

## GUARDIOLA'S SUGAR AND COFFEE MACHINERY.

It is well understood, by those familiar with the manufacture of

## SUGAR

according to the best and most correct scientific principles, that it is of great importance that all the operations be carried on with the utmost rapidity, otherwise the juice is liable to ferment, entailing considerable loss. In slow evaporating pans, the juice is exposed to another danger, termed "inversion," through which it loses its power of crystallization. In brief, the longer the evaporation lasts, the larger is the quantity of molasses obtained; and consequently the amount of crystallizable sugar is diminished in the same proportion. All open evaporating pans, wherein these liquids are boiled in large quantities at once, produce these evil effects. Pans evaporating *in vacuo* are free, to a certain extent, from these inconveniences; but a vacuum apparatus is very expensive, and requires skillful labor, besides the use of animal charcoal filters and their revivifying kilns, etc. The helix evaporator, illustrated in Fig. 1, although it works under the full pressure of the atmosphere, is claimed to have an evaporating power superior to that of any other open pan, and equal to that of any pan working *in vacuo*. It presents also other advantages, which no vacuum pan can have, namely, the separating of the impurities, by the same apparatus, during the ebullition of the juice. This is obtained through a very ingenious strainer that follows the whole length of the channel; not a drop of liquid is lost, and a beautiful, clear stream of syrup runs out of the evaporator, leaving little work for the filters. The impurities arrested

the water is stopped, and the defecated juice run along the helix, never allowing the channel to be bare. One after another, the compartments of the double pan are emptied, in order to receive the syrups supplied by the helix. In a few minutes the whole train is in good working order, and everything goes on smoothly. When work is stopped, a small stream of water is run in right behind the juice; this water protects the metal from burning, and at the same time cleans

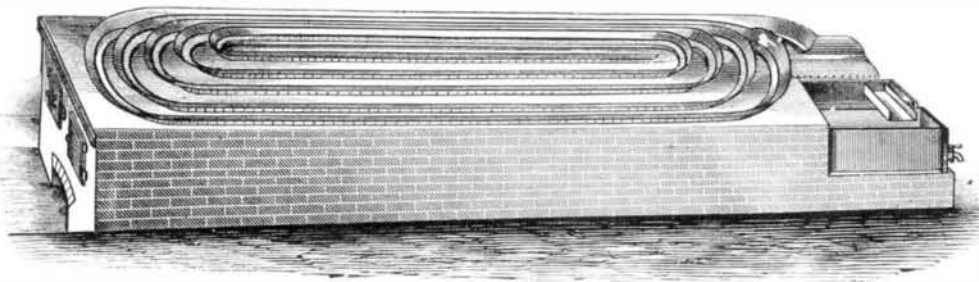


FIG. 1.—GUARDIOLA'S HELIX SUGAR EVAPORATOR.

the apparatus. When the defecated juice begins to run and boil, the impurities coagulate and rise with the froth, spreading over the continuous strainer, and there they are deposited, allowing the clear juice to pass through the small holes and falling into the channel below. In this manner, the impurities are set aside and removed without causing the loss of a drop of liquid; in fact, this helix evaporator suppresses entirely the "scums." The syrup that comes out of this evaporator, in a continuous jet, is so pure and so rich in crystallizable sugar that it leaves very little for the filters to do. The quantity of the juice and the fire will regulate the density of the syrup, which has to receive its last concentration in a separate pan. The fire must be kept, as much as possible, under the helix evaporator, which receives the full

this important industry, for the accomplishment of which the appliances have hitherto been of the most primitive character; and his inventions are the result of the extended practical experience. His object has been the saving of time and labor, and the improvement of the quality of the product. It is hardly necessary, therefore, to add that the inventions herein described are worthy the consideration of persons engaged in the above-named industries. Mr. Guardiola has

given his inventions a thorough trial, on a large scale, before bringing them before the public. The engravings which we present herewith represent machines for washing, drying, hulling, and polishing coffee, and also one for grinding corn when boiled for the purpose of making tortillas.

The washing machine, Fig. 3, is employed to get rid of a mucilaginous substance that adheres to the husk or inner cover of the coffee

berry, after the pulp or outer cover has been removed. If the coffee is left in a heap for some hours, after having been pulped, this gummy substance is decomposed and is then easily washed off. The coffee, as it is gradually introduced into the machine, is simultaneously acted upon by a small jet of water. In a few seconds, the coffee emerges at the other end of the cylinder thoroughly washed, and passes to a sieve, when the water drains off and the berries are then ready for the process of drying. This washer is made of several sizes, to prepare any quantity of coffee desired.

