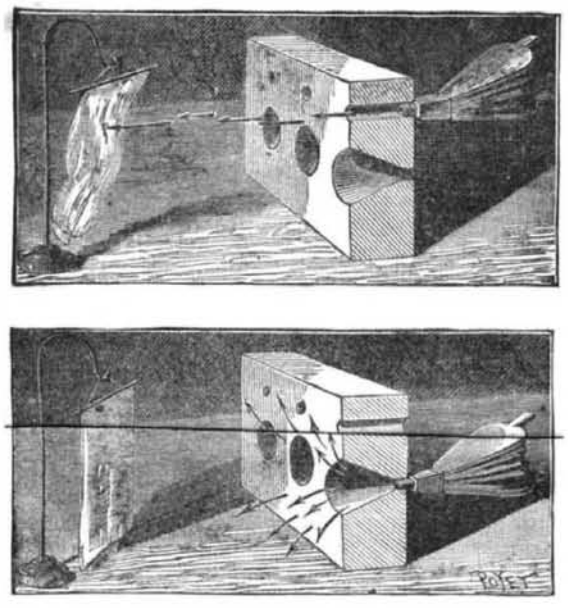
ON THE AIRING AND LIGHTING OF HOUSES.

One of the greatest dangers against which man should provide in his dwelling is the confining of the air that he must breathe. It is not enough that the air that surrounds our dwellings be salubrious, but it is especially necessary that the internal air be not contaminated by any mephitic odors, and that we may breathe therein as in the open air. So the fundamental conditions that are necessary in order to have a healthy habitation may be summed up as follows: (1) that of having fresh air to breathe amid walls and furniture kept at a proper temperature; (2) that of receiving the full light of the sun, and of having the objects about ourselves amply lighted; and (3) that of having no dejections remain in the house.



Figs. 1 and 2.—EFFECTS OF AIR BLOWN THROUGH CYLINDRICAL AND CONICAL APERTURES.

Such conditions, hygienists have at all times endeavored to realize, but, in measure as human habitations have become more numerous and more closely packed, builders have the more and more neglected them. And yet, the proper sanitation of a house is the best means of warding off epidemics and all contagious diseases; for the example of all epidemic manifestations shows that it is in unhealthy towns, and in quarters that contain the foulest habitations, that these almost exclusively develop and spread. The great epidemics of past ages obtained their innumerable victims in those heaps of houses accumulated around the ramparts or under the churches and castles of our old cities. At present, it is under the same conditions that such scourges as cholera, typhoid fever, smallpox, and others make the most ravages; and these ravages they will continue to make until we succeed in improving such dwellings. Doctors Fodor and Rozsahegyi, after recently examining the houses of Buda-Pesth, from this point of view, have published the following results.

Out of every 100 houses the mortality was found to be

	Very clean houses.	Clean houses.	Dirty houses.	Infected houses.
Cholera	2	199	268	402
Typhoid fever	175	177	182	356

On another hand, there has been registered, per 10,000 inhabitants and for 15 years, the following mortality for the same city:

	Very clean houses.	Very dirty houses.
Cholera	90	430

Is not the cleanness of a house, moreover, connected with the conditions of hygiene that it presents?

Among the conditions that we have enumerated above, there are two to which we would now more particularly call the attention of our readers. The Exposition of City Hygiene, now open at the Loban barracks, back of the City Hall, furnishes the occasion to show various processes that have been devised in recent times for the sanitation of towns and dwellings; and the moment seems to be well chosen, then, for making known the principal arrangements.

As regards the airing of houses and apartments, it is obvious that an endeavor should be made to continuously introduce into the latter as much air as possible from the exterior, such air, whatever be the situation, being much more wholesome than that confined within doors. As for the evacuation of the air, that is effected through the chimneys and numerous apertures that our apartments are provided with. In a number of connected houses, it is effected through special apertures. Now, in each inhabited room it is the window that puts us most thoroughly in connection with the surrounding atmosphere; but although the panes of glass that close this let in an abundance of light (an indispensable condition for salubrity), their impermeability is such as to prove an obstacle to the entrance of air. So, in the various cases where there has been need of introducing air into inhabited rooms in such a way as not to incommode people, methods of all kinds have been tried to obviate the said impermeability. Hence the placing of casements at the upper part of windows, and hence, too, that innumerable variety of Venetian blinds with strips of glass, mica valves, opercula, etc. In England, where much attention has been paid to this subject for a certain number of years, an infinite number of all sorts of processes have been devised; but it was soon found out that these caused currents of air of more or less strength, that struck the heads of those occupying the rooms thus aired. Then the idea occurred to place ventilating bricks, provided with conical apertures, at the top of the walls, near the ceiling. The experiment shown in Figs. 1 and 2 explains the principle of this arrangement. When air is introduced by a bellows into a cylindrical conduit, a rectilinear current is produced which strikes in a direct line the objects placed in front of it, as shown in Fig. 1, where the little banner opposite the conduit is seen to be considerably disturbed. If, on the contrary, the bellows be introduced into a conical conduit having the same external orifice and a flaring internal one, the same quantity of air can be blown without causing the banner to budge, the air dispersing in all directions as soon as it emerges from the expanded mouth of the conduit (Fig. 2). The use of such bricks, however, is accompanied with some drawbacks. It is difficult to multiply them much in apartments; and, as it is not convenient to wash them, the conduits get full of dust, which easily contaminates the air as it enters. A few years ago the idea occurred to some one in Leeds to substitute for these bricks a sort of wooden cage placed before the windows, and containing quite a large number of small apertures connected with cylindrical glass conduits ending in small panes. This affair has an ugly appearance, and possesses the same inconveniences as those just mentioned.

