

was desirable that the vessel's floating powers should be retained, so that she could be moved farther up the shore from time to time as her draught lightened and the tides suited. During these rebearchings, so long as the cellular iron deck remained intact, no signs of straining were observed, but after a considerable portion of this deck had been cut away and she was again floated and grounded, the strain was more than the vessel could bear, and a fracture took place in the top-side plating, which as the tide left extended toward the bilge, leaving an opening 2 ft. wide, and thus proving what a great source of strength Brunel had given to the structure by the introduction of this cellular iron deck.

This great vessel, which from various causes was such a failure financially, was at the time she was built undoubtedly many years in advance of the times. Since then the size of steamers has steadily increased, especially of those engaged in the Atlantic and Australian passenger trades, until the Atlantic liner of the present day, 600 ft. long and 65 ft. broad, approaches much more nearly to the dimensions of the Great Eastern than to those of the Atlantic liner of 1850-60. Crippled from the first by the want of sufficient capital to finish fitting her up and properly to work the vessel, she was always in troubled waters; but her failure has been more the result of such financial difficulties than due to defective design or workmanship, or unfitness for the work for which she was intended or employed in. The opening of the Suez Canal in 1869 shortened the voyage to India considerably, and the great amount of tonnage passing through it made practicable the maintenance of coaling stations, and the supply of coal *en route* with dispatch and at a reasonable cost. The *raison d'être* of such a vessel was thus annulled, and she could not take advantage of the new route in consequence of the depth of water in the canal being insufficient to allow her to pass through. The progress in marine engineering, from simple to compound engine engines, permitted the Atlantic liners with which she competed to be run with much smaller proportionate working expenses, and this, coupled with the weak financial position of the

GUN WRINKLES.

By G. D. HISCOX.

SHOT GUNS AND RIFLES.

MUCH of the satisfaction derived from the use of a shot gun or rifle is to know that its aim can be depended upon and that it is always ready for its best work.

In order to accomplish this condition the owner of a good gun should take pride in keeping it in first class order and be willing to sacrifice enough time for that work, cleanliness being of the first order.

The work of cleaning should always terminate the day's sport, or as soon as possible thereafter, by washing the bore of the barrel with hot water, wiping dry while the barrel is hot and pushing a swab slightly moistened with vaseline through the bore at least twice, and then wipe all the iron or steel parts of the gun with a cloth moistened with vaseline.

If the gun is to be put into a case, it should have a final wipe with a dry cloth, to prevent greasing the case lining.

If a rifle, examine the grooves by looking through the bore at a light, after cleaning, when, if there is lead in the grooves, it will show by a break in the continuity of the grooves; if a shot gun, by streaks or patches of a dull color on the surface of the bore.

The leading of both shot guns and rifles is lessened to a great degree by using wads that are paraffined or moistened with vaseline or clean tallow.

In breech loading shot guns using cartridges the end wad should be soaked with paraffin or tallow, while in breech-loading rifles the ball end of the cartridge should have a thin coat of paraffin or tallow.

When leading is noticed it should be removed at once by a hard wad, wet with kerosene oil and fastened to a wooden ramrod; if the lead does not come away at once, wet the bore thoroughly with the oil and let it lie for a short time or overnight, when the lead will easily separate from the barrel by the friction of the hard wad. Rifle barrels, when leaded in the grooves, are somewhat more difficult to clean. When the lead cannot be removed by the hard swab or scratch

the rod back and forth and at the same time turning it around, so as to make the sweeps cross each other to keep the bore circularly true, using oil to keep the work of the emery free. By a careful manipulation of the strokes, the choke taper can be made by gradually shortening the strokes, so at last they should stop at about two inches from the muzzle. The same shortening of the stroke should take place at the middle of the bore, so as to produce a slight increase in size toward the muzzle.

The operation of freeing alone will be a much easier one and should be done in the same manner as described above, only that the emery cylinder should protrude from the muzzle at every stroke of the rubbing operation, while for choking it should always stop at the muzzle and shorter, as before described.

A straight bore is what its name means, a perfectly straight and cylindrical gauge throughout the bore.

