THE LOUISIANA SULPHUR WELLS.

BY PROF. J. B. FRAUCKHAUSER.

From your issue of December 21, 1895, the readers of the SCIENTIFIC AMERICAN have already gathered some information about the valuable sulphur mines of Southwestern Louisiana; hence the present article, giving a more detailed account of the manner in which the mineral is extracted from the bowels of the earth, will, I hope, prove of no little interest.

Since 1870 company after company failed in the attempt of establishing mines in Calcasieu Parish, La. The main difficulty to be overcome, which for the last thirty years has exercised the ingenuity of many an engineer, is the layer of quicksand, from four to five hundred feet in depth, covering the sulphur in question. The first company that grappled with this difficulty brought to the spot immense cylinders of steel, with the intention of sinking them to the required depth and using them as walls for the shafts. After considerable labor, an outlay of many thousands of dollars and even the loss of several lives, they abandoned the enterprise as practically impossible. The next company that was tempted to mine these same extensive veins of almost pure native sulphur put up immense refrigerators, and attempted, but to no avail, to "neutralize" the layer of quicksand by freezing it into one solid mass. After these and other attempts and subsequent failures it was clear that, if ever Louisiana was to place its sulphur on the world's markets, a completely novel method of mining it was to be invented.

The company now in charge bought some two years ago at Sulphur Mines and vicinity considerable tracts of land and began operations soon after. New failures were predicted until it became known that Mr. Herman Frasch, scientist and engineer, of Cleveland, Ohio, had entirely revolutionized sulphur mining by his new and ingenious process.

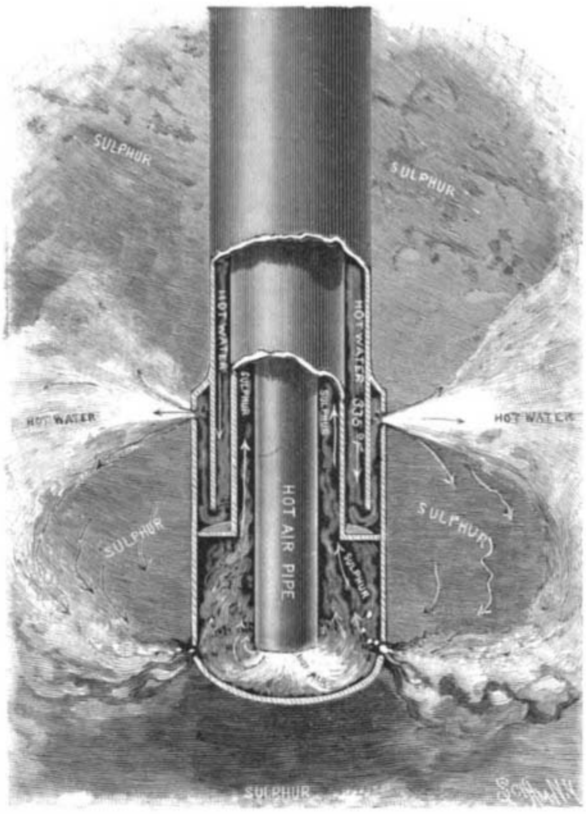
Everybody is acquainted with the method of mining salt in our Northern salt wells. Water is first pumped into the well, becomes saturated, and is then pumped up again. The salt is thence easily obtained. As sulphur is not soluble in water, the same process could not be used. Mr. Frasch, however, solved the difficulty by having recourse to heat. His process, similar in many particulars to the one just referred to, consists in melting the sulphur in its recesses and then pumping it up in a semiliquid state, leaving most of the impurities behind.

A well reaching down to the bed of sulphur and sufficiently large to receive a six inch pipe is first bored. The pipe used is in reality composed, as will appear from the adjoining cut, of three concentric pipes, which are respectively six, four and two inches in diameter. Through the cylindrical space left between the first and second pipes, water at the high temperature of 335° Fah. is poured into the earth. This water, as is evident, must be constantly kept under a pressure of from twelve to fifteen atmospheres; otherwise, it would be converted into steam and be useless.