Prof. Emil Trelat, of the Conservatory of Arts and Trades, has for a long time been teaching how advantageous it would be to have at the upper part of windows some panes of glass containing a large number of small apertures of conical section, in order to satisfy these important conditions of airing rooms. Messrs. Geneste & Herscher, on their side, being struck by these same advantages, endeavored to find some industrial process capable of furnishing glass so arranged.

The Messrs. Appert Bros., after numerous experiments, have finally succeeded in manufacturing perforated panes, such as shown in Fig. 5. The manufacture of such glass offers very great difficulties, as may be easily divined. We know, in fact, that, when we want to pierce a piece of glass in order to put finger-plates upon room doors, we have to use a steel rod, and pour turpentine upon the glass in order to renew the surfaces and render the biting of the steel easier. Sometimes we add oxalic acid, and even mashed onions. During this operation the plate is often broken.

Messrs. Appert, Geneste & Herscher's perforated panes contain 5,000 apertures per square meter. These apertures have a circular section of 3 mm. diameter, and are spaced 15 mm. from axis to axis. The glass is 3·5 mm. thick. Other panes, a little thicker, have 4 mm. apertures spaced 20 mm. from axis to axis. By special, patented processes, the Messrs. Appert have succeeded in surmounting all the great difficulties that this industrial problem presented, and their perforated glass now stands as a very remarkable specimen of recent progress in the art of glass making.

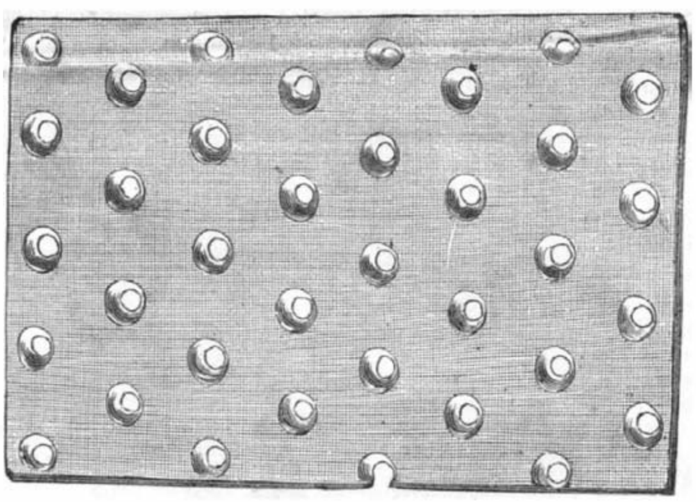
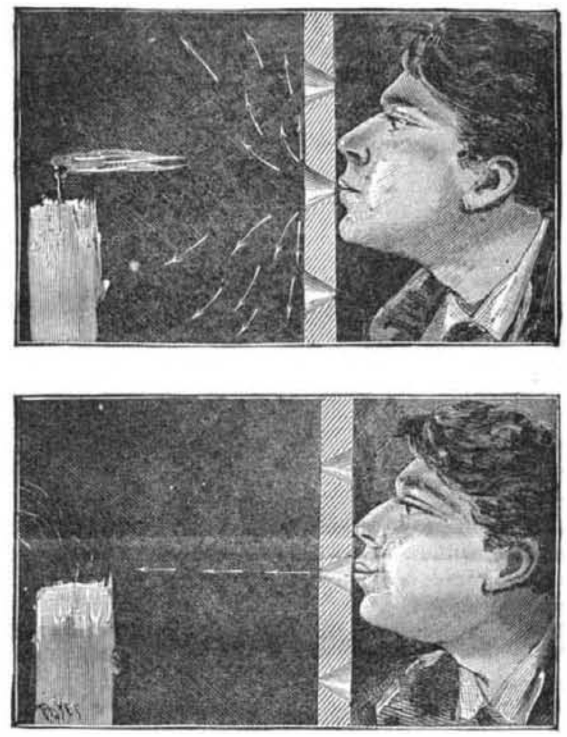


Fig. 5.—PERFORATED GLASS.

