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The Screw Mower and Reaper.

A new mechanical movement, as a possible element of future machines, always possesses a peculiar interest. This interest is greatly heightened when, as in the present instance, such a movement has been demonstrated to be of real practical value. The peculiar feature, of the mower and reaper shown in our engravings, is the application of a worm wheel and screw to the rotation of the crank shaft which drives the cutter bar, which worm wheel and screw possess features that entitle the arrangement to be classed as a new movement. Fig. 1 is a perspective view, the parts of the machine being lettered as follows: A is the worm gear wheel, B the screw, C the step pin, D the casing of the worm gear, a portion being broken away, E the connecting rod wheel, F the connecting rod, G the cutter bar and H the draft rod.

The latter is so attached that the draft is applied to the rear of the axle in such a way as to throw nearly the whole weight of the machine on to the axle, and thence on to the driving and carrying wheels. Side draft is balanced by making the outside drive wheel slightly smaller than the inside, thus throwing more labor on the former. In regard to the worm wheel, it will be seen, on reference to Fig. 2, that it is peculiarly constructed, the teeth being formed very differently from those of the ordinary worm gear, where the screw actuates the wheel. In this case, the wheel impelling the screw, the teeth are so cut that they only operate on that side of the axis of the screw at which they disengage from their contact with the thread.

At first sight this may seem a trifling alteration from the old form, but in effect it so much reduces the friction of this kind of train that we are assured actual test shows a reduction of loss from friction in the application of power, in favor of this train, as compared with the best cut spur gearing. A moment's reflection will serve to convince our mechanical readers that teeth made to act on both sides of the axis of the screw will, at the side on which they enter, really act to consume the power applied at the other side, on account of their coming in contact before they have fully entered the interspaces, and the strong lateral pressure they exert upon the journals of the screw shafts. By the peculiar pitch of the screw thread employed in this movement, and the shape given to the teeth, the two do not come into contact until the teeth reach the position to act with greatest power upon the incline of the thread, and with the least friction.

By this means the end thrust of the screw, received by the step pin, C, is so reduced that, we are told, a nickel five cent piece, placed between the end of the step pin and its bearing in the end of the shaft, did not wear out during a whole season of active work in mowing and reaping, and that no trouble from heating has been experienced.

The screw is of steel, double threaded, and consequently revolves once on the passage of two teeth. The worm gear is of gun metal, which further reduces the friction. The simplicity of the arrangement is apparent, and we are assured the proprietors will at any time test their machine with others to show its superior lightness of draft.

As shown in Fig. 1, the gear is inclosed in an iron case, which forms part of the frame.

The finger bar, shoe, etc., are attached to or taken from the frame, without bolts or pins, by a hinged coupling, that allows the bar to work below or above a level. The bar can be thrown entirely up by the driver while in his seat, without stopping his machine; the cutting apparatus may be adjusted to any required height or set at any angle, and the main frame to swing under or over the axle, thereby giving a front or rear cut combined, without

disturbing in the least the driving device. The frame may be cast all in one piece, or parts of it made of wrought iron.

On the whole, we incline to regard this an important and valuable improvement, an opinion that is strengthened by reports that reach us in regard to its working during two seasons of actual service.

Three manufactories are now making the machines, and at one, in Wheeling, Va., 1,000 machines are now building. The patent is now owned by the Universal Mower and Reaper Company, 91 Liberty street, New York, who will license the manufacture of the machines, or the application of the screw

brown color on her cheeks, it paled gradually towards the bridge of her nose, and the centre of her lips, chin, and neck. Those of your readers who have a copy of Colonel Yule's narrative of the embassy to Ava will see a good likeness of the woman, and a description of herself and family."

ROOFS, PAVEMENTS, AND SAFES, UNDER FIRE AT CHICAGO.

The office of the *American Builder*, at Chicago, sharing the common fate of the other periodicals, during the late conflagration was burned down. But the publishers, with commendable enterprise, have reproduced the publication, and the number for November, now before us, contains much interesting matter, from which we take the following:

ROOFS.

"The business blocks of Chicago were covered, chiefly, with paper coated with tar and gravel, a preparation commonly known as felt roofing. Even the 'fireproof' *Tribune* building was covered with this material, which has been in general use throughout the United States for a number of years. During the progress of the fire it became very evident that these roofs assisted materially in the spread of the conflagration. The heat was, of course, intense where adjacent buildings were in flames, the tar melted, and ignition was the consequence; so that roofs which ordinarily resist fire, in this instance were prime aids in spreading it.

