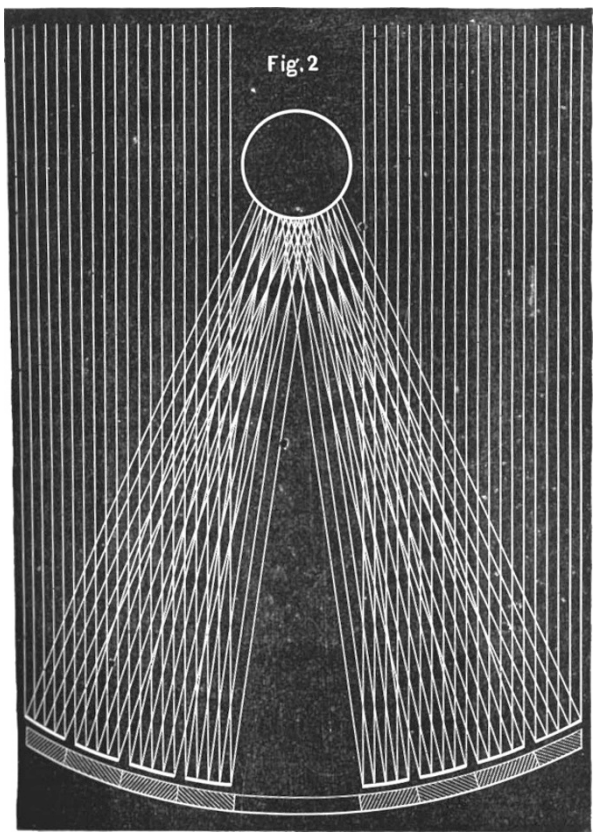
rays," taught me to adopt in place of curved surfaces and converging rays, flat surfaces and parallel rays, as shown by Fig. 2, which represents a transverse section of part of the reflector. The direct vertical solar rays, it will be seen, act on the mirrors; while the reflected rays, divided into diagonal clusters of parallel rays, act on the heater, the surface of which will thus be exposed to a dense mass of reflected rays, and consequently raised to a temperature exceeding 600° F. at noon during ordinary sunshine.

The cost, durability, and mechanical energy of the sun motor being thus disposed of, it remains to be shown whether the developed energy is continuous, or whether the power of the engine changes with the increase and diminution of zenith distance and consequent variation of atmospheric absorption. Evidently an accurate knowledge of the diathermancy of the terrestrial atmosphere



is indispensable to determine whether the variation of the radiant energy is so great that the development of constant power becomes impracticable. Of course, manufacture and commerce demand a motor developing *full power* during a modern working day of *eight* hours. Observations relating to atmospheric diathermancy continued during a series of years, enable me to assert that the augmentation of solar intensity during the middle of the day is so moderate that by adopting the simple expedient of wasting a certain amount of the superabundant heat generated while the sun is near the meridian (as the steam engineer relieves the excess of pressure by opening the safety-valve) a uniform working power will be developed during the stipulated eight hours. The opening of the safety-valve, however, means waste of coal raised from a great depth at great cost, and possibly transported a long distance, while the radiant heat wasted automatically by the sun motor is produced by fuel obtained from an inexhaustible storehouse free of cost and transportation.

It will be proper to mention that the successful trial of the sun motor described and illustrated in NATURE, vol. xxxi. p. 217, attracted the special attention of landowners on the Pacific coast then in search of power for actuating the machinery needed for irrigating their sun-burnt lands. But the mechanical detail connected with the concentration at a single point of the power developed by a series of reflectors was not perfected at the time; nor was the investigation relating to atmospheric diathermancy sufficiently advanced to determine with precision the retardation of the radiant heat caused by increased zenith distance. Consequently no contracts for building sun motors could then be entered into, a circumstance which greatly discouraged the enterprising Californian agriculturists prepared to carry out forthwith an extensive system of irrigation. In the meantime a simple method of concentrating the power of many reflectors at a given point has been perfected, while the retardation of solar energy caused by increased zenith distance has been accurately determined, and found to be so inconsiderable that it does not interfere with the development of constant solar power during the eight hours called for.