From the point of view that now specially occupies us, it must be remarked in the first place that these window panes have a surface of three square decimeters per square meter open to the external air. Moreover, as the apertures open out in the interior, the currents of air expand upon entering the room. Prof. Trelat, to whom belongs the merit of having brought about the manufacture of this glass and of having shown its great value for airing dwellings, rightly recommends that it be not placed at less than 2·5 m. (8¼ ft.) above the ground, in order that the currents of air that enter shall not incommode the occupants; so that it is especially useful in all high rooms, and chiefly in apartment houses, school rooms, hospitals, dormitories, churches, and so forth. It has the advantage that it never becomes obstructed, since all the panes of the window are necessarily washed, and for this reason the air that traverses them does not become charged with any impurities. As the panes are made of translucent, not transparent, glass, they keep neighbors across the way from peering in. These perforated panes may likewise be profitably employed in rooms not so high and in our apartments, provided that they be so arranged that their open surface can be covered at times—this being easily done by means of a movable frame. Figs. 3 and 4 represent an easily reproduced experiment, by means of which is shown how this glass imperceptibly effects the airing of an inhabited room. If we blow in the direction of the small aperture toward the larger, the air will expand along the sides of the cone, and, on making its exit, will form a back-draught behind the candle opposite; while the candle will be at once extinguished if we blow in the opposite direction, the air in this case proceeding straight ahead and with force.



Figs. 3 and 4.—EFFECTS OF BLOWING AIR THROUGH A CONICAL APERTURE IN BOTH DIRECTIONS.

Prof. Trelat does not confine himself to professing that fresh air should be introduced, permanently and as much of it as possible, into living rooms, and that to this end it is well to provide the upper parts of windows with perforated glass; but also insists upon the necessity of introducing into rooms light that comes directly from the sky, at least during such times of the day as they are occupied. In fact, he has for a long time been the resolute partisan of a unilateral lighting of our school rooms, in which one of the sides of the room would contain broad glazed windows for giving light, and the other would contain bays for airing, to be opened only at night and during recess. As well known, artists accord peculiar qualities to lighting effected in this way. Prof. Trelat proposes to transform our usual internal arrangements, and make the upper part of windows entirely free. In one of the halls of the Exposition may be seen a window draped in this way by means of a rich curtain due to Mr. Penar, a skillful upholsterer. The light in this hall is certainly very agreeable, and of such a character as never to injure the most delicate sight, even after prolonged work in it. It remains to be seen whether fashion will adopt an arrangement for draperies whose elegance can certainly not be denied. However this may be, the question is put, and Prof. Trelat, whose proposed arrangements are shown in Fig. 6, will at least have done the service of pointing it out and solving it.

Prof. Trelat, whose models, made in conjunction with Mr. Gaston Trelat, are shown in Figs. 8 and 9, likewise insists upon the necessity of setting houses in different positions in northern and southern countries. It is well known how too much given we are to making everything uniform in our country. For example, we observe the same mode of construction adopted in our barracks at Dunkirk, Bayonne, Brest, and Toulon, just as if the climatic features were everywhere the same. Now, in order that the heating of the structure be equally distributed throughout all the materials, and that the rays of the sun may penetrate the rooms deeply, it is necessary that, in the north, the house shall be directed east and west, while, on the contrary, it should be north and south if it be desired in southern

GOOD LIGHT WITHOUT VIEW. LIGHT AND VIEW. NEITHER LIGHT NOR VIEW.

Fig. 6.—HOW A ROOM SHOULD BE LIGHTED.

lands to suppress the injurious action of the solar rays of the morning and evening.—*La Nature.*

Jarrah Wood.

Jarrah wood (*Eucalyptus marginata*) is a product of Western Australia, where it is found in considerable abundance. Mr. Thomas Laslett, Timber Inspector to the Admiralty, in his valuable work, "Timber and Timber Trees, Native and Foreign," says of it: "It is of straight growth and very large dimensions, but, unfortunately, is liable to early decay in the center. The sound trees, however, yield solid and useful timber of from 20 feet to 40 feet in length, by 11 inches to 24 inches square, while those with faulty centers furnish only indifferent squares of smaller sizes or pieces unequally sided, called flitches. The wood is red in color, hard, heavy, close in texture, slightly wavy in grain, and with occasionally enough figure to give it value for ornamental purposes; it works up quite smoothly, and takes a good polish. Cabinet makers may, therefore, readily employ it for furniture; but for architectural and other works, where great strength is needed, it should be used with caution, as the experiments prove it to be somewhat brittle in character. Some few years since a small supply of this wood was sent to the Woolwich Dockyard, with the view to test its quality and fitness for employment in shipbuilding; but the sample did not turn out well, owing to the want of proper care in the selection of the wood in the colony."

