SCIENTIFIC DIVERSIONS.

Street venders are often seen selling, at night, a little mouse which they place upon the back of their hand, and which keeps running as if, having been tamed, it wished to take refuge uponthem. In order to prevent it from attaining its object, they interpose the

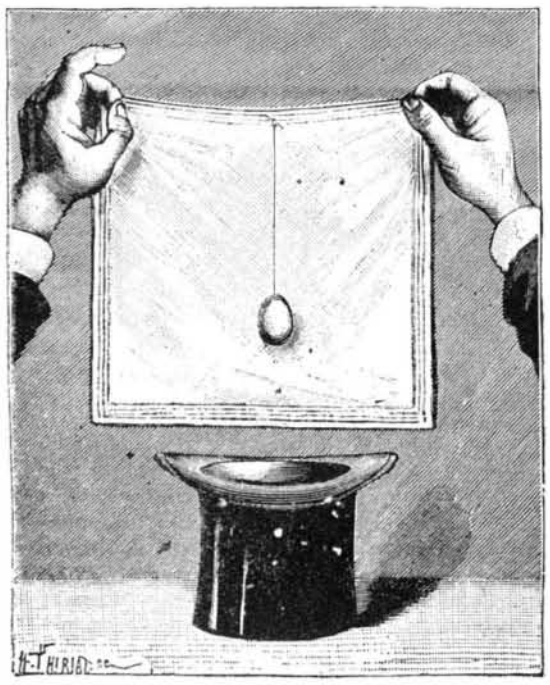


Fig. 2.—THE EGG AND HAT TRICK.

other hand, and then the first one, which is now free, and so on. The mouse keeps on running until the vender has found a purchaser for it at the moderate price of two cents, including the instructions for manipulating it, for, as may have been divined, it is not a question here of a live mouse, but of a toy. This little toy is based upon two effects—first, an effect of optics, and second, the effect due to an invisible thread.

The mouse, which is flat beneath, is provided near the head with a small hook, and the operator has fixed to a buttonhole a thread ten inches in length terminating in a loop. He fixes this loop in the hook above mentioned, and, tautening the thread, places the mouse upon the back of his left hand (near the little finger, for example).

On moving the hand away from the body, the mouse, which does not stir, seems to slide over the back of the hand, and, at the moment that it is about to fall on reaching the thumb, the right hand, passed beneath, arrives just in time to catch it near the little finger, whence, by the same movement as before, it seems to go toward the thumb (Fig. 1).

In order to perform the experiment off-hand, it suffices to take a cork and carve it into the form of a mouse, then cut away the under part of the animal thus rough-shaped, so that it may lie perfectly flat, then make two ears out of cardboard, and a tail out of a piece of twine, and finally blacken the whole in the flame of a candle. After this, the black thread, terminating in a ball of soft wax or a pin hook, having been fixed to a buttonhole, allow the spectators to examine the mouse, and, after it is returned to you, fix the thread, either by its ball of wax or its hook, to the front of the flat part of the rodent, which you may then cause to run as above described.

Another effect due to an invisible thread is the following:

Some months ago, in a Parisian public entertainment, a clown took a hat and a handkerchief and then, after showing, by spreading it out, that the handkerchief was empty, drew an egg from the folds of the crumpled fabric and allowed it to drop into the hat. Then he took up the handkerchief, shook it out again, crumpled it up, found another egg, and let it drop into the hat, and so on. When it might have been supposed that the hat contained a certain number of eggs, he turned it upside down, and, lo and behold, the hat was empty! All the eggs from the handkerchief were reduced to a single one attached by a thread to one of the sides of the handkerchief, and which the amusing operator maliciously exhibited, after seeming to look for the vanished eggs.

While the handkerchief was stretched out, the egg was behind it, and, although it was shaken, remained suspended by its thread. In crumpling the handkerchief it was easy to seem to find the egg in it, and to put it in the hat, where it did not remain, however, for, lifted by the thread, it resumed its place behind the handkerchief. Fig. 2 shows the handkerchief at the moment that the egg has been removed by the thread on the side opposite that of the spectators.