After reaching the bottom of the pipe, which is closed, the water ascends and reaches a series of small apertures, placed all around the pipe at a distance of one inch from each other. The sulphur that lies concealed in a stratum of porous rock soon melts, as the hot water flows into the well; and since the pressure is very high, it is forced into the lower part of the pipe through a second series of holes as shown, collects in the cup, and is ultimately carried upward in the vacant space between the inner and middle pipes. The center pipe, which at first may seem to be unnecessary, had to be introduced to keep the sulphur from congealing before reaching the top of the well, and thus rendering all previous labor useless. Hot air, at a pressure always somewhat lower than that of the water in the outer pipe, is constantly furnished by immense heaters and introduced into the well through the inner pipe by a number of force pumps. The machinery once started, operations proceed until steam is blown off from the top of the pipe, in which case no more sulphur can be melted in the well, at least for the time being. A few hours later the work can be resumed. It sometimes happens that the steam is blown off after a very short time; at other times, however, several days elapse before this occurs. The pipe is occasionally sunk, as need may be, until the bottom of the sulphur vein is reached.

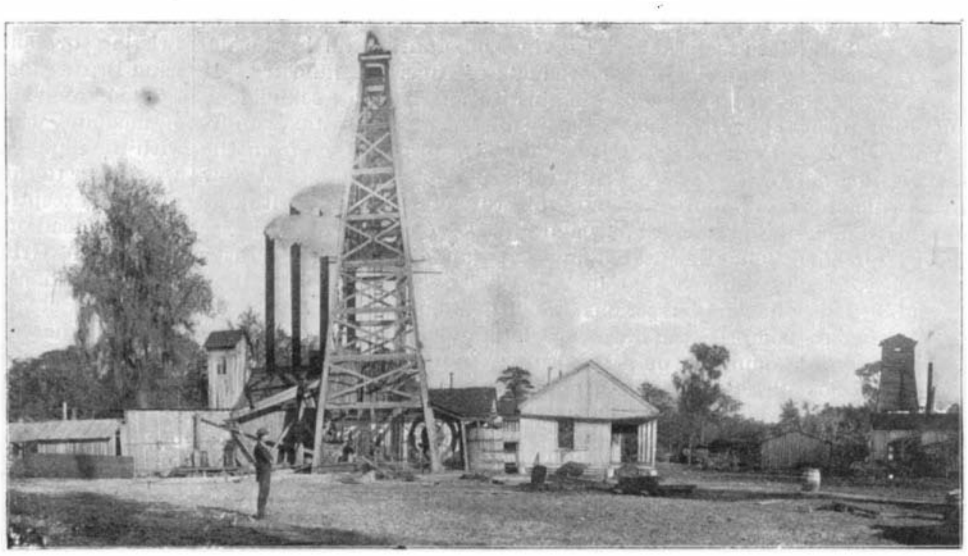
Such is, in short, Mr. Frasch's method. The sulphur thus obtained is, when it reaches the open air, of a dirty dark brown color. It flows into large shallow vats, is allowed to cool for eight or ten hours, crystallizes meanwhile, and is then sawed into blocks of convenient size.

The first and main difficulty once overcome, a second one presented itself, namely, that of finding proper materials for the construction of the pipe. A metal not acted upon by sulphur, and still consistent enough to bear the strain of high pressures, was to be found. Iron or steel could not be used. Aluminum suggested itself from the start, but this metal is not strong enough to support the required pressure. A mean was struck by the inventor, and the steel pipes used were coated with a heavy layer of aluminum.



SECTION THROUGH INLET PIPE OF SULPHUR WELL.