The clerk of works at Freemantle, in reporting upon the opinions expressed by shipbuilders and others, says: "The sound timber resists the attack of the *Teredo navalis* and white ant. On analysis by Professor Abel, it was found to contain a pungent acid that was destructive to life. The principle, however, was not found to be present in the unsound portions. Great care is therefore necessary in preparing the

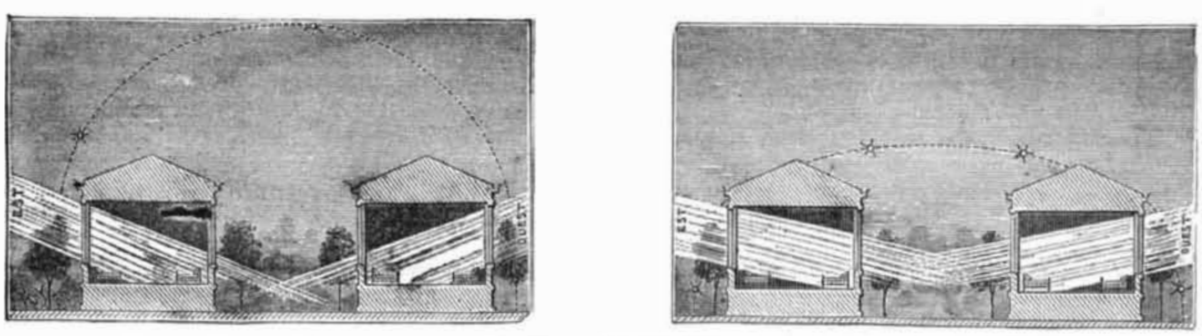


Fig. 8.—DIRECTION IN WHICH BUILDINGS SHOULD BE SET IN NORTHERN COUNTRIES.

wood for use by flitching [illegible] all the defective portions of the heart out, and using only the perfectly sound timber."

Very much has been said about jarrah being subject to split when exported to England in log. It must be borne in mind that its density renders seasoning very slow, and that the inner portions of the larger trees are often in a state of decay, even while the outer portions are in full vigor. A tree under these conditions, the inner portions comparatively dry, and the outer full of sap, shipped at once to such a variable climate as that of England, very naturally bursts from unequal shrinkage, being also exposed to very great changes of temperature. To obviate this peculiarity and apparent defect, let the jarrah be fallen when the sap is at the lowest ebb, and carefully flitched, as previously suggested.

The methods adopted in seasoning jarrah are as follows: The logs are thrown into the sea and left there for a few weeks; they are then drawn up through the sand, and after being covered with seaweed a few inches deep, are left to lie on the beach, care being taken to prevent the sun getting at their ends. The logs are then left many months to season. When taken up they are cut into boards seven inches wide, and stacked so as to admit of a free circulation of air round them for five or six months before using them.

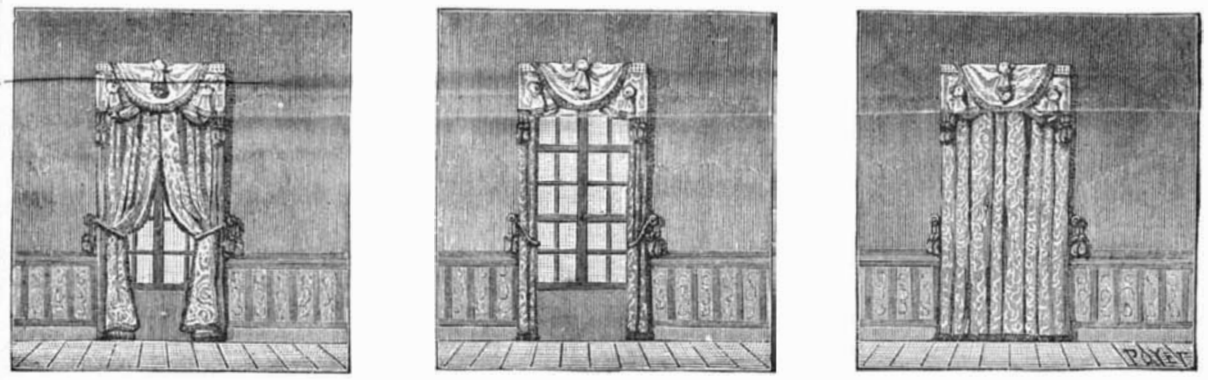
In a communication forwarded to India by H. E. Victor, Esq., C.E., of Perth, in reply to inquiries made by some gentlemen engaged in the carrying out of several large contracts for public works in India, he says: "Undoubted authority is unanimous in declaring that the timber of the jarrah, under certain conditions, is indestructible."