On attaching a black thread, 16 or 20 inches in length, to an empty egg, and selecting the egg thus prepared from a lot of ordinary eggs, as if by chance, we have a ready means of amusing and mystifying spectators for a long time. Having hooked the free extremity of the thread to a buttonhole of the waistcoat, let us lay the egg upon the table. After apparently ordering it to approach us, it suffices to recede from the table to make the docile egg obey the command. By the same means, it may be made to make its exit alone from a hat, or, again, by bearing upon the invisible thread, it may be made to dance upon a cane or upon the hand, in a word, to perform various operations that eggs are not accustomed to perform.—*La Nature.*

THE MAUSER MAGAZINE RIFLE.

In the Mannlicher rifle, the magazine is permanently attached to the weapon, and every cartridge used is first put into the magazine. To enable this to be done, and at the same time to raise the average rate of firing, as compared with a single loader, the cartridges are issued in sets of five carried in steel clips or holders. The complete set or bundle is placed in the magazine with nearly as great ease and celerity as a single cartridge can be placed in the body or the chamber of the rifle. After every five shots there is a momentary intermission for reloading, but it is very short. If the magazine be empty, it is quite possible to use the rifle as a single loader. This principle of loading by means of a cartridge holder which goes bodily into the magazine has been adopted in Austria and Germany.

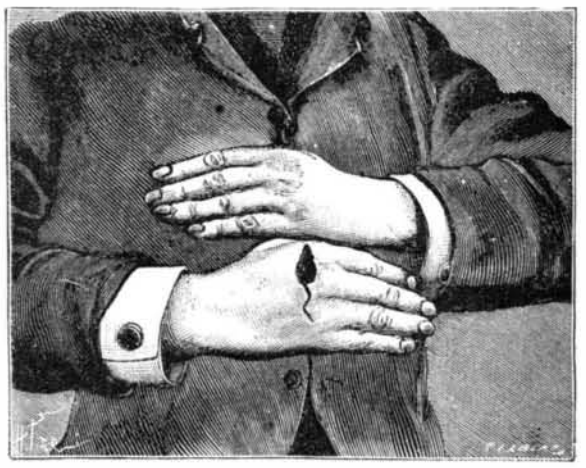
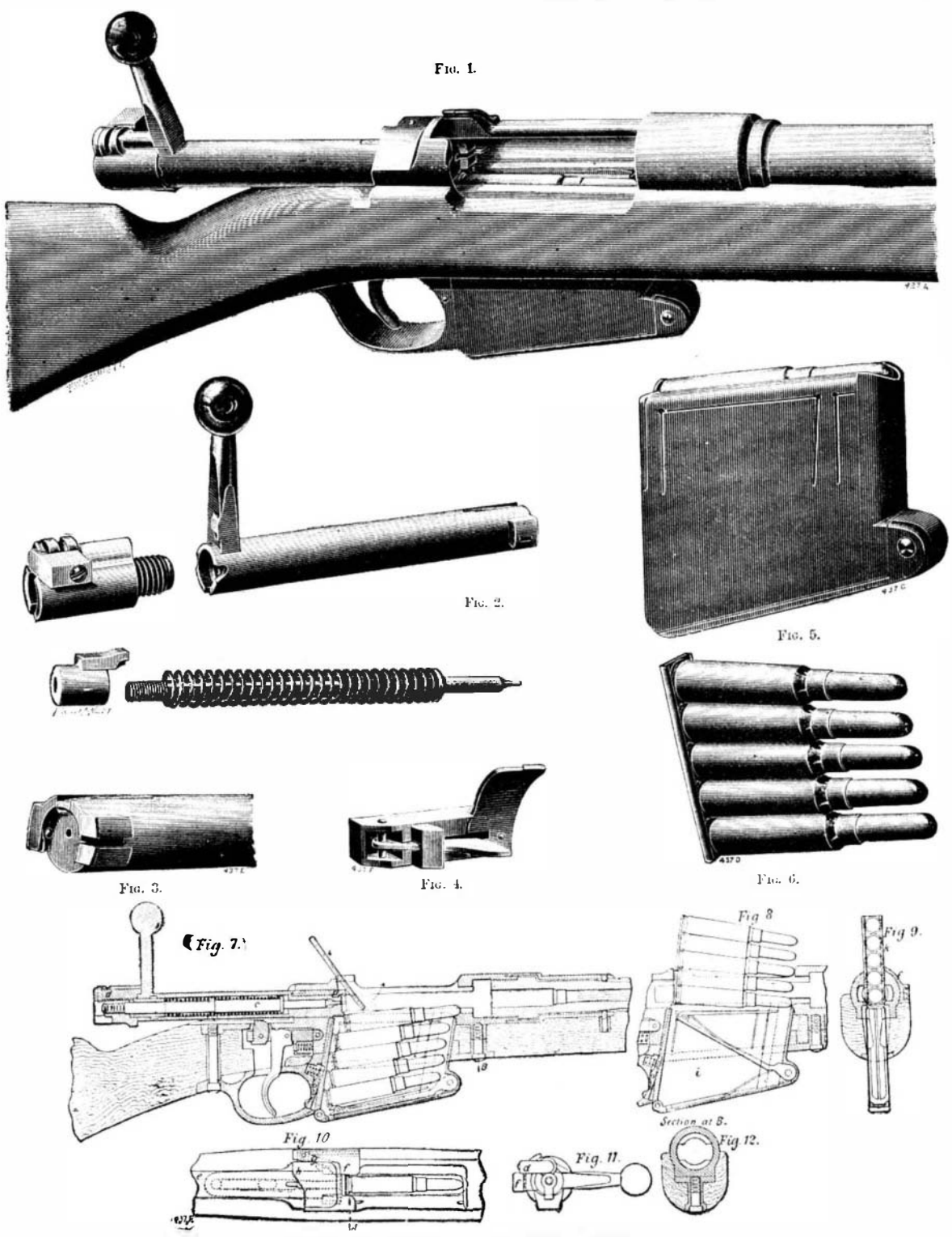