Thus equipped the present company is still proceeding cautiously, though sure of success. In a few months six or seven wells will be operating at the same time, and thousands of tons of the Louisiana mineral will be brought on the market to compete to advantage with the sulphur imported from Sicily and other countries. Analysis has proved the sulphur obtained from some of the wells to be ninety-nine per cent pure: a fact which strongly recommends this improved method of sulphur mining, and gives reason to expect that the extensive sulphur deposits of Louisiana will soon force from our markets the less valuable foreign product.



WELL, PUMP AND DRIVING MACHINERY—SULPHUR MINES.

SULPHUR BLOCKS READY FOR SHIPPING.

On the Plains of the Maremma.

The name of Maremma is given to a large extent of insalubrious land which borders the Mediterranean, whether insalubrious because uncultivated, or uncultivated because insalubrious, is a problem which has not yet been solved. Though both modern science and quickened national enterprise have of late years been applied to its solution, the results accomplished have been unconvincing. The Tuscan part of the Maremma stretches inland nearly to Siena. Beginning at the north a few miles from Leghorn, it extends to the ancient frontier of the Pontifical States, from whence the same immense tracts of sparsely cultivated and malarial territory continue under the name of the Roman Maremma and Campagna to the gates of Rome.

There is no hard-and-fast border line between the healthy and unhealthy land, but the transformation is a gradual one, the villages become rarer, the cultivated land diminishes, stretches of wood and bog are more frequent, until we no longer see any houses by the roadside, but only here and there in the distance some small gray hamlet perched on the top of a rocky hill, "like roosting falcon musing on the chase." On the hillside near such oases, some fields, a few olive trees, and then again begins the wood land, large forest trees, then groves of beeches and oaks, lopped continually for firewood, the forest full of dangers and alarm, with its ponds and bogs and labyrinths, a hiding place for anything from a ghost to a brigand, in short, the typical forest of the Maremma. Toward the Mediterranean coast the hills become less abrupt, and along the shore, and up the broader valleys which diverge from it, stretch immense extents of undulating grass lands seemingly uncultivated, but which really are sown piece by piece in regular rotation every ten years.

It is toward these plains that the migratory flocks gather to pass the winter, and here we may study a curious phase of life only possible in given circumstances of climate, of traditional customs, and of property. The large properties in the Maremma, consisting of pasture land and forest, have often a villa or castle for the accommodation of the proprietor on his flying visits, but always a factor's house which is the center of the administration for the buying and selling of the timber, the cattle, the lambs, and the cheese; the direct management of the flocks is, however, in the hands of the head man, or "Vergaio." From him the so-called "Vergheria" derives its name, the house, the center of business and of amusement, the general meeting place, the temporary hospital. It is a large loghouse constructed in the midst of the pasturage, usually on high lying ground, and if possible near a water course. Its shape is circular, the diameter being about sixty feet; it has a solid framework of logs lined with wattle work of canes and covered externally with thick thatch. This structure is completed by a conical roof surmounted by a cross (the apex being left open for the escape of smoke). Two doors of wattle and thatch give access to this cabin on the east and west. Two smaller doors in the interior lead on the north into a large shed in which the cheese is stored, and on the south into a smaller cabin inhabited by the "Vergaio." The wall spaces within the large circular cabin are divided by posts and planking into stalls, which are again divided transversely by two divisions so as to form so many box-like beds, the spaces between the lower horizontal planks and the floor being used as a wardrobe and store cupboard by the occupants of the respective beds, while from the dividing posts hang saddles, bridles, spurs, tassels, and decorations of every kind. In the center of the building a rude circle of stones is formed, in which a large wood fire burns. A stout pole, supporting a movable wooden arm at right angles, is planted by the fireplace; from the end of the arm hangs a chain and hook, by means of which the huge caldron for boiling the milk is suspended over the flame, or swung back to rest on the round cushion of withes on the hob. The same method is used with the pots in which the men cook their meals of polenta, etc.—Good Words.

Buried in a Tree.

