, for that reason, if possible, be entirely free from exposure. The buildings should be as nearly fire-proof as possible; brick is conceded to be the most suitable building material, and supplemented with slate or metal roofing, best secures that result. The space allotted to each department of the manufacture should be ample, and walls and ceilings should be smoothly coated with fire-proof mineral paint, which would facilitate the removal, if it did not prevent the accumulation, of dust and fibre, always an element of danger. The plan of the building should contemplate a division of the risk, and this has been found not incompatible with convenience and economy in carrying on the business, thus tending to greater safety, and, in case of fire, securing salvage. The main building and machinery can, in a measure, be substantially separated from the storage of the seed, sacks, bagging and manufactured

products. All safeguards and all improved appliances to extinguish fires, should be supplied and kept in order. Aside from what would seem the selfish interest of our profession, allow me to urge some reasons why we may with propriety make these suggestions. For the loss of his property the assured may be indemnified, but to the nation, for material wealth gone to smoke and ashes, there is, in one sense, no indemnity; it is lost forever. There is, besides, the economic fact that every increase of exposure involves an increase of premium which can be saved. Consideration is very properly due to the insurance capital that protects the industry, and, on the other hand, proper regard should be had for the personal safety of the operatives, especially in view of their responsibilities as heads of families, to whom any interruption in their daily labor is a calamity. Incentives of this nature are sustained by the reflection that every man owes to society an example of prudence and consideration for others.

This paper would be incomplete if I did not allude to the different hazards peculiar to the fabrication, which exist in most of the mills now working, but they can in a measure be avoided, as I will proceed to explain. In the linters the danger has been greatly lessened by the attachment of condensers which discharge the cotton in a comparatively compact form, somewhat similar to batting, thus decreasing dust and floating fibre. Another safeguard is found in the thorough sifting of the seed before going to the linters, and has a fourfold advantage: it removes a great deal of dust before the hulling process begins; it saves much wear and tear to the teeth of the saws; it lessens the danger of fire from contact of foreign substances with them, and it improves the quality of all the products. Next in order as an element of danger, we may rank spontaneous combustion. All vegetable seeds and oils have a natural proclivity in this direction. It may be caused by the lack of proper ventilation of the seed stored in bulk, or it may be due to a want of care and cleanliness in the disposition of the waste and rubbish, inseparable from the manufacture. Another source of danger is found in the friction incidental to bands and journals, but easily remedied by the use of proper lubricating oils and constant cleanliness. It is as well to say that the lack of systematic vigilance and intelligent attention, on the part of the superintendent, to

the daily and hourly working of the mill, has also sometimes ended in disaster, and should be guarded against. We have now enumerated the most common sources of danger. From my investigation of them I am encouraged to believe that they can be materially lessened.

We now come to consider the best method of extinguishing fires. Before proceeding with this part of the subject, I will state that I have found a very general concurrence of opinion among the managers of mills to this effect; that no measures adopted to extinguish fires, whether by steam, water, or water charged with carbonic acid gas, can be safely depended upon for effective service, unless supplemented by a disciplined organization of the employees of the factory to carry them out.

From my own observation, it is safe to make two assertions, the truth of which I think will be generally conceded. First, that eighty per cent. of all fires are discovered in their incipency, and would never have originated had proper precautions been taken to prevent them. Second, that when they did originate, they could easily have been extinguished had the requisite appliances been ready at hand. I say this more particularly with reference to cotton-seed oil mills, but substantially the same remarks will apply to all manufacturing risks.