Fig. 1.—THE ANIMATED MOUSE.

A third type of magazine rifle is that invented by Mr. Mauser, and adopted by the Belgian, the Turkish and the Argentine governments. It has a magazine which, although not absolutely fixed, is not intended to be removed except at considerable intervals for purposes of cleaning. The cartridges are issued in sets of five held together by clips or holders, but these clips do not go into the magazine, and form no part of the equipment of the rifle. In other words, if the clips should become rusty, or be bent by blows or pressure in packing, the soldier would still be able to use his magazine, a condition of affairs which would not obtain if the cartridge holders had to be placed bodily in the magazine. A concurrent advantage of this arrangement is that the bottom of the magazine does not need to be left open for the clip to fall out when emptied. If an open-bottom magazine be rested on damp ground, as would be the case with the marksman lying down, mud or wet is almost certain to enter the opening, with the likelihood of rusting the interior of the magazine. Should this occur the cartridge holders would not fall out, and possibly the feeding spring itself would be rendered useless. In the Mauser system the cartridges in their holder are placed directly over the mouth of the magazine, and by pressure of the thumb are fed out of the holder into the magazine, as will be better understood when we come to describe the mechanism in detail. The holder falls away and ceases to be an element in the affair. Further, the Mauser rifle does not need a cut-off to render it a good single loader. The soldier may keep his magazine full during the early part of a fight, reloading after every shot if he likes, and thus preserving his store intact against the supreme moment. This cannot be done with either the German or Austrian rifles; they are only available as single loaders when the magazine is empty. Neither can a half-empty magazine be replenished in them without sacrificing the cartridges which it contains.

The construction and mechanism of the Mauser magazine rifle are clearly shown by the illustrations. Fig. 1 shows the body of the weapon, with the bolt



THE MAUSER MAGAZINE RIFLE.

drawn back and the magazine full. Fig. 2 shows all the parts of the bolt with the striker. Fig. 3 is a view of the end of the bolt with the extractor. Fig. 4 is a separate view of the piece marked *f* in the details. Figs. 5 and 6 show the cartridges and their holders. Figs. 7 to 12 show details.