One of the most curious mausoleums in the world was discovered the other day in an orchard at the village of Noebdenitz, in Saxe-Altenburg. A gigantic oak tree, which a storm had robbed of its crown, was up for public auction. Among the bidders happened to be Baron von Thummel, scion of a family of ancient lineage that has given the world of literature one charming poet and the fatherland many distinguished statesmen. The Baron, who lives on a neighboring estate, had ridden to the auction place quite accidentally. Finally the tree was knocked down to him for 200 marks. Upon his arrival at the castle he told an old servant of his purchase, describing the tree and its situation. The old servant said he remembered attending the funeral of a Baron Thummel seventy or eighty years ago, and that the body had been buried in a thousand-year-old oak belonging to the parsonage. Investigation clearly proved that the orchard had once been the property of the village church, and that at one side of the old oak was an iron shutter, rusty and time-worn, that the people of the town had always supposed to have been placed there by some joker or mischievous boys. The iron shutter proved to be the gate to the mausoleum of Baron Hans Wilhelm von Thummel, at one time minister of the state of Saxe-Altenburg, who died in 1824, and wished to be buried "in the thousand-year-old tree he loved so well." In the hollow of the tree Baron Hans caused to be built a sepulcher of solid masonry, large enough to accommodate his coffin. The coffin was placed there, as the church records show, on March 3, 1824, and the opening was closed by an iron gate. In the course of time a wall of wood grew over the opening, which had been enlarged to admit the coffin and the workmen, and for many years it has been completely shut, thus removing the last vestige of the odd use to which the old tree had been put. The tree has still some life in it, and its rich verdure is only now turning a violet tint. The coffin in which Baron Hans reposes has on one side grown to the tree, the dead and the live wood joining together in eternal embrace.—Public Opinion.

The New Soo Lock.

At Sault Ste. Marie the new 800 foot lock was officially opened by the revenue cutter Andrew Johnson and the harbor improvement steamer Hancock locking through 10:30 A. M., August 3. Work on the lock was commenced on May 4, 1887, when the first dipperful of earth was excavated for the cofferdam. Dimensions of the new lock are 800 feet long, 100 feet wide and 21 feet deep. The side walls are 1,100 feet long. From the east end for 282 feet the walls are 45 feet high, and from that point westward they are 43 feet high. The walls are 20 feet wide at the base and retain this width for 10 feet, when by five 2 foot offsets 5 feet apart they are narrowed to 10 feet in width. At either end the walls are 36 feet wide from base to top. The cut stone for facing is of the best Kelley Island limestone, and was transported here in the rough. The faces of the lock wall consist of 23 courses. From courses 2 to 22 the stones were cut 6 feet long, 3 feet wide and 2 feet thick, part of the first course and the capping course being 1½ feet thick. The cost to the United States for the masonry was $1,085,469. In the basement of the power house are situated two 30 horse power turbines, which will drive 3 three plunger single acting high pressure pumps that will deliver pressure fluid to loaded accumulators, where it will be stored under pressure of 300 to 500 pounds per square inch, ready for use, and delivered to engines as required. The exhaust, or discharge, from the engines will be returned by means of a separate set of piping to a tank in the engine room and used continuously. The pressure fluid will be a limpid mineral oil, and will be used during the entire season. This will be different from the present lock, which uses water pressure in the summer and oil during the cold weather. The lock chamber can be filled and emptied when in operation in from 6 to 7 minutes. Water is let in through six culverts, which run longitudinally under the lock floor. In connection with the lock, there is under construction a magnificent office and power building of cut stone and brick, which will be completed in December. It is 81 feet 6 inches long and 80 feet 9 inches wide, and will cost approximately $100,000. In the basement is located the operating machinery and pumping plant. Including the approaches, the great work completed will cost in the neighborhood of $5,000,000. The work was begun under the supervision of the late Col. O. M. Poe, who lived to see the great undertaking practically completed. General Superintendent E. S. Wheeler had active direction of the work.—Marine Review.