Of all the methods of extinguishing fires, I am most favorably impressed with that of water charged with carbonic acid gas; not, however, dispensing with a plentiful supply of common water and the proper apparatus to utilize it. Water can be charged with five hundred times its own bulk of carbonic acid gas, and thus combined is very effective in extinguishing fires; for, as is well known, fire cannot exist in the presence of its two great antagonistic elements, water and carbonic acid gas. This is particularly true as applied to what may be termed surface fires, and oils are always such. Carbonic acid gas apparatus has these advantages: it costs less, and is more apt to keep in order than water-appliances. The stationary chemical tank, holding, say, not less than four hundred gallons, is now being generally introduced into manufacturing establishments. Assuming the tank to be in position near the engineer, and connecting with every department of the mill by stand-pipes and rubber hose, it can be almost instantly utilized by signal from a bell or electric button. The signal once given, it can be operated by a single

person, and will deliver a powerful stream, in less than a quarter of a minute, in any part of the building. One of these tanks in the Eagle and Phoenix Cotton Mill, at Columbus, Ga., recently did very great service in a serious emergency, and was the means of extinguishing what might have proved a disastrous fire. However, it is well to remember that it is only at the inception of a fire that chemical apparatus render the most valuable service; for when a certain degree of heat is reached within a burning building, the carbonic acid gas ceases to be effective. For this reason I have coupled with my recommendation of their adoption, the necessity also of a plentiful supply of common water, and the appliances necessary to utilize it; then, if the carbonic acid gas proves insufficient, the water (always a desirable adjunct), remains available. The modes of utilizing steam or water as a means of protection, have been so often treated of that I do not think it necessary to discuss them here.

We have spoken of appliances, and it is, therefore, proper that we should say a few words in reference to precautions. It seems almost presumptuous in one who has had no personal experience with either one or the other to discuss them. Availing myself of the knowledge of others, I will, nevertheless, make mention of the more obvious and necessary ones.

If it be true, that an organization of the employees is desirable to make appliances effective, it is not the less true that the superintendent should be fully empowered to prescribe, introduce, and have entire control of, all precautions his experience may dictate. Too often, from ignorance or parsimony, he is restricted in carrying out his own ideas of what is needful. This should not be. He is most responsible for the safety of the property, and should be authorized to use his own best judgment in all that concerns its protection. The linters being the most frequent source of danger, should never be left unwatched while the machinery is in motion. The walls and ceilings of the lint room should be kept free from any accumulation of dust or fibre. Of course, there should be a night watchman, whose vigilance should be controlled by some of the various devices for that purpose.

I beg to say that I had hoped, in the investigation of my subject, to gather such statistics as would enable me to arrive at an adequate rate of premium for Cotton-Seed Oil Mills, but the imperfect

data I have secured does not justify my drawing any conclusions. So far as my information shows, the average rate of premium, now paid on all the mills, is $3\frac{1}{2}$ per cent. ; but an *average* rate is not a fair criterion upon which to base the rate for any particular mill, for if there be a class of hazards where each particular risk should stand on its own merits, it is the cotton-seed oil mill. It would be in the interest of correct underwriting to adopt a basis rate of say $2\frac{1}{2}$ per cent. for standard mills, and to graduate from that figure up to 5 per cent., in proportion as each mill falls short of, or approximates, the standard. This would be just to the assured, just to the assurer, and would be an incentive to improvement in the character of all the mills.

It will interest you to know that since the war fourteen mills in all have been destroyed by fire, distributed as follows: In Louisiana, four; Mississippi, four; Texas, two; Arkansas, two; Tennessee, two; an average of one mill per annum. The origin of the fires so far as I have been able to ascertain, were, one from gross carelessness, two from spontaneous combustion, three from lack of proper precautions in the lint room, one from incendiarism, two from the addition of cotton ginning as a business, and five from causes unknown. Permit me to say that, in view of the increase of this industry in the future, it is hoped that with the progress now making in improvements and appliances, the insurance capital of the country will be justified in protecting it at reasonable rates of premium.

In conclusion, gentlemen, I must apologize for having devoted so large a proportion of my paper to the origin and history of cotton-seed oil. But as a Louisianian I am constrained to make, at least, a note of the share her citizens have had in the enterprise; to pay a tribute to the memory and worth of those who are gone; and to record with pride the value of the services rendered by all. By their foresight, genius and industry they conferred a great blessing on their country, and deserve well of it for having done so.

HENRY V. OGDEN.

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