A modified choke bore has the muzzle only slightly drawn in on an increasing taper, commencing about one inch from the muzzle, and should be less than one five-hundredth of an inch smaller at the muzzle than the bore of the barrel at the base of the choke. A full choke bore is only a little more drawn in than the modified form. The extreme allowance for full choking should not exceed one two hundred and fiftieth of an inch less than the bore, and commencing about two inches from the muzzle.

Choke boring of any degree is made to control the scattering of the shot by impacting it at the moment of leaving the gun.

The standard gun makers of the United States make all shot guns with choke bore. English and German guns are made both straight and choke bore, the choke bored guns being stamped to designate them.

The method of loading guns or cartridges enables the sportsman to control the amount of scattering that is required. To make a scattering shot place a thin wad on the powder and a thick one over the shot; and for a close shot, reverse the order of the wads.

For velocity of shot from a shot gun, with various charges and hints on shooting on the wing, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 254. For description and illustration of a very curious property of double barrel shot guns, a lateral springing by firing, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 441. For the method of manufacture of gun barrels, see SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 24, 25, 568.

A BALL FIRED VERTICALLY.

When a gun is fired absolutely in the vertical, the ball will fall a few inches to the south and west from the gun, in northern mid-latitudes; due west at the equator, and northwest in southern mid-latitudes. This deviation of the return ball is caused by the angular displacement of the vertical or radiant line from the earth's axis, at the point of discharge; the vertical line swinging on the earth's axis as a center by virtue of the earth's revolution to a measurable amount during the upward and downward flight of the ball.

For the same reason in northern latitudes a ball fired due south will deviate to the west and when fired due north will deviate to the east.

A ball fired vertically is retarded in both its upward and downward flight by friction of the air, so that its velocity at return will be considerably less than at the moment of leaving the gun, yet great enough to be destructive in its effect. The amount of retardation depends upon the relative densities of the ball and the air. If fired in a vacuum, or if there was no air, it would return with the same velocity as that of discharge.

From a record of firing in which muzzle velocity, time and range were observed, the loss of velocity at end of flight for iron balls was found to be 46 per cent. for muzzle velocities of 1,700 to 1,800 ft. per second; and 36 per cent. for velocities of from 1,200 to 1,300 ft.

For lead balls the loss should be somewhat less, for their greater density, say 40 per cent. for rifle muzzle velocities of 1,800 ft. per second.

The height that the ball attains before commencing its return is a neutral point between its flight and return, and from which the force of impact at return may be computed from the elements of gravity and the resistance of the air.

DIFFERENTIAL VELOCITIES.

When a ball is fired from a car under high speed, its velocity is accelerated, if in the direction of the car's motion, or retarded if fired to the rear, equal to the amount of velocity due to the speed of the car.