THE HOUTS AUTOMATIC TELEPHONE SYSTEM.

This system provides improved means for allowing any subscriber in a system to instantly connect himself with any other subscriber without the aid of an operator at the central office. Each telephone in the system is provided with a call box as shown in Fig. 1,

Fig. 1.—THE HOUTS TELEPHONE—AUTOMATIC CALL FOR SIXTY SUBSCRIBERS.

and at the central point where the wires come together a central appliance, as shown in Fig. 2, is so arranged that any call box in the system can instantly electrically connect the telephone to which it is attached to any other telephone in the system without interfering with any other telephone in the system or any conversation being carried on by any pair of telephones in the system. The improvement was patented by Wallace A. Houts and is being introduced by the Houts Automatic Telephone Switch Company, of Parker, S. D.

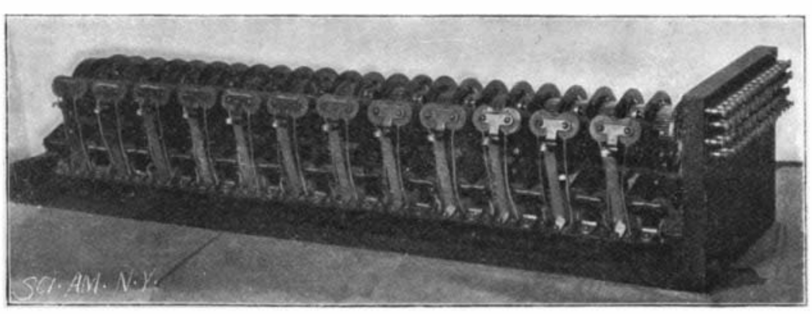


Fig. 3.—THE HOUTS TELEPHONE—SECTION OF CENTRAL OFFICE SWITCH.

The call box as shown in Fig. 1 is designed for sixty subscribers, while the central appliance in Fig. 2 has sixty wires, but only magnets and ratchet wheels enough for twenty-five subscribers.

In making a call the subscriber presses the handle on the face of the call box, moving the dial forward until the number with which he desires to communicate is opposite the button at the left. This button is pressed, which fixes the position of the dial, allowing the handle to turn on until it again reaches the home point or falls into the notch from which the subscriber has started it. This releases the spring-actuated toothed wheel (Fig. 1), allowing it to move forward until the proper number of electrical impulses have been sent over the wires to the central point and the leg attached to a ratchet wheel (better shown in Fig. 3) has been moved forward until it rests upon the wire attached to the telephone the subscriber wishes to call. The bell is then rung in the usual manner, notifying the subscriber that he is wanted. A rod connecting the receiver hook and the call box releases the dial as soon as the receiver is replaced upon the hook. This starts the call box, which sends the proper number of impulses through the magnets (better shown in Fig. 3) and turns the ratchet wheel (Fig. 3), so that the leg is returned to and rests on the home wire.