The new motor being thus perfected, and first-class manufacturing establishments ready to manufacture such machines, owners of the sun-burnt lands on the Pacific coast may now with propriety reconsider their grand scheme of irrigation by means of sun power.

JOHN ERICSSON.

THE WHITE RACE OF PALESTINE.

ON the occasion of my first visit to Palestine I was struck by the number of blue-eyed, fair-haired children whom I met with in the towns and villages, more especially in the mountainous parts of the country. At the time I supposed them to be the descendants of the Crusaders or of the other natives of Northern Europe who found their way to the Holy Land during the Middle Ages. But a new light has recently been thrown on the matter by the ethnological observations made by Mr. Flinders Petrie in Egypt.

The winter before last Mr. Petrie was commissioned by the British Association to take casts and photographs of the ethnological types represented on the Egyptian monuments, and to note, wherever it was possible, the colour of the skin, eyes, and hair. It was not the first time, however, that notes of the kind had been taken. Some years ago, Osburn, a careful observer, had noticed that in the sculptures of Ramses II. at Abu-Simbel "the Shasu of Kanana" were depicted with blue eyes, and red hair, eyebrows, and beard, and the Amaur with "the eyes blue, the eyebrows and beard red." As "the Shasu of Kanana" lived a little to the south of Hebron, while the Amaur are the Amorites of the Old Testament, it was clear that a population existed in Palestine in the fourteenth century before our era which had all the characteristics of the white race.

Mr. Petrie's observations have abundantly verified this conclusion. He finds that, on the walls of a Theban tomb, the chief of Kadesh on the Orontes is painted with a white skin, and light red-brown hair. Kadesh was the southern capital of the Hittites, after their invasion of Syria, but the Egyptian inscriptions describe it as being "in the land of Amaur"; and that its chief must have been an Amorite is shown by the fact that the Hittites are depicted with yellow or orange skins, their hair being black, and their eyes dark.

The physiognomy of the Hittites and Amorites, moreover, differed widely. The Egyptian artists agree with the native Hittite monuments in representing the former

with ugly protrusive profile, and Mongoloid features, the hair being arranged at the back of the head in a sort of "pig-tail." The Amaur or Amorites, on the other hand, are a handsome people, tall, and dolichocephalic, with large sub-aquiline noses, and a short pointed beard at the end of the chin. The defenders of "the fort of Amaur" are represented as having been burnt a light pink-red by the action of the sun. Otherwise the skin is white or "sallow."

We learn, then, from the ancient monuments of Egypt that a portion of Palestine was occupied by a white race before its conquest by the Israelites. And they further inform us that this white race continued to exist in the country after the conquest. The physical characteristics of the captives taken by Shishak in the time of Rehoboam from the cities of Judah have Amorite and not Jewish features. There is nothing in common between them and the tribute-bearers of Jehu, who are depicted on the black obelisk from Nimroud, now in the British Museum, with faces of a most typically Jewish cast. In the tenth century before our era, consequently, the bulk of the population in the southern part of Judæa must have been of Amorite origin.

It is not wonderful, therefore, if we find traces of the same population still surviving in Palestine. There is no need of explaining their existence by a theory of their descent from the Crusaders. The survival of the ancient white race of Palestine is parallel to the survival of the ancient white race of Northern Africa, now generally known among French writers under the name of Kabyles. The Kabyles were at one time imagined to be the descendants of the Vandals, but we now know that they have inhabited the southern coast of the Mediterranean since the later Neolithic age. They are the Libyans of antiquity, represented on the Egyptian monuments, like the Amorites, with white skins, blue eyes, and dolichocephalic skulls, and similarly described by classical writers. They extended into Teneriffe and the Canary Islands, and their long-headed skulls have been disinterred from the dolmens of Northern Africa.

To the traveller who sees them for the first time the Kabyles offer a striking appearance. Their clear white skins, covered with freckles, their blue eyes and light hair, remind him of the so-called "Red Kelts" he has met with in an Irish village. They bear a high reputation for physical courage and love of independence, though at the same time they seem to be an orderly people. But they have two characteristics which they share with the white race of Northern Europe. They are mountaineers, the climate of the African plains being apparently too hot for them, and they are distinguished by their tall stature.