The drying apparatus, Fig. 4, performs one of the most tedious and expensive operations in the preparation of coffee for the market. It has hitherto been the practice, in drying coffee, corn, cocoa, etc., simply to spread the grains and expose them to the air and heat of the sun. This process would seem to be the most economical; but in cloudy or rainy weather, the drying completely stops, and often the planter sustains heavy losses through the delays and deterioration of his crop. The great number of people required in the sun-drying process and the length of time consumed are objections that every planter has experienced, and is desirous of avoiding. Every grain of coffee, etc., in this apparatus is kept constantly in motion by the rota-

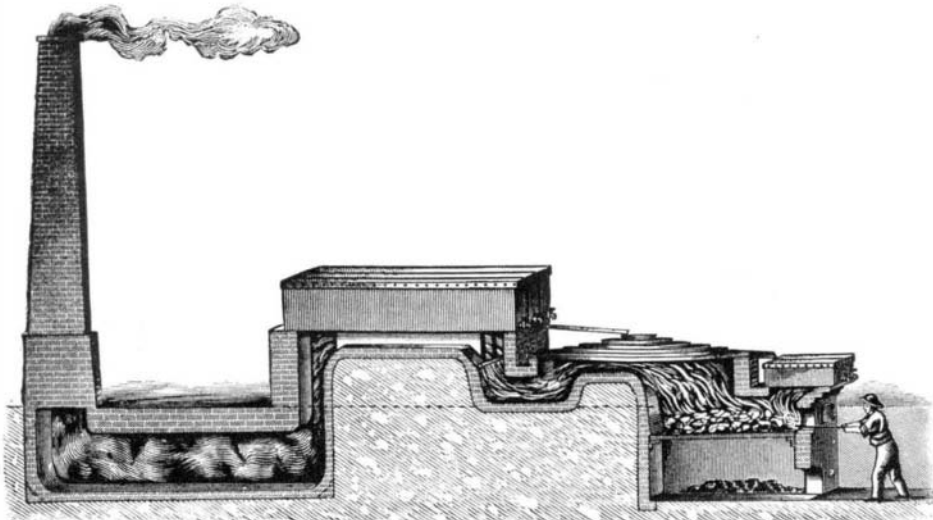


FIG. 2.—GUARDIOLA'S TRAIN OF SUGAR-MAKING APPARATUS.

and left on the strainer are readily removed by hand; boys or women can be employed for this purpose.

The *modus operandi* is easily understood. The saccharine juice, after having been defecated, is directed, in a determined quantity, on to the top channel, and in its passage down to the end of the gutter it loses the greatest part of its water by evaporation, leaving on the strainer nearly all the impurities. The apparatus is calculated to produce, in about five minutes, defecated juice from, say, 8° to 25° Baumé, in a continuous stream, the amount being determined by the length of the channel. The economy of fuel claimed amounts to about 40 per cent; and as all the operations go on with greater rapidity, there is also a saving of time and labor. Of course, a constant degree of heat must be maintained in the furnace in order to obtain a constant density in the syrup; otherwise this can always be obtained by the use of a double pan, set on the same flue.

The train of sugar-making apparatus shown in our Fig. 2 is composed of three defecating pans set on the same level and on separate flues, a helix evaporator and a double flat pan, the latter being

used to regulate with greater nicety the density of the syrup. This battery is so disposed that one pan discharges into the next below. The defecators keep the evaporator supplied with juice; while one is being emptied, another is filling up, and the third is in course of defecation. After filling up the defecators, a little water is run in the channel of the helix and into the double pan, and the fires are lighted. As soon as one defecator is ready,

benefit of it. When the syrup has reached the desired degree of density in the double pan, it may be directed, while hot, either into bag or bone-black filters. From the filters, the syrup is put into an open striker pan or into a vacuum pan for that purpose. A copper tilting pan, for direct fire, with a rolling damper (also the invention of Mr. Guardiola), which cuts off the fire instantaneously from under the pan, can be used to prevent the charring of the sugar.

The saving of fuel, time, and labor, by using this helix evaporator, is so great, says the inventor, that the attention of all persons interested in sugar making should be called to it. The apparatus will be made of any size desired, oval or round.