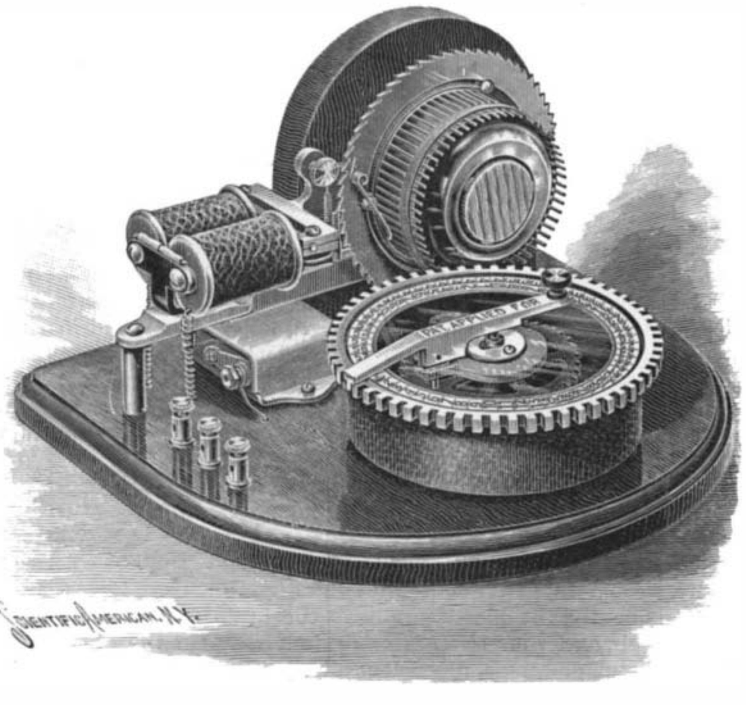


Fig. 2.—THE HOUTS TELEPHONE—CENTRAL OFFICE APPLIANCE.

By bearing in mind that each call box in the system has a pair of magnets at the central point and a ratchet wheel which is insulated from all the other wires of the system, the working can be readily understood. The central appliance is built up in sections to accommodate the number of subscribers in the system, each telephone in the system having a wire running under each ratchet wheel in central, and insulated from all the wires and ratchet wheels of the system except its own.

This is the simplest system to which our attention has been called and would seem to be perfectly applicable in all systems of 100 or less, where the expense of an operator creates quite a tax upon a few subscribers. By the use of this system, perfect night, day and Sunday service can be had.

Chemical Effects of the Sun's Rays.

The old text books used to tell us that the rays of the sun contain three things: light, heat, and actinism. We know now that these three things are one, or rather that the effects ascribed to them are different effects of one and the same radiation, which when it raises temperature is known as heat, when it affects the retina as light, and when it brings about chemical change as actinism. It remains a fact, however, that this last effect has been much less studied than either light or heat, except in some special and limited fields, such as that of photography. Some contributions toward a more exact knowledge of it are made by M. Duclaux, director of the Pasteur Institute at Paris, in the Annales of the Institute. We quote, says the Literary Digest, a notice from the British Medical Journal which runs as follows:

"The [chemical] activity of the rays was estimated by exposing solutions of oxalic acid of known strength to their action. The oxalic acid is converted with more or less rapidity into carbonic acid, which escapes, and at the end of the experiment the degree of acidity of the solution indicates the amount of the oxalic acid which has been decomposed, or 'burnt,' to use M. Duclaux's term. The results showed, as was to be expected, that with an overcast sky the chemical action of the sun's rays was much less than on a fine day, but beyond this they were far from concordant. With a dappled sky or with light cumulus clouds the solar combustion might be more active than with a blue sky or with a slight amount of cirrus. In a word, the apparent fineness of the day is not in any way related to its chemical activity and its hygienic power. On the whole, however, the action was greater in August than in September. This is in accordance with the experience of every photographer. As accounting partly for the discrepancies found between succeeding days both equally fine, M. Duclaux states that all essential oils and the odors sent forth into the air by vegetation diminish the actinic power of the radiations which reach the surface of the soil. A succession of warm days stimulating vegetation, and in mountainous regions increasing perhaps the amount of terebinthinate odors given out by the fir forests, will tend to render the air more impervious to, or more capable of absorbing, the actinic rays, so that on the third or fourth in a succession of fine days the chemical action of the sun's rays would be less than on the first. This difference under natural conditions would, however, be diminished by another observation made by M. Duclaux, to the effect that when in a liquid the chemical action set up by the sun's rays has once been started, it continues afterward more easily, so that when a partly overcast day follows a fine day the total action may be as great, or nearly as great, on the second as on the first day. M. Duclaux's researches certainly open up a wide field for research; they undoubtedly have a bearing on many hygienic questions, and we may echo his hope that his paper may stimulate others to prosecute similar inquiries."