"The *Builder* has always been opposed to the use of this kind of roofing material, and now we insist upon it that architects and builders abandon it altogether. It may be well enough to use it upon isolated cheap dwellings, but let us have no more of it within the fire limits. Let no architect who values his reputation recommend it to his client. In place of paper and tar, we have tin, iron, or, what is better than either, concrete. This latter will endure fire, and it is not expensive. Our concrete pavements stood intact where great flagging stones flew to pieces. We commend the concrete for roofing purposes, and trust the architects may be induced to listen to reason and experience, and recommend it for all brick and stone edifices.

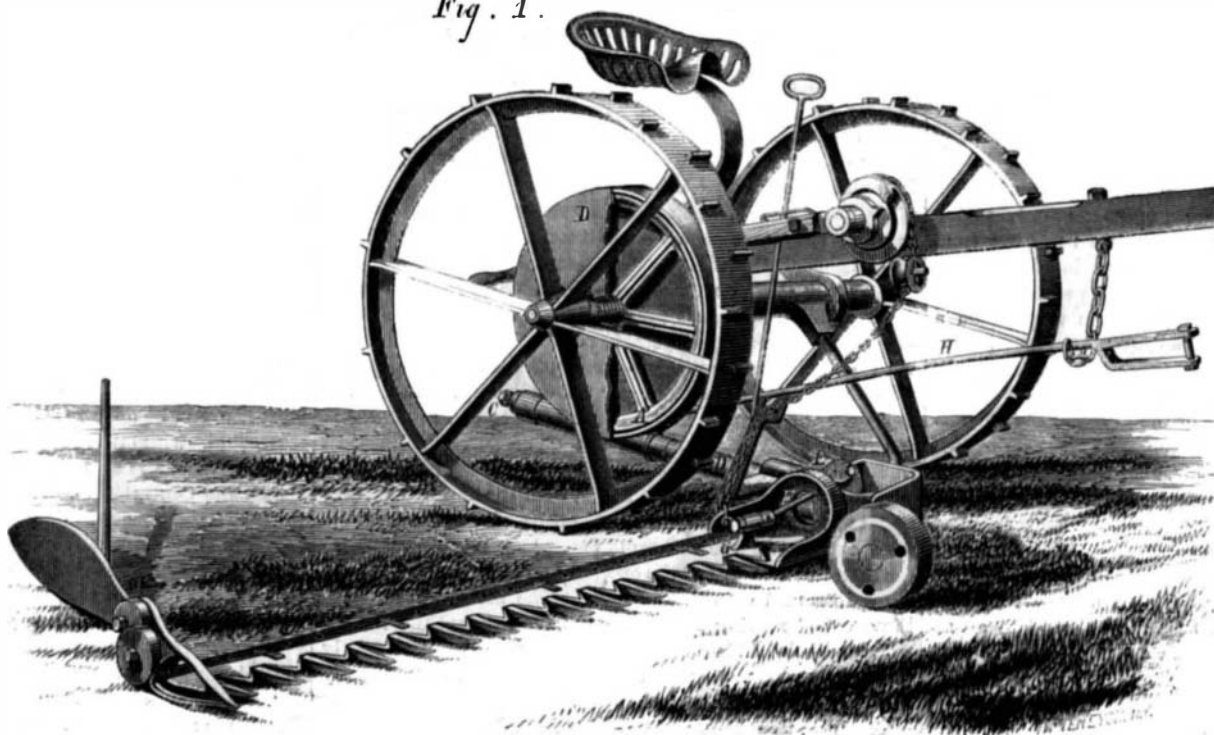
PAVEMENTS.

"Noticeable among the results of the late fire was the effect upon the different pavements. The Nicolson is, in many places, completely honeycombed, the fire having eaten its way downward into as much of the wood as was dry enough to burn.