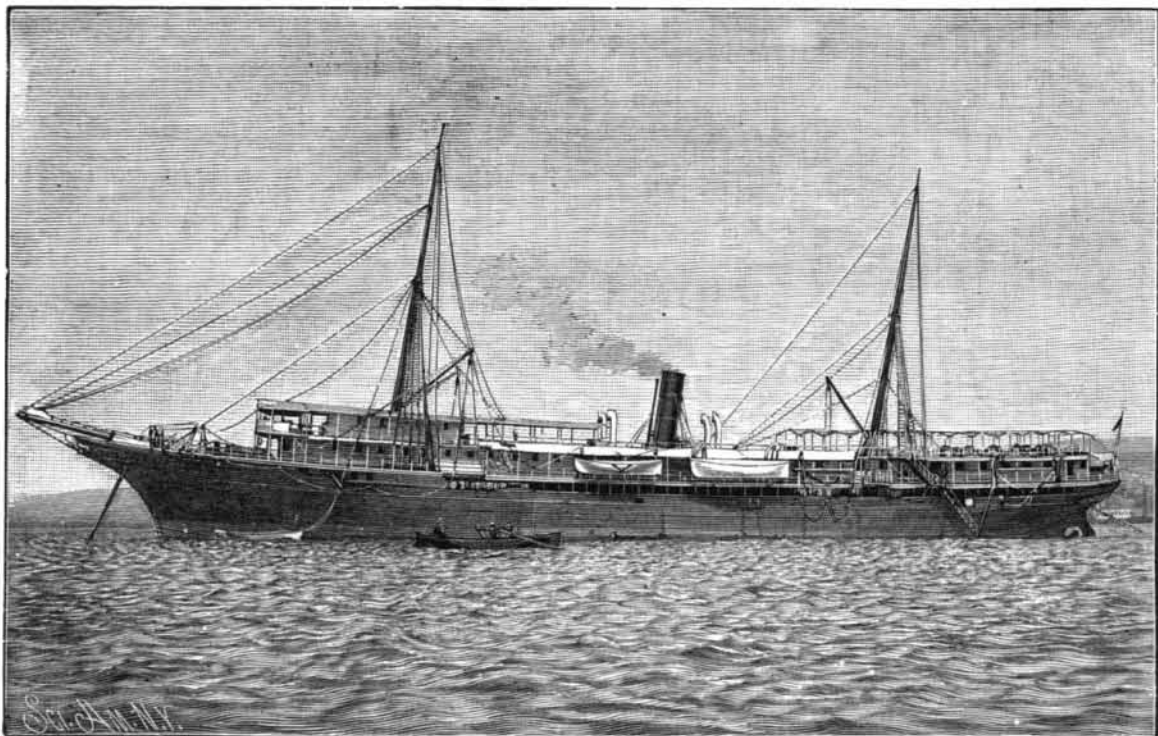
If a ball is thrown to the front with the same velocity that the car is moving, its actual velocity will be doubled. If thrown to the rear with the same velocity that the car is moving ahead, the ball will drop to the ground under the exact point that it left the hand, *i. e.*, the man moves away from the ball at the velocity of its flight.

If a ball is thrown at right angles to the line of motion of the car, it will not move in the direction of aim, but will move at an angle equal to the value of the two velocities, and if thrown at exactly the velocity of the car, it will deviate at an angle of 45° from direction of aim. This is an important point in shooting at moving objects, or from a swift-moving train. Thus a ball fired vertically from a car moving at 50 miles per hour, and occupying two seconds in returning, would strike the ground 140 feet ahead of the point from which it was discharged, less the retardation due to friction of the air; or would return to the car at the rear of the point from which it was fired.

Again, a ball fired directly at an object 500 feet off, at right angles to the direction of the car at the above speed, and with an average velocity of the ball of 1,500 feet per second, would pass 24 feet wide of the mark. This is one of the points requiring a sharp perception of the conditions of velocity in shooting birds on the wing, or animals on the run.

BLUING OF GUN BARRELS.

The most perfect method of bluing gun barrels is by heating in a muffle until the desired blue color is raised, then stopping the process by suddenly cooling in water, the barrel being first made clean and bright with fine emery cloth, leaving no marks of grease or dirt upon it when the bluing takes place. As this is somewhat difficult to accomplish in the hands of



THE CHILEAN TRANSPORT SHIP ITATA.

company owning the great ship, enabled the Atlantic liners to reduce their rates, so that, with the comparatively small number of passengers who favored her, she could not be run at a profit.

The views given are from photographs taken from time to time during the process of demolition. It was almost impossible to get a satisfactory proof, for when the camera was sufficiently near to give any idea of detail, it gave a poor idea of the vessel, and when sufficiently far off to take in any considerable portion of the vessel, all detail was lost. The above description, together with the views, will, however, give some idea of what she was like.

Fig. 1 is a general view of the vessel, showing how the three upper tiers of decks were first cut away all fore and aft down to the 30 ft. deck, *i. e.*, the lowest deck, which was 30 ft. above the inner hull. Fig. 2 is a view of the starboard side before dropping the stem and hawse pipes. Fig. 3 is a view of the starboard bow. Fig. 4 is a view looking toward the stern, and showing the double skin on the starboard side.—*The Engineer.*

THE ITATA.

WE give an engraving of this Chilean vessel that occasioned so much trouble to our naval department a few months ago. This is the boat that took on board a load of arms at San Diego for the Chilean insurgents, and contrary to the laws, sailed from the harbor, although technically under arrest. She was pursued by a war vessel of the United States to the harbor of Iquique, on the Chilean coast, there surrendered and taken back to San Diego.