Professor Von Mueller, Government Botanical Director of Victoria, says: "Its wood is indestructible; is attacked neither by chelura, teredo, nor termites, and is therefore much sought after for jetties and other structures exposed to sea-water. Vessels built with this timber have been enabled to do away with all copper-plating. It is very strong, of a close grain, slightly oily and resinous in its nature, works well, takes a fine finish, and is, by shipbuilders in Melbourne, considered superior to oak, teak, or any other wood for their purpose."

The committee of Lloyd's, after the representations of His Excellency Governor Weld, determined to rank this timber with those in line 3, Table A, of the Society's rules; thus ranking it with *Cuba sabicu*, pencil cedar, etc., for the construction and classification of ships. The purposes to which jarrah may be applied are innumerable; [illegible] could not be admitted, as well as where they are used; and as the material can be supplied at a price considerably less than the timbers named, in the log, and at half their price in scantling, it should be employed where hitherto timber has been considered undesirable—for instance, in sea-facing, dock-lining, landing-stages, breakwaters, and beacons; curbs, road-paving, block-flooring, weather-boarding, and wainscot partitions, wallings, ceilings, and roof coverings.

A Western Australian almanac says: "None of the neighboring colonies possess timber of a similar character to the jarrah, or endowed with equally valuable properties. If cut at the proper season, when the sap has expended itself and the tree is at rest, it will be found the most enduring of all woods. On this condition it defies decay; time, weather, water, the white ant, and the sea worm have no effect upon it. Specimens have been exhibited of portions of wood which had been nearly thirty years partly under water and partly out. Others had been used as posts, and for the same period buried in sand, where the white ant destroys in a few weeks every other kind of wood. For this peculiar property the jarrah is now much sought after for railway sleepers and telegraph posts in India and the colonies. It is admirably adapted for dock gates, piles, and other purposes, and for keel pieces, keelsons, and other heavy timber in shipbuilding. Vessels of considerable burden are built entirely of this wood, the peculiar properties of which render copper-sheathing entirely unnecessary, although the sea worm is most abundant in these waters."

Though in the foregoing there are a diversity of opinions, yet the general tendency is to testify to the usefulness in an extraordinary degree, under stated conditions, of jarrah wood, and the practical mind will quickly see many opportunities for taking advantage of a wood possessing so many valuable qualities as this wood has been found to contain; and it is not saying too much to express a hope that the shipments now in the London docks will be but the prelude to many other, and more important, consignments to this country, where intrinsic merit is the only passport necessary to gain public favor and support where commercial interests are concerned.—*Building News.*



GOOD LIGHT WITHOUT VIEW. LIGHT AND VIEW. NEITHER LIGHT NOR VIEW.

Fig. 7.—HOW A ROOM SHOULD NOT BE LIGHTED.

St. Sophia, Constantinople.

St. Sophia at Constantinople, of which at last authentic particulars have been obtained in the work of Salzenburg of Berlin, who, taking advantage of the scaffoldings erected by Fossati for the repair of the building, measured carefully every part of it. From this it appears that the diameter of the drum of the dome is 100 Prussian feet, or 102 feet 11 inches English, but the dome itself is 4 feet more, or 107 feet in diameter. It is constructed of forty ribs, projecting each 2 feet, which die away toward the center, leaving about one-third of the dome perfectly plain. The form is segmental, 45 feet 6 inches in height, and described consequently from a point about 8 feet below the springing. Round the base are forty windows, which throw in a flood of light; and altogether its appearance internally is as beautiful as any I know of. Originally, it was even flatter than it now is; but being in that form beyond the constructive power of its architect, it fell in, and the present form was adopted; but even then the architect tried to keep it as low as [illegible] that the flatter it was the floor it covered, and all of the parts around it. To obtain these internal advantages, however, the architect sacrificed the exterior entirely, and it is on the outside perhaps the ugliest dome ever constructed. But the same remark applies to the whole church. No pains whatever seem to have been taken with the exterior, though every part of the interior is designed with the greatest care, and ornamented with the most profuse liberality.—*J. Fergusson.*