"The concrete pavement, which had been laid down in small patches by way of experiment in different parts of the city, endured the test well, and is today in as good condition, apparently, as before the fire. So that, as regards one quality at least, there is little chance for comparison between the wooden and concrete pavements, so great is the advantage in favor of the latter. And there occurs no convincing reason why the concrete should not be more generally adopted. In the instances where it has been employed, the results seem to have been very satisfactory. The wear of heavy vehicles has produced little impression wherever the concrete has been properly laid, and the surface presented is even and well adapted to the transportation of heavy loads. Appearances certainly indicate that,

in point of convenience and durability, the concrete is the pavement for the future. We have not the figures indicating the relative first cost of the different pavements, though the concrete is certainly expensive; but, unless a greater difference exists than appears likely, it would seem that economy and a regard for the public good demand a substitution of the concrete for the wooden surface of our streets.

Fig. 1.



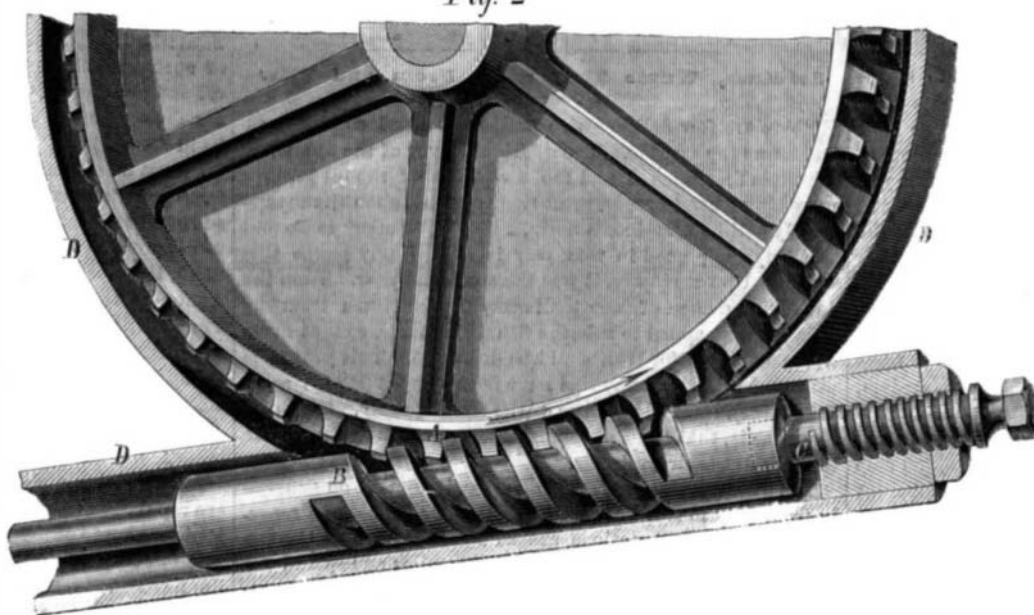
GOODWIN'S SCREW MOWER AND REAPER.

and worm gear attachment, on royalty. The machine was patented by Wm. Farr Goodwin, March 30, 1869, and August 29, 1871.

A Burmese Hairy Woman.

A correspondent of the *London Times* writes to that journal the following particulars, referring to a hairy woman and her children, of whom he had before spoken in his letters: "When I was at Mandalay in 1859, I saw the same woman and three of her children. The eldest and youngest were hairy like their mother, while the second, like his father, presented no such peculiarity. The husband was a man who report said was induced to wed this woman to become possessed of the marriage portion which the King of Burmah

Fig. 2.



had promised to bestow upon her on her bridal day. The bridegroom was a plucky individual at any rate, though his motives may have been mercenary. The hairy woman, whose name I forget, had a pleasant and intelligent face—there was nothing whatever repulsive in it. The hair on the face and breast was several inches long; on the forehead it was parted in the middle, and blended with that of her head. Of a light

SAFES AND VAULTS.

"The experience of the late fire affords much information regarding the relative merits of safes and vaults for the preservation of papers or other valuables. The work of digging out safes from the ruins, which was begun as soon as the heat of the smouldering piles would admit, resulted in proving the fact that safes, however well constructed, would not, under all circumstances, preserve their contents unharmed. Those placed in wooden buildings, as a rule, held papers and books in good condition; the materials of which such buildings were composed burned so quickly and entirely, leaving nothing remaining to smoulder and retain the fire, that safes did not become heated through. But in buildings of brick and stone, the result was more unfortunate. The safes fell among masses of material which burned steadily and gave forth intense heat for days after the first fire, and thwarted any attempts made at removal. The safes lying in the midst of such heaps of fire became intensely heated throughout, and when efforts to remove and open them were finally successful, their contents were found in many cases to be ruined. Books, papers, and bank notes still retained their form, but had changed to black in color, and, upon the slightest touch, crumbled into powder. In almost an exact proportion to the length of time they had been forced to remain in the burning ruins, safes were found to have preserved their contents uninjured or partially or totally destroyed. It is evident that, while a well constructed safe will hold, uninjured, books and papers, for a time, yet, if remaining in the fire for a long period, no one yet made will fulfil its purpose.