Due legal proceedings were had, the vessel was recently discharged from custody, and has returned to Chile.

MODERN dwellings, and especially modern office buildings, are becoming a mass of mechanical, electrical, hydraulic and pneumatic contrivances. The putting up of a tall building requires almost as much careful engineering as in building a tower for the Brooklyn Bridge. Architects are continually calling upon civil engineers to solve the problems by which they are confronted in work of this kind.

brush after soaking in kerosene, the barrel should be thoroughly cleaned out with hot water and strong soda, to remove all traces of the oil, and dried while hot. Plug one end and pour in two or three ounces of mercury and agitate the mercury over the leaded part by tipping the barrel. This operation will make an amalgam of the lead and mercury that can be pushed out by the scratch brush and oiled swab.

A wooden ramrod should always be used in sporting and fine guns.

A steel ramrod scratches the barrel and slightly abrades or bruises the muzzle.

Any defect at the muzzle will vary the direction of the shot or ball and make the aim uncertain; much of the perfection of range depending upon the perfect form of the muzzle.

Freeing a gun is slightly enlarging the bore toward the muzzle to give it greater range, or a flatter trajectory, by lessening the friction of the charge, but not enough to increase the windage.

A perfectly cylindrical or straight bore is not the best form for a gun barrel. A slight enlargement, for a quarter to one-third of the length at the muzzle end of the barrel, of a taper form at the beginning, but straight at the muzzle, is needed for best effect. The amount of enlargement can scarcely be comprehended by observation, for it should not exceed one five-hundredth of an inch enlargement of diameter, and is usually done by rubbing with a piece of flour emery paper attached to a cylindrical rod of hard wood.

Guns that are known to be straight bore may be given a modified or full choke bore by stopping the operation of *freeing* at the muzzle, so that the bore will swell from the middle toward the muzzle and draw into the original size at the muzzle.

The operation of freeing and choking a straight bore shot gun is a delicate one, yet may be accomplished by an amateur by the use of flour of emery cloth glued around the end of a round wooden rod, the emery occupying three inches in length of the rod and when ready for use should just enter at the breech. The rod should be split with a thin saw for four or five inches from the end, and pushed through the barrel from the breech to near the muzzle, where a thin piece of wood should be entered in the split, to give the emery paper a bearing on the surface of the bore. Then draw and push

amateurs, we recommend the fluid method as being more under control.

BLUING BY STAINING.

Clean and polish the barrel to a fine even grain with flour of emery paper or cloth, then brush or rub with a sponge or rag wet with a solution of one part protochloride of antimony (butter of antimony), one part nitric acid, two parts hydrochloric acid. Add the hydrochloric acid last drop by drop, to prevent heating. As soon as the barrel is thoroughly wet, rub the surface of the barrel with a piece of green young oak wood until the desired blue color is produced.

BLACK BY STAINING.

Clean the barrel as above described and sponge with a solution of four parts of protochloride (butter) of antimony, two parts sulphuric acid, one part empyreumatic pyroligneous acid or gallic acid. Apply several coats, or until the surface is black enough.

BROWNING BY STAINING.

Clean the barrel as above and sponge with a solution composed of one ounce alcohol, one ounce tincture of iron, one ounce corrosive sublimate, one ounce sweet spirits niter, three-fourth ounce sulphate of iron, one-half ounce nitric acid, in one quart of hot water; keep in a glass bottle. Apply with a sponge or rag; expose to the air for a day; then rub with a steel scratch brush or card until the loose rust is entirely removed. Then apply the mixture again and expose as before, and a third time if the second is not satisfactory, using the scratch brush or card after each exposure, when the barrel should have a dark and even brown color.

In operating with these processes, always plug the barrel tightly at both ends.

AFTER TREATMENT.

After staining with any of the acid processes above is complete, the barrel should be thoroughly washed with boiling hot water, to clear it of all traces of acid, quickly dried, and while hot rubbed with paraffin, boiled linseed oil, or, if a varnish is preferred, use shellac varnish or copal varnish on a piece of soft leather; wiping the varnish on quickly and thin, so as to make a smooth, even finish.