The system of loading by means of a temporary clip is clearly brought out in the engravings. The clip itself, *k*, is a piece of thin plate steel bent over at its edges to form a groove or rebate in which the flanges at the bases of the cartridges fit. This groove is quite open at either end, so that the cartridges are free to slide out. To prevent them chattering out during transit, or while in the soldier's pouch, a light spring, made of a piece of wavy steel ribbon, is laid in the bottom of the groove and holds the flanges of the cartridges firmly against the turned-over edges of the steel strip. The whole packet is quite firm and compact, so that it can be handled without the slightest danger of falling apart. But if pressure be applied to the cartridges in a line parallel to the clip, then they can be readily made to slide out of the groove. Provision is made in the body of the rifle (Figs. 1, 8, and 9) for holding the clip perpendicularly, or nearly so, over the mouth of the magazine in such a position that a moderate pressure applied by the thumb to the upper cartridge will feed the whole of them downward into their places. The clip is left standing, supported at the sides and the bottom by the solid metal of the rifle body, and held by the elastic pressure of the piece, *f* (Figs. 4 and 9). The first movement of the bolt (Fig. 7) throws out the clip, and the piece, *f*, springs back into place.

In the Mauser magazine the cartridges are pushed in sideways, and yet the spring does not force them out again as soon as the pressure is withdrawn. This most convenient arrangement results from the construction of the magazine, *i* (Fig. 5). The lips are turned over for nearly the entire length, but they are divided by a straight cut from the sides, and are so elastic that they readily spring apart to receive a charge. They are, however, sufficiently strong not to be opened by the elastic pressure which forces the cartridges upward. The base of the top cartridge projects above the mouth of the magazine sufficiently to be caught by the bolt, *a* (Figs. 1, 5, and 7), when it is moved forward, forcing the point of the bullet up an incline into the barrel, and thus springing apart the lips of the magazine to allow the cartridge to escape from it.

The magazine itself is exceedingly compact, not interfering with the grasp of the soldier in firing. The construction of its feeding arrangement is seen in Figs. 7 and 8. This is formed of two leaves, each acted upon by a spring. This feeding arrangement can be easily got at for cleaning or repairs. The bottom of the magazine is pivoted at its rear end, and secured by a screw at its forward end (Fig. 7). If this screw be withdrawn a few turns, the bottom of the magazine, with the spring attached to it, drops down, and a few turns more enable the feeder to be detached and withdrawn. The screw is still engaged for more than half its length in the thread, so that there is no likelihood of its being dropped and lost. The magazine is secured by a catch lever which takes into a depression in its rear end. By pressing on the button which comes through the front of the trigger guard the catch lever can be withdrawn and the magazine liberated. This operation can be performed in a few seconds, but it is not intended that it shall be carried out on the field of battle. The bottom and ends of the magazine (Fig. 8) are thick and solid, and are capable of withstanding a very severe blow, while the sides are to a very considerable extent protected by the stock. Of course any part of the magazine would be irretrievably damaged if struck by a bullet, but the same thing is true of the soldier.

The bolt is of great simplicity. Apart from its cocking arrangement, it is merely a hollow cylinder of steel with a handle at one end and two locking lugs at the other. These lugs (Figs. 2, 3, 9, and 12) slide through two grooves in the breech of the gun, and on the bolt being rotated lock behind two projections. In fact, they constitute an interrupted screw. The strain of the explosion is thus borne by the base of the bolt and the breech of the barrel and is not transmitted through the body.

The Mauser extractor (Figs. 2, 3, and 7) is a spring let into the bolt with a hook protruding into the recess which receives the base of the cartridge. In extracting, the handle of the bolt moves along an incline, *h* (Figs. 1 and 10), on the body, and in doing so it is drawn back about ⅛ in. This motion has the effect of freeing the cartridge, even if it be jammed, and while it is taking place, the soldier has very considerable leverage to aid him. The shape of the recess at the end of the bolt is worth noticing (Fig. 3), for upon it depends the extractor getting hold of the cartridges, which are made with a groove round the base.