"With vaults the result proved entirely different. In nearly every instance well built vaults held their contents intact. Bricks and mortar proved excellent non-conductors of heat; and upon the opening of large vaults which stood for some days in the midst of fire, their interiors were found scarcely warm.

"These discoveries will doubtless have the effect of introducing more largely the construction of vaults in buildings devoted to business uses; and the disasters resulting from their faulty construction, of which the one in the Custom House furnished a notable example, will perhaps induce more care in building. A vault badly built is worse than a poor safe, for the latter does afford a degree of protection to what is within it, while the former gives no protection at all.

It must not be inferred from the statements made above that the safes buried in the ruins of the late fire did not accomplish a great degree of good. Property of immense value was preserved through their agency, and, where not exposed to heat of the most intense character and for a long time, the safes generally stood the severest test well, and reflected credit on the makers, and must continue to be used, even where vaults exist; for, to secure perfect safety, valuables must be placed in a safe surrounded by a vault; and, for ordinary fires, safes have proved themselves equal to all requirements. But for such occasions as the late fire, only vaults can afford the perfect security needed."

DOWN IN THE CAISSON OF THE EAST PIER OF THE ST. LOUIS BRIDGE.

[From the Railroad Gazette.]

The grand entrance is a brick shaft dropping vertically to the iron girders, and thence is finished in iron through the air chamber. The steps descend spirally; you find yourself hemmed in by the circular walls of the well. On each side of you are iron doors, about 18 inches square and 30 inches from the floor. The place is damper than a parlor, but drier than a well 60 feet below water surface should be. This you notice while a man who is sweeping the floor tells you that one of the doors will be open in a moment. There is a sound as of a whistling of air through pipes, and soon a door does open, and a man within beckons you to step through, which you do, into an iron handbox, say 6 feet in diameter and about 9 feet high, containing several pipes with air cocks upon them, and a seat. As your companion has a candle, you observe another similar iron door opposite to the one by which you entered. Your companion now closes the latter and turns one of the cocks, when there comes in, with a sharp, loud hiss, an atmosphere which is destined to arrive at a normal pressure of about 40 pounds to the square inch. Directly you feel a severe pain in one ear. Your guide asks you concerning it, and directs you to perform the motion of swallowing, which you do and are relieved. After this you swallow involuntarily. The guide now tells you, speaking in a key above the hissing of the entering air, that the strength of 40 men could not open the door through which you have just passed, and that the opposite one will shortly be loosened. Soon this occurs, and you slip upon a floor of loose sand, which, illuminated by the candles of the workmen, looks like bright yellow sugar just turned out fresh from the hogshead. You walk through it with great freedom, and even when passing through one of the log girders, which divide the chamber into three compartments, longitudinal with the pier, by an aperture about 18 inches square, you step deep into a loose pile of it; you step out with little apparent effort. A little to your right and extending downwards from the ceiling is a pipe with a loose valve hanging to the end of it and palpitating like the tongue of a hot dog. This and others around supply the apartment with air. Upon your left a man is shovelling sand into a trough of water. Into this trough is encased the lower end of an iron pipe which drops from the ceiling. Near the top of this another pipe, which comes through the masonry parallel with it, turns into it and a little upwards. This is the sand pump. All the sand which the man throws into the trough is sucked up by the vacuum, created by a stream of water which comes down the second pipe, and is projected upwards through the first.

And so this goes on regularly for days: the sand being excavated, the caisson with its load of stone sinking, and the masonry added continually until the rock is reached. Then men say that "another engineering epoch has occurred. The east and largest pier of the St. Louis Bridge has safely reached the rock through a depth of ninety feet."

Still walking around, you notice that the peculiar bright appearance of the sand comes from the fact, that although the air pressure has driven all the free water from its interstices, a film surrounds each grain, retained there by an adhesion superior to the pressure, which brightly reflects the yellow light from the candles.