For keeping barrels from rusting when in use and where conveniences for heating are not at hand, the frequent wiping of the barrel and all iron or steel parts with a rag moistened with vaseline, which can always be kept ready for use in a small tin box, will be found most effective.

MOTTLING OF GUN TRIMMINGS.

The mottling of locks, hammers and trimmings of guns is done by the casehardening process, and has no further peculiarities than the protection of the surfaces from the oxidizing effect of air while in the process of heating, and the rapidity of transfer to the water when at a proper heat for hardening. The process consists in packing the pieces carefully in animal charcoal, such as charred leather, scraps of hoofs or horns, charred and pulverized so as to allow it to pack closely in contact with the surface of all the articles in an iron box (cast iron preferred), with a cover to fit closely inside, so that, if the box is not full, the cover will set in contact with the material.

Pack so that no piece touches another on their faces or sides that are to show mottling; press the cover down and put a little fine sand on top around the edges, to prevent air entering between the cover and box. Heat the box in a forge or furnace fire to a bright red heat; keep it at this heat for fifteen to twenty minutes, according to size of box, then take off the cover and seize the box firmly with a pair of tongs; hold it over a tub of water, tip the box and spill gently the contents (iron and charcoal) into the water. The time of dropping the pieces into the water governs the depth of color, and this must be had by practice. Turning the box over slowly and at the same time shaking it clears the pieces from the charcoal and gives each piece a short exposure to air while hot; which gives it its color or cloudiness.

The distance that the box may be held above the water may vary from six inches to two feet. Also varying the depth of color and the various positions in which each piece touches the water gives variety to the figures and shades.

The work should be immediately taken from the water and dipped in boiling hot lime water, dried and oiled.

THE ETCHING OF NAMES, CRESTS OR MARKS.

The process of etching a name or crest is not difficult, but should be confined to the lock or a plate let into the stock; the lock is a favorite place.

The piece should be made clear of oil, grease or varnish by cleaning with turpentine or caustic soda. A thin coat of asphalt varnish may be spread on the surface with a camel's hair pencil, or a mixture of asphalt and beeswax dapped on the warmed surface with a cotton wad in a piece of silk. Then with a steel point trace the name or design by scratching the lines down to the surface of the metal, so as to leave none of the varnish or wax on the surface that is intended to be etched. Then make a roll of beeswax soft by warming, flatten it and lay a border all around the design to keep the acid from spreading where it is not wanted. For the etching acid prepare in a small bottle one part nitric acid, four parts water, two parts acetic acid, and pour enough on the etching to cover the surface. It should bite sufficiently deep in from ten to fifteen minutes. If the acid does not seem to take hold evenly, which will be known by the rise of little bubbles from all the lines, make a voltaic circuit by bending a small strip of sheet zinc and touching the metal outside of the wax wall with one end and the surface of the acid with the other end. An active evolution of gas bubbles from the etched lines will at once show the action of the acid. When the acid bite is thought to be sufficient, pour off the acid and wash, then remove the wax border and clean off the etching wax by heating and wiping or with turpentine.

Another style, where a name is bright with an etched background, is done by writing the name with a fine camel's hair pencil with thin asphalt varnish,

and inclosing a space around it with the brush and varnish; then make a wax border and etch the background as above described.

[FROM THE CHATTANOOGA TRADESMAN.]

COTTON SEED OIL AND THE PRODUCTS OF THE COTTON SEED.

By D. A. TOMPKINS.

FROM time immemorial the praises of the olive tree have been sung both in sacred and profane literature.

For centuries before and after the Christian era it was held, and is still held, in the highest esteem. This high estimation in which the olive tree is and has ever been held comes undoubtedly from the fact that in its fruit and oil mankind has heretofore obtained more from it that is useful than from any other plant or tree.

It was an olive branch that the dove brought back to Noah in the ark to give courage and hope to the survivors of the flood. The olive branch is well nigh a universal emblem of peace among all peoples.

In ancient times, and in many countries still, olive oil is the principal and in many cases the only cooking grease. Our Anglo-Saxon habit of using animal fats in its stead is the exception, and not the rule. In the Arabian Nights the forty thieves were concealed in jars that were supposed to contain oil.