The helix evaporators, like the many other inventions made

ting movement of the machine; while an even temperature pervades the whole mass. The vapors arising from the grain are instantly blown off by a current of hot air. A heater and fan accompany this apparatus, and the temperature is easily controlled. By this machine, Mr. Guardiola states, a planter can have his coffees ready for market 24 hours after he puts them in his drying machine.

## MALT

has also been dried lately in the same apparatus in the city of Philadelphia, at a heat varying from 90° to 122° Fah., afterwards raised towards 160°, in much less time than is usually employed in the old brick kilns, with excellent results. The machine occupies very little space and requires but little attention. It is especially adapted for brewers' use, inas-

much as it separates all the radicles during the drying process, thus delivering the malt perfectly screened and clean. Mr. Guardiola assures us that he has dried corn and kept it for two years without its being injured by weevils, and this in localities where the grain usually became spoiled within three months. The corn was subsequently planted,

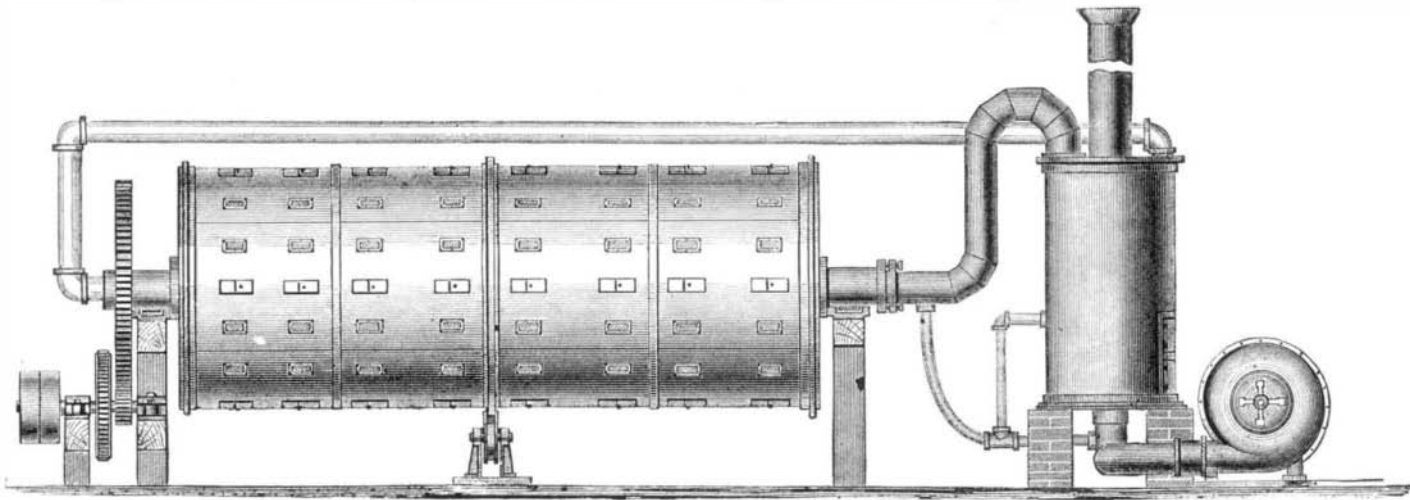


FIG. 4.—GUARDIOLA'S COFFEE-DRYING APPARATUS.

by Mr. Guardiola, are the direct result of practical experimenting to meet his own needs on his large estate, Chocó, Guatemala, where they are in successful use. In addition to the sugar evaporators, Mr. Guardiola, who is already well known to our readers as the inventor of a variety of novel and useful apparatus relating to the preparation of

## COFFEE

for the market, has invented several machines for processes in

and it germinated, thus showing that its vitality was unimpaired. One of these machines, as shown in our engraving, 16 feet long by 6 feet in diameter, is claimed to be capable of drying 10,000 lbs. of coffee or corn, or 300 bushels of malt, etc., per day, requiring less than 4 horse power to drive it. For smaller quantities, machines are made to be operated by hand.

It has been a common objection made to former appliances

for drying malt or grain that the principal aim has been too great a heat, thus rendering the grain liable to injury. Mr. Guardiola has avoided this danger, by using a low degree of heat throughout, particularly when the moisture in the grain is at its greatest. Fig. 5 is an end view of Fig. 4.