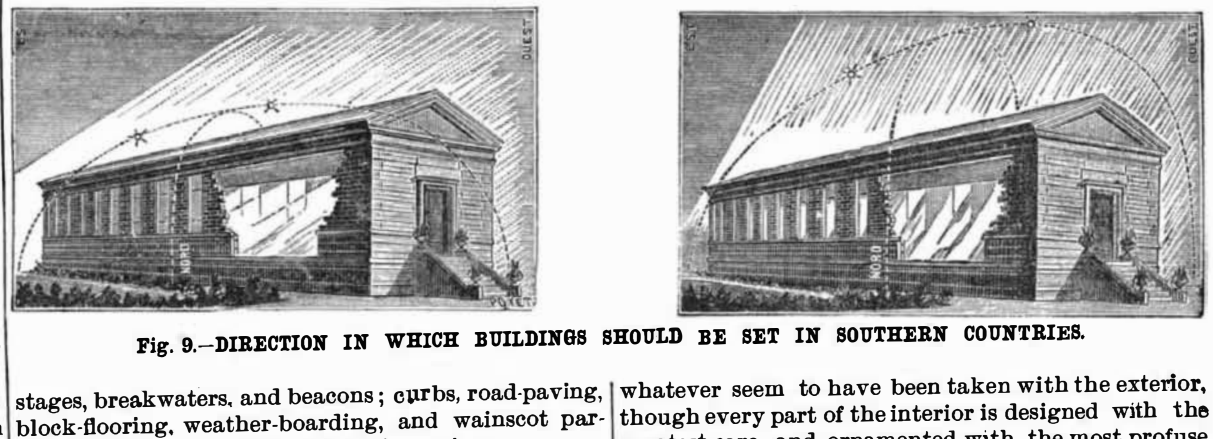


Fig. 9.—DIRECTION IN WHICH BUILDINGS SHOULD BE SET IN SOUTHERN COUNTRIES.

Swiss carved work in whitewood affords excellent opportunities for hand-painting, and many pretty articles for home decoration can be made from it.

The Electro-Osteotome.

Dr. Milton J. Roberts, of this city, a distinguished surgeon, is the author of the new mode of examining diseased bones, which consists in boring into and lighting up their interior surfaces with the electric lamp. He describes his devices as follows: My aim has been to make as nearly a universal osteotome as possible; that is, an instrument with which the surgeon can cut bone with ease, safety, and accuracy in any desired direction. The instrument which I have elaborated is called the electro-osteotome.

As it is now constructed, it is provided with two headpieces, one for the carrying of various sizes of circular saws, and the other for the holding of drills and burrs of various shapes and sizes. By means of this instrument, a bone may be perforated with any size drill up to a quarter of an inch in diameter, or a cross or longitudinal section of it made with as much facility as a similar wound could be made in the soft parts by means of a sharp scalpel.

For the early positive diagnosis of the existence of diseased bone, the instrument is provided with very fine drills, from the one sixteenth to the one thirty-second of an inch in diameter. These drills are constructed, not after the form of the ordinary twist drill, but upon the principle of a cheese tester; that is, they have a longitudinal groove on one side. By means of such a drill, a plug or sample can be removed from any suspected area of bone. No incision through the soft parts is necessary. The drills revolve at a very high rate of speed, and readily penetrate the soft parts and bone. Upon removal of the drill, the debris lodged in the groove is placed upon a glass slide and examined under a microscope. If there be commencing ostitis, the characteristic findings will be manifest. Of course, when drilling into the head of a bone, and a cavity or soft spot is reached, the sensation communicated to the hand will be all that is desired to establish the fact. The use of the drill in this manner is analogous to the use of the hypodermic needle in the soft parts for diagnostic purposes. If no disease exists, no harm is done by means of the puncture.

Once having thus positively determined the existence, site, and probable extent of disease, an incision is made down to the bone, and a large drill or trephine, from a quarter of an inch to half an inch in diameter, is carried through the bone into the diseased area or cavity. Upon removing this, smaller drills or burrs may be passed in through the opening thus made, and used to excavate the affected bone.

For the thorough inspection of the parts, I have had constructed a miniature incandescent lamp, so small as to readily pass through a quarter inch drill hole. These lamps (half candle) furnish sufficient light to thoroughly illuminate the interior of any bone cavity.

DOUBLE DREDGER.