Now talking of candles reminds us of the Chief Engineer's remarks upon the danger of fire, in this triply compressed air, and his experiments thereon. These, moreover have been noticed as not agreeing with the experiments made by Dr. Frankland (Philosophic Transactions, 1861). As this subject must become of importance, in view of the increased use of compressed air in hydraulic construction, it may be well to lightly compare the two series of trials, and show that there is no discrepancy, but an actual agreement. Captain Eads plainly speaks of the danger of fire, and instances several cases where the clothes of the men had actually caught the flame, as showing the increased combustion arising from the increased supply of oxygen.

Dr. Frankland, in the above mentioned memoir, on the contrary, shows that from the rarefied air upon the top of Mont Blanc to the laboratory condensation of three atmospheres, there was no more tallow consumed and therefore no more combustion in the one case than in the other, and that the quantity agreed precisely with the quantity of material consumed under the normal pressure. The discrepancy, however, is explained by the very reasons deduced from his experiments, which he gives as the decreased mobility of the atoms of oxygen arising from the increased condensation. It is plain enough that, other laws being equal, the mobility of the particles may be in exact inverse ratio to the density, in which case the combustion will remain the same through all changes of pressure.

But would Dr. Frankland's experiments, if, instead of being conducted in a bell glass practically air tight and the pump stopped as soon as the desired pressure was obtained, made with a bell glass leaking at every pore, so that the pump would constantly have to supply the deficiency, with moving figures flitting from place to place, always in motion and constantly breathing, with the test object—the candle—continually changing its position, and sometimes blown upon with a strong blast from the lungs, with the figures violently agitated when the fire touches them—would, we say, his experiments have given the same result? It would seem not; for then the mobility of the oxygen particles would not have been decreased with their density. The action of leakage, the effect of moving bodies, would have restored the mobility, and we should have three times the oxygen with nearly the same, and not one third, the mobility, and consequently nearly three times the combustion.

There is, therefore, great danger from fire in compressed air, and a strong light, which could be retained in one place where the air is still, is a desideratum.

But we have now visited the subfluviatile chamber and seen its wonders, and so returning through the air lock, where the letting off of pressure does not affect the ear, we are at the foot of the spiral staircase.

Here comes the tug of war. Your strength which has been increased by the compression, has now fearfully diminished. You are weary and without nerve for the ascent. You feel, indeed, as a wet rag might feel if suddenly brought to a consciousness of its limpness. So with sloth you drag your weary way to the top, and finding the air still bleak, and wet, and Novemberish, and that when you get upon the streets your umbrella is twisted in every direction by the wind save the direction from which the rain comes, you wish you were back again deep under the river, with a plentiful supply of tempered air, strengthened with oxygen, and a steady umbrella over your head capable of turning aside the northwest wind and the full flow of the Mississippi River.

Sardines, Where They Come From and How Preserved.

There are few delicacies so well known and so highly esteemed as the sardine. The delicious flavor of the fish when the tin is first opened, and the sweetness of the oil (always supposing a good brand), print their charms upon the memory. It will be unwelcome news, however, to many to be told that anything good in this way is exceedingly scarce this season. Unfortunately, it was the same last year. Then the destroying demon of war took away the fishermen from the villages, and, added to this, the fish were scarce, so that more were contracted for than could be delivered. This year it is worse. Few fish of any size have been caught (except some very large), least of all those of the finest quality. The consequence is, that the French manufacturers are again unable to carry out their contracts.

The fishery, says the London *Grocer*, is carried on generally from July to November, all along the west coast of France. Two of the largest stations are at Douarnenez and Concarneau. Fleets of boats go out some few miles and spread out their nets, by the side of which some cod roe is thrown to attract the fish. The nets are weighted on one end and have corks attached to the other so that they assume a vertical position—two nets being placed close to each other, that the fish trying to escape may be caught in the meshes. Brought to land, they are immediately offered for sale, as, if staler by a few hours, they become seriously deteriorated in value, no first class manufacturer caring to buy such. They are sold by the thousand. The curer employs large numbers of wo-

men, who cut off the heads of the fish, wash, and salt them. The fish are then dipped into boiling oil for a few minutes, arranged in various sized boxes, filled up with finest olive oil, soldered down, and then placed in boiling water for some time. Women burnish the tins; the labels are put on, or sometimes enamelled on the tins, which are afterwards packed in wooden cases, generally containing 100 tins, and then are ready for export.