The coffee hulling and polishing machine, represented in Fig. 6, is remarkable for its simplicity. A mortar and pestle are its principal parts; and the construction is such that the coffee is cleaned and polished by the friction of one grain against another, moving in the broken chaff. The pestle is a cone, having on its surface oblique projecting ribs, set at proper distances from each other so as to form channels. The interior of the mortar is also provided with ribs and channels. The pestles drop simultaneously into the mortars, and the coffee is forced to move up and down the channels. The husk is thus broken and finally pulverized, leaving the coffee thoroughly clean. By opening a valve at the bottom, the contents of the mortar are discharged. No coffee grains

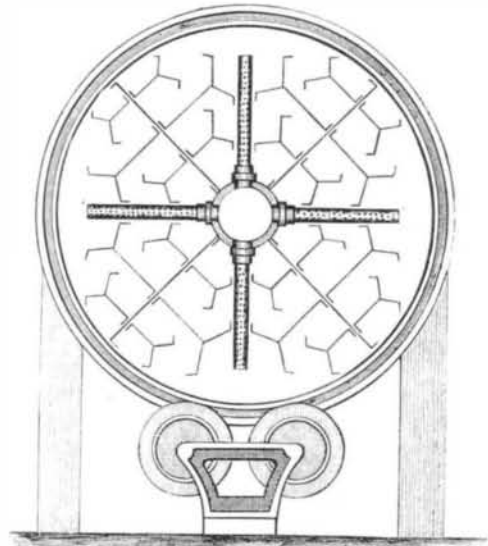


FIG. 5.—COFFEE DRYER, TRANSVERSE SECTION.

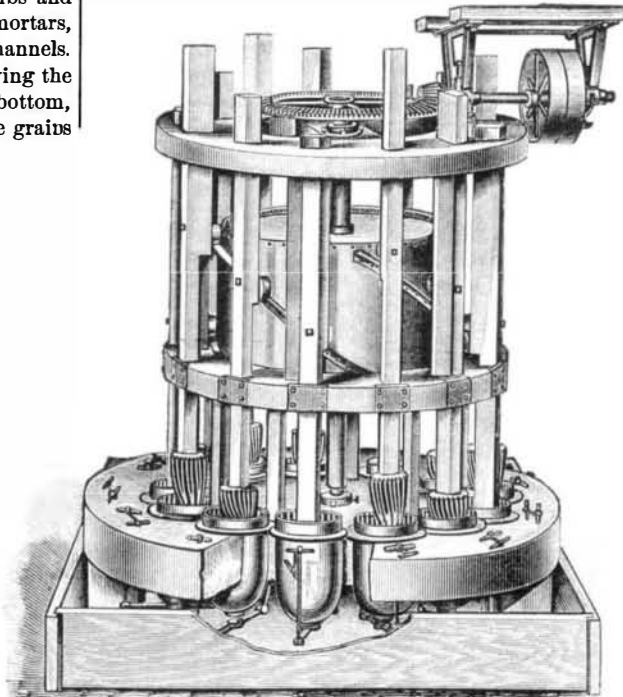


FIG. 6.—GUARDIOLA'S COFFEE HULLING AND POLISHING MACHINE.

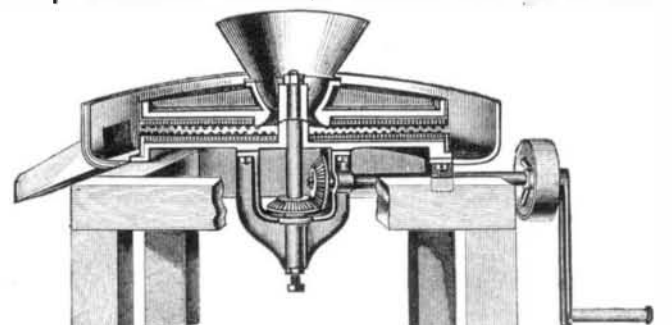


FIG. 7.—GUARDIOLA'S COFFEE HULLER FOR HAND POWER.

are broken. Each mortar will clean about 150 to 200 lbs. coffee per hour. The battery shown in our engraving has 13 pots; the number, however, may be increased or decreased as desired.

Fig. 7 represents a new coffee huller, useful where steam or water power cannot be had. The principal and most important feature of this machine is the elasticity of the rubbing surfaces. If the parts that come in contact with the coffee do not yield instantaneously, the coffee is injured and the loss is sometimes very great. But this machine has an elastic material acting like a very sensitive spring on the rubbing plates, so that the latter yield to the slightest pressure, while they are sufficiently rough and rigid to break apart the husk of the coffee.