The engraving below represents one of Priestman Brothers' double self-contained dredgers, and is taken from a photograph, in South American waters. The dredger is somewhat novel in its construction, being the first of the kind which has been made. A large steam hopper dredger has been fitted with four of Priestman's machines, made to the order of the Mersey Docks Board, and can be seen working in Liverpool or Birkenhead docks; but this particular dredger, although suitable for all kinds of dock and harbor work, was specially designed for exportation. It forms part of an order for the Brazilian Government for carrying out harbor improvements in the port of Maranham, where it is required to deepen the channel and deposit the dredgings behind the breakwater for reclamation purposes. The two dredgers shown are each capable of lifting from fifty to eighty tons of material per hour, in accordance with the nature thereof, being fitted with strong interlocking steel-faced grabs—see Figs. 1 and 2—suitable for hard sand, clay, or mud, gravel, etc., each of which, when filled, holds about 40 cwt. of deposit. The steam is taken from a multitubular boiler, 9 feet long by 8 feet diameter, having a heating surface of 386 feet, and is conveyed to the engines through steam passages up the center columns of the respective machines. The barge is constructed to facilitate transit and erection abroad, and is made in eight longitudinal sections, being plated, riveted, and calked in the makers' yard in Hull; each end of each several section being supplied with strong angle iron frames, forming at the same time flanges for bolting or riveting the several sections together. The decks are of timber. The rubbing belt, deck planking, stringer plate, and keelsons are made to cross the joints of the several sections, to increase stability. The dimensions of the barge are 60 feet in length by 22 feet beam, and 6 feet deep, with flat bottom, rounded ends and bilges, to increase buoyancy in the water when the dredgers are at work. The rest of the order comprised four iron barges, constructed in a very similar manner to the above, 48 feet long by 15 feet beam, and 6 feet deep, to carry the deposit raised by the dredgers, and two of Priestman's portable bucket elevators, each capable of lifting about fifty tons per hour, with wheels for running upon the quay for discharging the barges of their dredgings, and placing the same behind the breakwater.—*The Engineer*.

Fig. 1.

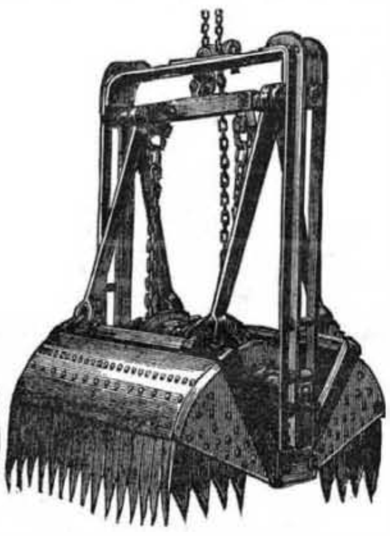


Fig. 2.

A Russian Petroleum Pipe Line.

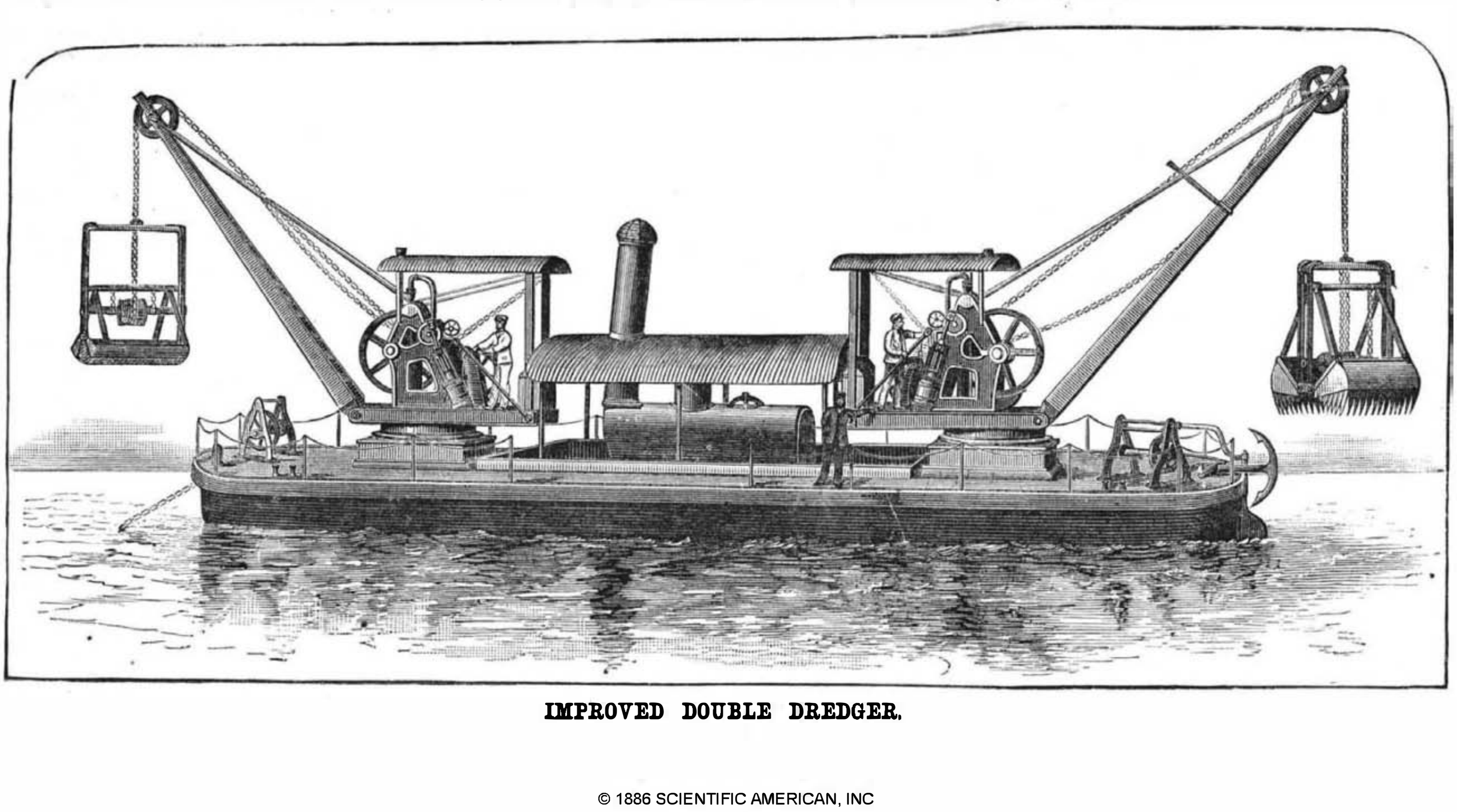
In the London *Pall Mall Gazette* of October 8, Mr. Charles Marvin, who has written much concerning the Russian petroleum wells and refineries, has the following concerning the long contemplated project of a pipe line across the Caucasus, whereby petroleum is to be carried to the shore of the Black Sea at a very low cost:

The Russian government has completed at last the scheme for the petroleum pipe line from Baku to the Black Sea, a distance of nearly 600 miles. The capital required for the scheme is £2,000,000.

The pipe must be large enough to allow of the passage of 160,000,000 gallons of oil a year, and the stoppages for repairs must not exceed on an average one a month, or last longer than three days. As soon as the traffic reaches 90 per cent of the full working power of the line, the company must proceed to lay down a second oleoduct, and have it ready for traffic in two years. The time allowed for laying down the first pipe line is three years. The concession will last twenty years, but no guarantee will be given by the state, nor will the company be allowed to own oil wells and refineries. Where the pipe line traverses crown estates, the land will be given the company for nothing, and elsewhere it will enjoy the same privileges as railway corporations. One-third of the pipes must be obtained in Russia, but this clause will not be insisted upon should the supply be inadequate. The tariff to be charged for the oil pumped through the line is 10 or 11 copecks the pood, or 12s. or 13s. a ton. This will amount to a little more than a halfpenny (1 c.) a gallon. The engineering obstacles to the enterprise are of a very trifling character, with the exception of the passage of the pipe line over the Lesser Caucasus. The ascent to the Suram Pass, 3,200 feet above the sea level, is somewhat sharp, but an extra number of powerful pumping stations will overcome this obstacle, while on the Batoum side of the range fewer stations will be needed, owing to the force with which the oil will flow, by its own gravity, to the Black Sea coast. There is, therefore, no reason for fearing that the pipe line will not be laid down in three years' time, perhaps considerably earlier. As for the distance, it is a mere trifle compared with the American pipe lines, which collectively extend to a length of 9,000 miles. When it is open for traffic, the export of Russian petroleum *via* the Black Sea will increase tenfold, and there will be a terrible tumble in the price of American oil in Europe. At present, tens of millions of gallons of refined petroleum can be had at Baku for a penny a gallon. The projected pipe line will run it across to the Black Sea for another halfpenny, and for very little more than that sum it will be possible to bring it to London in tank steamers. In this manner, whether England makes the pipe line or not, she will derive a substantial benefit by its completion.

Comstock Deep Mining.

"Orders have been received from San Francisco to stop all work in the Chollar mine, and to immediately strip all levels below 2,400 feet. The orders also necessitate the immediate suspension of all operations in the lower levels of the Hale & Norcross mine. This action is the result of the flat refusal on the part of the trustees of the Savage mine to pay their one-third proportion for keeping the pumps in motion at the combination shaft. The lower levels in both mines will be abandoned and flooded as soon as the ponderous pumps are shut down. The stoppage of work in these mines throws several hundred men out of employment and, it is believed, sounds the death knell of deep mining on the Comstock."



IMPROVED DOUBLE DREDGER.