It does not always seem to be remembered that the longer the tin is kept unopened the more mellow do the fish become; and, if properly prepared, age improves them as it does good wine. But if they are too salt at first, age does not benefit them—they always remain tough. The sizes of tins are known as half and quarter tins. There are two half tins, one weighing eighteen ounces and the other sixteen ounces gross. The quarter tin usually weighs about seven ounces, but there is a larger quarter tin sometimes imported. Whole tins, and even larger ones still, are used in France, but seldom seen here.

As is well known, the sardine trade is an important branch of industry, very large quantities being consumed in France; and the exportation to England and America is truly wonderful.

Proposed Ship Canal in Russia.

Under the heading of "Internal Navigation in Russia," *Le Moniteur des Interêts Matériels*, published in Brussels, gives the following article, which we translate:

"Since the completion of such immense works as the piercing of the Isthmus of Suez and the Mont Cenis, simply and easily done in a few years, none of the gigantic enterprises which our ancestors dreamt of, and for many years considered impossible, are likely to frighten engineers or capitalists. The union of the two seas in the south of Russia, has been, as is well known, ever since the time of Peter the Great, the "holy wish" of the Government of Russia. Of what importance to the great empire would a canal, permitting her to send her fleets into all the ports of Persia, and giving a support to her power in the East, be! And what an accession of power would result from the possibility of carrying, to one destination, the united fleets of the Black and Caspian Seas!

"From commercial and industrial points of view, we might predict a great future for such a canal; for a sea, hitherto closed, would be open to all maritime nations; and their vessels could, without discharging cargo, penetrate into the heart of Asia, and also carry to the West all the products of Persia and Central Asia. Russia has only too many reasons to favor such an enterprise; and accordingly the Czar instituted, in 1864, a commission charged to consider the feasibility of the project. The chief of this commission, M. Blums, believes the plan to be practicable; and, if we study the map with a little attention, the immensity of such an enterprise reduces itself to proportions comparable to those of the Isthmus of Suez Canal.

"The distance which separates the Sea of Azov from the Caspian is about 650 or 700 Russian versts, or 700 kilometers (about 441 miles). The Isthmus of Suez is 150 kilometers across. But two important rivers, the Manitscha and the Kooma, both take their rise in the Caucasus, and empty their waters respectively into the two seas; and using their streams would permit a considerable abridgment of the labor. The engineering difficulties will probably be greater than at Suez, where the highest rise in the level was only 20 meters. It will be necessary to leave a much larger margin for contingencies, and it is well known to what an amount these came in the earlier work. Still other new problems present themselves. Here, however, are the figures given by the engineers of the abovementioned Russian commission:

"A canal can be constructed from one sea to the other for 81,000,000 silver rubles (about \$60,750,000). The measurement of the soil to be removed will amount to 550,000,000 cubic meters (about 720,000,000 cubic yards).

"The Russian Government cannot, at present, hope to see other nations concurring in this enterprise. Foreign commerce will naturally prefer the shorter and better canal of Suez; but the junction of the Sea of Azov to the Caspian is of such importance to the Russian empire, both from political and commercial points of view, that the Government will not shrink from a considerable expenditure. And it would be in Russia itself that the greater part of the needed capital must be sought; and it would there be possible to obtain it, by insuring, as has been done to the railway enterprises, a sufficient interest for the money. It would be easy, moreover, to promote, in the countries which the canal is intended to unite, the creation of banks and other commercial establishments, by the concession of lands and of facilities of transit. The question is of permanent importance to Russia, and from the present state of public opinion in that country, and from the spirit attributed to the Government, it will probably be answered in a sufficiently short time."

A Square Toed Plan for Making Money.

A Boston boot and shoe firm, which has an extensive Northern reputation by reason of its loyalty, lately hit upon an ingenious plan to push their trade in the South. They invented a sort of a square toed boot, on the leg of which was imprinted the likeness of Gen. R. E. Lee, and this was to go into the general Southern market. A finer boot was then made with the picture of Stonewall Jackson, also imprinted on the boot leg, and this was intended especially for Virginia dealers. The firm then applied for a patent on their trade mark. The Examiner to-day decided that the application could not be granted on the ground that these trade marks tended to encourage disloyalty in the South. The firm have taken an appeal to the Commissioner.