Throughout the same ages the cotton plant has always existed, but remarkable as it may seem, its value seems never to have been understood until within the past twenty-five years.

The three prime necessities of the human race are: Food, clothing and shelter.

Toward supplying these, the olive tree furnishes its fruit and oil for feed, and in a very limited extent its wood for construction.

The cotton plant now supplies lint from which clothing, for the body, the bed and household (carpets) are made. It supplies oil for cooking purposes, and for many industrial uses—for use in lamps in mines, for lubrication in cutting threads on pipes and bolts, for making soap, glycerine, candles, butter, lard and innumerable other uses.

The cotton seed meal is used for supplying ammonia and other constituents in commercial fertilizers, for food for cattle and dairies, for fattening beef, sheep, and for various other purposes. Lately, however, it is being largely used as a food for cattle and sheep. This is especially the case at dairy farms, where cattle are being fattened for beef, and at saw mills, where oxen are used to haul logs.

In truth we are suddenly brought to a realization of the fact that the cotton plant gives us more than the olive tree ever gave to mankind, and for protecting machinery and methods for the protection of useful products from cotton seed, values which have for centuries been unknown have suddenly been brought to light. The men who have been most instrumental in the production of valuable products from cotton seed have been doing a work not only for themselves, but for the country at large and for civilization.

The First Cotton Seed Oil Mills.

A man named Martin operated a cotton seed oil mill in New Orleans as far back as 1847. But few other mills were built prior to the civil war.

Immediately after the civil war of 1860 to 1865 several mills were built, some of which succeeded and some failed. By 1870 the business of crushing cotton seed had developed into a distinct and entirely legitimate business, but the processes employed and everything pertaining to the industry were held in great secrecy.

The oil was found to be about the same as olive oil, and the meal was largely exported and used in England and on the Continent for stock feed. What was purchased in America was principally used as a fertilizer.

The oil was used principally as a substitute for an adulterant of olive oil, and readily sold for 50 to 60 cents per gallon, crude.

Those mills that were managed with even a rough approximation to ordinary care and business judgment made very large profits.

As the business still developed, and the price of oil became less, the pork packers discovered that by adulterating it with beef stearine it could be sold as lard.

Since its introduction to this use large and increasing quantities have been consumed by the pork packers. Since about 1880, the consumption of cotton seed oil has been largely increased by its use for packing sardines on the coast of Maine, for making butter in America, Holland and elsewhere, and for innumerable other purposes.

The Machinery Used.

The principal machinery used in the earlier cotton seed oil mills was brought from England. It was no doubt such heaters and presses as were used to crush oil from linseed, some Egyptian cotton seed and other oil seeds that were produced or shipped to England.

The Egyptian cotton seed are black and lintless, very similar to seed from sea island cotton in this country.

The process of working them was very simple. They were first crushed under old fashioned milling stones, then put in steam jacketed kettles with mechanical stirrers and cooked. The product was dumped from the kettle or heater into a wooden bin, and from the bin it was put into small cloth sacks, these being in turn inclosed in a hair mat. The whole was put into a hydraulic press containing about five boxes, and put under about two to three thousand pounds pressure to the square inch, on rams ten to twelve inches in diameter.

The upland American seed are not entirely free from lint. On account of the quantity of oil this lint is capable of absorbing, and also on account of the injury the lint is to the cake as a feed stuff, it was important to separate the hull from the meats.

This was accomplished by the use of a huller, a machine to cut seed to pieces, and then screening out the meats from the hulls in boiling chests having the reel clothed with wire cloth.

The earlier mills built were either built by foreign mechanics or native Southern mechanics of ante-bellum

type, both of which are dogmatic, opinionated and incompetent. It commonly required about

Two Years to Build a Mill

and get it in successful operation.

Up to about 1880, the owners and the mechanics, who knew the process, maintained the greatest secrecy possible, as to the cost of a plant, the profits and the manner of its operation.

The new condition of things brought about by the results of the war in the South developed very quickly a much better class of mechanics and engineers than foreign and "rule of thumb" native mechanics that had formerly held sway. Some of the new men were native and some came from the North. About 1880, some mills were brought to a degree of efficiency and economy of operation far exceeding what had before been accomplished. The mills of George O. Baker, of Selma, Ala., and O. O. Nelson, Montgomery, Ala., were notably more improved than the average about this time.