The gate which is cut through one of the locking pieces on the end of the bolt is made to accommodate the piece, *f* (Figs. 1 and 4). A blade hinged to this piece projects into the body of the rifle and passes through the gate when the bolt is drawn back. This gate is so deep that the blade is pressed by a spring into the path of the empty case, forcing it out of the grasp of the extractor, and flinging it sideways out of the arm on to the ground. Also connected to this piece, *f*, is a stop which normally prevents the bolt being drawn out of the gun. But by pressing back the piece with the thumb the stop is withdrawn, and the bolt can be removed in less than a second. It can then be taken entirely to pieces (Fig. 2) in a couple of minutes, and this without tools. It has a very powerful mainspring. This is provided to meet the requirements of the thick cartridge cases which are likely to be employed with smokeless powders. Smokeless powders develop such high pressures that it is probable they will require more substantial cases than have been employed with black powders. There is a very neat device for preventing the cartridge being exploded before the bolt is securely locked; compared with the arrangement used in our own weapon, the simplicity is most striking. It will be seen that a deep notch is cut in the rear end of the bolt (Fig. 2) to receive the cocking catch; it is only when the bolt is securely locked that this notch is opposite the catch. If the trigger be pulled with the parts in any other position than the right one, the striker cannot reach the cartridge, and consequently the fulminate is not exploded.

To lock the rifle, so that it may not be accidentally fired, there is provided the safety appliance, *d*, on the end of the bolt (Figs. 2 and 7). This is a short spindle with a cam at each end, and a roughed thumbpiece by which it can be turned half way round. When the spindle is rotated, the cam at the front end takes into a recess on the end of the bolt, and locks the latter against being turned, while the cam at the rear end inserts itself before the nut on the end of the striker, and holds it fixed.

The barrel is turned parallel to two diameters, the front portion being rather more than half the length. The body is secured to the wooden stock (Fig. 7), but the barrel is only clipped to it, and is left perfectly free to expand and contract. It lies in a deep groove in the wood, and is held in place by two perfectly parallel clips which serve only as guides, and do not fetter the movements of the barrel. The bore of the barrel is 7·65 mm. (0·301 in.). The front sight is a barleycorn; it is mounted on a ring which is slipped over the end of the barrel up to a shoulder and is brazed there. The back sight is marked up to 2,050 meters.—*Engineering.*

Truck Farming.

The United States census office has recently issued some highly interesting statistics of truck farming in the United States, as distinguished from market gardening, which is conducted so near to the local market that the farmer depends on his own team for transportation. The average truck farm is situated a great distance from the market in which its produce is disposed of. It is a new feature introduced within the few last years, except the little which used to be possible by canal. It is the modern railroad that has rendered possible the truck farm, and this partly accounts for the fact of its neglect in previous census compilations. Not that there was no truck farming in 1880, but the volume of it was vastly less than now.

It is estimated that upward of $100,000,000 is invested in the industry in the United States, the annual production being three-quarters of this amount, or $76,500,000, realized from 534,440 acres of land. In the work are engaged 216,765 men, 9,264 women and 14,874 children, who are aided by 75,868 horses and mules, and use nearly $9,000,000 worth of agricultural implements. The industry is carried on in nearly all the States, but the principal districts are a narrow belt on the South Atlantic coast and along the Mississippi Valley. The more fertile soils are chosen, labor and the railroad do the rest. The big cities are the best customers of the truck farmer, the wants of the people in the smaller centers of population being to a large extent supplied from the immediate neighborhood, and they take less per capita of that grown in other climates than their own.

The merchants of Chicago draw hither the fruits of Georgia, Florida, the West India Islands and Central America, the peaches and berries of Illinois and Michigan, Indiana, Ohio and Missouri, apples, grapes and pears from California, and cranberries from the marshes of Wisconsin. And the range of their distributive work is almost equally wide.

Few people have a correct idea of the effect this business has on transportation. In the season for most of the fruits special trains run each day from the producing districts to this city, the peaches and strawberries load down the boats which ply regularly between Chicago and the ports on the opposite shore of Lake Michigan, and hundreds of persons are employed here in the work of receiving, besides the thousands who find employment in handling the material at other points while it is being collected and distributed after having been raised by an army of workers. And, as previously stated, all this is of modern origin. The vast increase to human comfort permitted by the enjoyment of the products of other areas than those which surround the consumer, and the concomitant benefit to the many who in this direction minister to the supply of what may be called necessary luxuries to their fellow creatures, is the outgrowth of the present generation, which, by making railroad transportation far-reaching, speedy and cheap, has permitted the interchange of commodities on a scale that would never have been dreamed of by the people of fifty years ago. —*Chicago Tribune.*

The Sinking of the Utopia.