Fig. 8 is a

#### CORN GRINDER,

an apparatus which is used principally in Mexico and Central America, where corn is boiled and then crushed and reduced to a fine pulp, for the purpose of making *tortillas*, or flat, round cakes, which, when toasted, form the principal

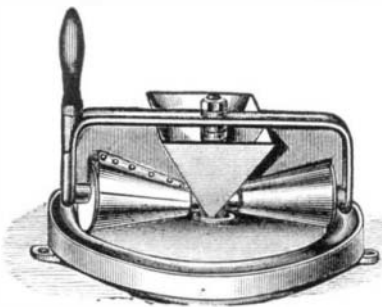


FIG. 8.—GUARDIOLA'S GRINDER FOR CORN, CHOCOLATE, ETC. food of the people. The machine is equally well adapted for grinding chocolate, seeds, paint, etc., as may be required.

Messrs. Morris, Tasker & Co., of Philadelphia, Pa., have recently made a new set of Mr. Guardiola's machines; and they may be addressed as to either the sugar or coffee machinery. Mr. Guardiola's address is Chocolá, Guatemala, Central America.

#### Wanted a Postage Stamp Cancellor.

The Government suffers yearly the loss of many thousands of dollars through the cleansing and re-use of postage stamps, after the same have once passed through the mails. About one thousand million stamps of all kinds are annually cancelled. Those printed on postal cards and envelopes, numbering, it is estimated, one third of the above total, cannot of course be used a second time. To prevent the remainder entering again into circulation, we rely on their being indelibly marked; but this important result no one has yet succeeded in attaining in a sufficiently simple and effective manner.

We still adhere to the old printers' ink besmeared pad and wooden hand stamp. In small post offices, where the clerk can take his time to the work, the above simple device answers all purposes, or at least is better than anything yet offered as a substitute; but in the offices of large cities, where the clerks are obliged to acquire marvellous celerity in handling the letters, it is almost a necessary consequence

that some stamps are so lightly marked that the greasy ink is readily removable.

The question now is whether a mode can be invented which will both rapidly and effectually produce the requisite cancellation. The prospects in this regard are certainly not promising, if we may accept the experience of the Post Office Department, which, after two years of experimenting on all sorts of inventions for the purpose, has recently brought its tests to a close, and is actually no nearer a solution of the problem than at the outset. A *World* correspondent says that, in one corner of the Post Office building in Washington, there is a room containing some five hundred

fruitless inventions. Most of them are inks. Fatty inks, metallic inks, sulphuric acid ink, which eats the stamp (also envelope and contents), caustic potash ink, which destroys the stamp or the post office clerk's skin on touching either, nitric acid ink, and any number of inks warranted to stand acids, but which promptly succumb to soap and water. One inventor brought a precious bottle of invaluable fluid all the way from St. Louis. He saw stamps cancelled with it proudly; but his gratification vanished when, ten minutes after, he saw the selfsame stamps washed clean with the all potent soap and water. Not a single ink submitted has stood the tests of the post office chemist; and even when that learned gentleman thought that he, profiting by the errors of others which he had so acutely detected, had certainly himself invented the elusive compound, the Smithsonian Institute chemist ruthlessly washed out the offspring of his genius. Chemical means in the form of inks are therefore failures; and nothing, thus far found, can surpass good printers' ink for obliteration purposes. A new chemical device has lately appeared which involves printing the stamps in colors produced by substances which, on being heated, change in hue. It is proposed, according to this, merely to heat the letters in the post office whence they are expedited. Three objections suggest themselves to the plan. First, heating letters will not postmark them, and it is highly desirable that postmark and obliteration shall (as is now the general rule) be effected simultaneously. Second, there is too much chemistry and heating apparatus about the invention to suit the average country post office. Lastly, packages containing cuttings of plants and many samples of goods could not be heated without ruining their contents. There are also various kinds of stamps proposed which, after once being affixed to the envelope, cannot be removed. Some years ago a quantity of stamps of this kind, seemingly printed on gelatin, were prepared in this city; but they failed to meet the approval of either the French Government or our own, to both of which they were submitted. It was practically impossible to preserve them, as a little moisture sufficed to curl them up, or caused them to adhere inextricably together.

Lastly are the mechanical cancellers, of which there are many. One harrows up the surface of the stamp with little hooks, too slow an operation; another jabs a stamp full of holes, but its ravages are easily cured by a little steam and a flat iron; another rips half the stamp off, but the knife is apt to get dull; and thus we might continue through a long category of inventions, which were all rejected in favor of hand stamp and pad.