These were equally the characteristics of the Amorites of ancient Palestine. The Jews declared that their "height was like the height of the cedar," the Semitic tribes by the side of them seeming to be but "grass-hoppers," and the iron couch of Og, the Amorite king of Bashan, preserved at Rabbath, afterwards the capital of Ammon, excited the wonder of later generations on account of its size.

The Amorites also occupied the whole of the mountainous district of Syria and Palestine from the neighbourhood of Kadesh in the north to the desert southward of Judah, and on the eastern side of the Jordan they founded the two kingdoms of Bashan and Heshbon. In the mountains of Moab and Seir they formed the aboriginal population, partially dispossessed by the Semitic tribes of Moab, Ammon, and Edom, and the name of Horite under which they went in Edom is best explained as meaning "white," in contradistinction to the Semitic Edomite or "red-man." A passage in the Pentateuch (Numbers xiii. 29) expressly states that along with the Hittites and Jebusites they inhabited the mountainous region, while the Canaanites dwelt on the coast and the valley of the Jordan. That Jebusite simply means a cross between Hittite and Amorite is clear from the statement of Ezekiel (xvi. 3, 4, 5) that Jerusalem, whose old name of Jebus gave rise to that of Jebusite, was born of a Hittite mother and an Amorite father. The Egyptian monuments bear witness to the same "interlocking" of Hittite and Amorite.

There is yet a third characteristic which has been ascribed to the white race of Northern Europe. It has been brought into close connection with the dolmens which cover so large a part of its territory. Faidherbe and others have traced a continuous line of dolmens of similar construction along the northern coast of Africa, through Spain, Portugal, and France, into the British Isles. No one, indeed, who has examined the famous dolmens of Roknia, in Algeria, can fail to be struck by their resemblance to the sepulchral cromlechs of our own country. If they are really due to the genius and influence of a single race, it would seem that the race moved from north to south, since the objects found in the dolmens of the south of France betray a more advanced stage of culture than those found in the north.

The chief objection hitherto raised against ascribing these dolmens to the white race with whom they are associated has been that similar megalithic monuments exist in Palestine. Over 700 have been discovered in Moab on the eastern side of the Jordan. Major Conder has drawn attention to others in the basaltic region in the neighbourhood of the ancient Dan, and though none have as yet been observed in Judah, this is probably due to the fact that the attention of travellers has not been called to them. I have myself come across a fine specimen on a hill to the south of Jenîn which had been overlooked by the Palestine Survey, and that megalithic structures once existed in Judah is evident from the occurrence in the Old Testament of names like Gilgal or "Stone-circle," and Ai or "cairn" (Joshua viii. 29). It will be noticed that they are especially plentiful on the eastern side of the Jordan, where the two chief Amorite kingdoms once flourished. Just as the dolmens of Northern Africa were the burial-places of the ancestors of the Kabyles, so tradition affirmed that the Amorite king of Ai had been buried beneath a cairn of stones.

The discovery that the Amorites of Palestine were racially allied to the ancient Libyans opens up ethnological and archæological questions of considerable interest. These cannot be touched upon here, but must be reserved for a future occasion. It is sufficient for the present to have drawn attention to a new and curious ethnological fact.

A. H. SAYCE.

ENGINEERING SCHOOLS.

AT a time when so much is being said about the need for technical education, especially in engineering, the following letter will be read with interest:—

Engineering School, Trinity College, Dublin, June 1888.

DEAR LORD ASHBOURNE,—As you have requested me to draw up a statement of the claims of engineering schools to be recognized by the Civil Service Commissioners as affording part at least of the technical training required of candidates for engineering Civil Service appointments, I send you the following account.

Allow me, in the first place, to state that I am not advocating the claims of our Engineering School here as in any way distinct from that of many other excellent engineering schools that exist. For instance, the Indian Government is so fully convinced of the absolute necessity for a proper technical school training for engineers that it requires all candidates for Indian engineering appoint-