In 1883, Mr. Fred Oliver went from Cohoes, New York, to Charlotte, N. C., and established an oil mill. It was very soon made apparent that the so-called oil mill experts had some mechanical ideas that were very crude and had little or no capacity to make designs of manufacturing plants. He, therefore, abandoned all effort to have a mill built by the experts and undertook the work himself, aided only by some conferences on mechanical matters with the writer and Mr. Liddell, from both of whom he purchased some of his machinery. This mill was an unqualified success and in its construction many mechanical faults of older mills were eliminated.

Only a little before this, the increased production of oil and the improvements made in new mills caused some of the older mills alarm. In Arkansas and Texas the field for seed was being more and more actively worked. The outcome of this competition was

The Formation of a Trust.

into which four mills of Arkansas and Texas entered. The original idea was to protect the four mills from the competition with each other. To the surprise of the formers of this trust, it was found that other and more successful oil mill companies became alarmed and interpreted an action that was an evidence of weakness as an evidence of strength. Every mill owner wanted to get into the new trust. The terms of the deed of trust were kept strictly secret, yet the less a mill man knew about it, the more he wanted to get in. Some few objected, but threats and claims of untold power on the part of the trust ultimately caused the bulk of all the mills to go in. Those few mills that stayed out reaped a rich harvest. The formation of the trust was begun about 1882, and the last mills were taken in about 1887.

Many of the men who best understood the oil mill business had been constrained by their own judgment to go into the trust because their mills were becoming old and unfit to compete with the new mills then being designed and built by competent engineers.

The mill built by the Oliver Bros., at Columbia, S. C., in 1884, was probably the first oil mill ever built from carefully prepared plans having in view complete organization of all the machinery.

Almost all the mills that comprised the trust were old and much worn. The insurance rates in them ranged from six to nine per cent. with very few exceptions. The operation of many of them was discontinued entirely. Nevertheless, it seemed for a while as if the trust was in possession of the cotton seed oil business, for it was plainly intimated that any new mill would be crushed.

The only hope of the trust for success was to control the business and keep the price of seed low and of product high. Most of their mills could not be operated with competitive economy. During the one year in which the trust had practical control about four hundred thousand tons of seed were purchased at an average price of three dollars per ton lower than they would have brought in a competitive market, being the equivalent of about one and a quarter million dollars.

Loss to the Producer on Seed Alone.

Just at this juncture the idea was conceived by Mr. Fred Oliver of arranging a company to build a series of new mills so located as to cover the entire seed territory. He associated with him Mr. Henry C. Butcher, of Philadelphia, and others, to organize the Southern Cotton Oil Company, which was accomplished in the spring of 1887.

The trust was exceedingly confident of their ability to cope with any new company. Their experience in mill building had been that it took about two years to build a mill and get it in successful operation. They ridiculed the idea that the proprietors of the Southern Cotton Oil Company could build and put in operation eight large mills in less than one year.

Plans of all the mills were made in complete detail. Eight skilled managers were engaged, one to take entire charge at each of the points selected, and the eight mills were successfully built and put in operation in about six months' time from the time work was begun, and the company crushed about two hundred thousand tons of seed the first season. The trust suffered so much in the competition that some of the principal officers were compelled to resign, and the trust properties went into new hands and its financial affairs were put under new management. Propositions were at once made for some sort of coalition with the new company, and a "working arrangement" was ultimately entered into by a vote of the boards of the two companies. This arrangement was entirely unsatisfactory to the Olivers and their friends of the Southern company, and they sold their stock and severed their connection with the company in the spring of 1889. Three new companies were immediately organized one by Mr. Fred Oliver, at Charlotte, N. C., one by Mr. John Oliver, at Atlanta, Ga., and one by Mr. J. S. Price, at Houston, Texas. By the influence of this movement about twelve other smaller companies were organized in the same year, and the oil business was again open to any one who wanted to go into it on a competitive basis. In the last two years about fifty new mills have been constructed, all of which are now in more or less successful operation. By reference