Now we shall not for an instant credit the idea that our inventors are content to remain baffled by this problem, for we are convinced that there is a solution of it, and a practicable one. Let the inventors therefore understand the main points of the requirement: The mode of cancellation must admit of rapid use; must in no wise affect the contents of the envelope; must be applicable without special machinery or any special process; must be so simple as to require no more skill to use it than is now required to manipulate the hand stamp; must legibly inscribe the postmark and cancel the postage stamp, both simultaneously; must be cheap; if an ink, it must be chemically ineradicable, and yet not necessitate rare or costly chemicals for its manufacture; and if a self-destroying stamp, it must be as portable as the present

ones. There is an excellent opportunity here for some inventor not only to confer a great benefit upon the community, but to secure for himself splendid rewards; for a thoroughly successful invention of this kind would be welcomed by every government in the world.

#### A Visit to a Slate Quarry.

At Festiniog are situated some of the largest slate quarries in North Wales. We find in the *Building News* the following graphic description of a visit to the locality:

Passing over an iron bridge we were soon in the midst of the busy scene. All around extended the workings, the sides of the mountains being strewn with slate, which to an outsider seems to be wasted in a very prodigal manner.

Down the precipitous sides, every now and again, a huge mass of slate is hurled by the quarrymen above, and as it jumps and tumbles down, the cracking and crashing of the waste slate adds not a little to the prevailing noise. In the distance we hear the boom of blasting, and in all directions trucks hurry along, some in strings laden with waste, while single ones rush up and down very steep inclines. These last are worked in couples with an endless chain and drum, the ringing, rattling noise they make being most startling to the visitor. Not infrequently these chains break, when, it may be imagined, the position of the unloading gang at the bottom is somewhat awkward.

At a certain point our guides stretched themselves prone

upon the ground—we following their example—and crept to the edge of a cliff. Peering over, a sight met our view which was interesting to a degree; four hundred feet below lay the busiest and most remarkable portion of the workings. Almost immediately beneath us was a huge gray colored chasm, its entrance all misty with the smoke and dust of the blasting which was going on somewhere deep down in the bowels of the mountain. Around this opening for some distance was a cleared space alive with pigmy men, who were busy loading and unloading the various trucks which kept arriving from all directions, some appearing every now and again out of the chasm, others working by the tank system in stages, while the majority came pelting down the mountain side, held by a thin bright thread which glistened in the sun; this was the chain system spoken of. From the clearing around the chasm, lines of tramway led away to the railway, along which strings of trucks drawn by horses toiled continually. Leaving our birdseye view, we walked along until we reached the workshops. In a large building the different processes of bringing the slate into shape were going on in full swing; wheels spinning overhead, with driving bands in all directions, sawing, planing, and lopping the slate into sizes. Everything apparently was done by machinery, with but the one exception, as far as we saw, of rending or splitting the slate into the thin slabs technically known as 'slates;' this appears to be entirely done by hand. The process is very simple but very interesting. The render sitting upon a block, with a pad on his legs, is supplied by boys with slabs about an inch and a half in thickness. Taking one between his knees, after having selected the truest end, he taps it with a broad blunt chisel and mallet, prising it open; then, with a turn of the wrist, rends the slab in twain. Often when he appears to have come to the last slate which can be got out of the slab, he will again rend it, apparently as easy as the first time. We watched one man for perhaps ten minutes, while he did over a hundred slates, and did not see one mistake. After this process they are taken to a revolving hollow drum with stout iron blades, and are held by a man on a fixed bed or frame, with a gauge attached to it, and squared up into the different sized slates.

Leaving the shops we went on until we came to some sheds, where was a shaft descending to the lower workings, passing on our way an old man sitting in a slate hut, who, assisted by a boy only, was busy rending, lopping, and slacking small sized slates, looking as 'though he adhered tenaciously to the old style, and scorned the idea of the new-fangled machinery. At one of the sheds we procured candles and then waited for the tank, or skip, to come up, which it presently did with a laden truck; this being pulled off on to the tramway, we stepped on to the tank in its place. The water was then turned on, and the tank filling, the weight of the water soon counterbalanced the loaded (empty) tank at the bottom. The water being turned off, we began to move, and down we went, until, after about a minute's journey, a gentle bump told us we were at the bottom. A rumbling noise and a shout warned us of the approach of some trollies drawn by a pony. We just managed to evade them, but not without some of the party getting very wet. The train we returned by carried about 300 quarrymen, who cropped off the trucks at the nearest point to their destination. These men work in gangs and earn very considerable wages.