Here we have a Clyde-built steamer of 2,700 tons, long engaged in the Atlantic passenger trade, which leaves Naples for New York with 800 Italian emigrants on board, puts into Gibraltar to fill up with coal from her owner's coal hulk, and while preparing to drop anchor, collides with a warship, and, as a consequence, more than five hundred of those on board are drowned within view of the shore.

It is not our function or purpose to blame any body for this terrible loss of life, nor do we suggest that, in view of what are the usual conditions under which the ocean passenger trade is conducted, there is any special blame to be attributed to any one in this case. On the contrary, it is to be feared that what happened in Gibraltar Bay on March 17 might have occurred to ninety-nine out of every hundred steamers at present afloat; and that as regards casualty by collision, the safety of passengers on the sea is for the most part to be found in the skill and care of the navigators rather than in the design of the vessels themselves. The shell of the strongest ship is necessarily so thin that contact, when in motion, with anything harder than water must inevitably result in penetration and the admission of the sea. After that the fate of the passenger depends upon the capacity of the compartment into which the water flows. If the compartment is so limited in size that when full of water to the sea level the vessel has still sufficient buoyancy to keep afloat, and if the bulkheads bounding the compartment are sufficiently strong to endure the strain thus brought upon them, then the passengers are safe. Safe for a time, at least, until they can be removed from the damaged ship, and altogether safe if favoring conditions of wind and sea enable her to reach port in her injured condition, as did the City of Paris last year. The worst place in which any steamer's side can be penetrated is abreast her machinery or boilers, as then her propelling power is lost. But if that space is so large as to admit water enough to sink the ship, then the mischief is at a maximum. This was the case with the Utopia, and her fate would be shared by the great majority of her sisters in the mercantile marine if similarly circumstanced.

But should such a fate be a necessary consequence of such an accident to a passenger steamer? The best answer to that question is afforded in the statement that such a fate would not befall certain passenger steamers if injured as was the Utopia. There are many vessels afloat, and several now being built, which, had they been borne down upon the Anson's ram, as was the ill-fated Anchor liner, would now be afloat without the loss of a soul. Why, then, should not all certified passenger steamers be so constructed? Why should any steamer constructed otherwise be certified as fit to carry passengers? We leave these questions to be answered by those who alone are in a position to afford authoritative replies.—*The Engineer.*

The Textile Industries in Maine.

The capital invested in cotton manufactories in Maine is $15,292,078, and capital invested in Maine woolen manufactures $3,876,028, a total of $19,168,106. The cotton mills use 13,586 horse power water and 1,875 horse power steam, a total of 15,461 horse power, and the woolen mills 3,406 horse power water and 404 steam, amounting to 3,810 horse power, the total horse power for cotton and woolen being 19,271. The cotton mills employ 859,890 spindles and 22,698 looms, and the woolen mills 358 sets of cards and 1,577 looms. The product of the cotton mills aggregates 204,282,000 yards per year, equivalent to 116,069 miles of cloth. The value of the annual product is for cotton $13,319,363 and woolen $6,686,073, a total of $20,005,436. The cotton mills pay in wages $2,936,640 and the woolen $1,044,606, a total of $3,981,246. The cotton mills employ 11,759 hands and the woolen mills 3,095, a total of 14,854 hands.

California Tin.

The first ingots of tin ever made in California lately arrived in San Francisco from the mines of the San Jacinto estate, Cajalco, San Bernardino County. These are what were known as the Temescal tin mines, which were discovered many years ago. Litigation and other causes have prevented the claims from being developed, but now an English company has purchased and equipped them for active work. Oil fuel is used in the furnace, this being much cheaper in that region than coal. The experiments with the reverberatory furnace and oil fuel seem to be successful.