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CANADIAN MECHANIC'S MAGAZINE AND PATENT OFFICE RECORD

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FREE TRADE or PROTECTION.

"Medio tutissimus ibis." *

IN the remarks we are about to make on these important political questions of the day, we wish it to be understood that they are not intended to have any political bearing on Trade Policy on either one side or the other; the country has given such a decided verdict in favor of protection, that we have now to await patiently until two or three years are past before the effect of protective duties will have had a sufficient trial to prove their benefit to Canada, or otherwise. The country has made a complete somerset in the political opinions it held five years since, and it would not be at all surprising if several of these acrobatic exhibitions of oscillating opinions should be exhibited at the termination of every quintennial term of parliamentary rule. But in writing on this subject in a mechanical magazine, we abjure all political theories; we have no axe to grind, nor any selfish object in view; we simply wish to review the question, and exhibit it in other lights than those which either party have shed upon it from the hustings; our readers then may possibly, from our deductions, and now that the effervescence of such political spirit has subsided, form a juster estimate as to whether benefits are likely to accrue from the present policy, or otherwise.

Politicians in discussing these questions are too apt to be carried away by their political feelings, and are not always actuated by truly unselfish motives, or by the force of calm reasoning power. Too many of such men are attracted by the stronger will or magnetic influence of political professionals, and are very apt to grow confused under a flow of impulsive argument—which is too often but a superficial gilding over the baser metal—from men who are fluent in words, but totally ignorant of the primary causes of the present depression in our manufactures.

(*) A middle course is the safest.

With respect to the fiat gone forth in Canada in favor of protection, several of the leading English and American journals have spoken of it in a deprecating tone, and consider that it is a retrograde step from prosperity; and advocates of free trade, in this country, point out, as the principal cause of the low ebb to which the manufacturers in United States have fallen, to their high protective tariffs. Now let us first consider the question of a comparison of free trade in Great Britain and free trade in Canada at the present hour.

When England adopted a free trade policy, what was her position compared with all other rival nations competing with her in manufactured goods, when that policy was adopted by her people? and what is the condition of Canada now compared with Great Britain at that time?

Great Britain had arrived at a supremacy in particular lines of manufactured goods far above every other nation of the earth; in fact, she had no rivals that she feared in competition, or needed to be protected against. Her policy was to endeavour to open the ports of all nations to a free entry of her goods, and why? because, at that time, she had machinery the finest in the world, and coal and iron the cheapest. She had a population, trained to mechanical labor, far in excess of any other nation, and it was an important, and even vital object, in a country where the land was held by a few hundreds of nobility, and millionaires, to keep that population in constant employment. If she had rivals in any particular trade, the balance of superiority was pretty equal. She had no adjacent power, like the United States, on her very border, with a population ten times greater than her own. She was then a nation which, at that period, had arrived at the very acme of perfection in many kinds of manufactured goods, and, therefore, when English journals twit us with making a retrograde movement, and attempt to draw a comparison between them then, and our country now, it is almost like comparing the setting up of a child to fight a giant. She had no country to contend against then that had a population ten times greater than her own, that could at any moment flood her markets with bankrupt stock, or with a surplus stock of manufactured goods, and ruin the manufacturers of similar goods in her own land, not only by bringing down the prices, but actually preventing the sale of

goods already manufactured, because they had glutted the market with their foreign manufacture. She had no country that could, at that time, compete with her in machinery. She could manufacture for millions without much competition, whilst we can only manufacture for hundreds in our own country, whilst an older, more powerful, and wealthier power, whose demarcation line runs for hundreds of miles along the most populous and wealthy part of Canada, defies us to compete with her in her own country by her high protected tariff. We are limited to a few thousands of actual purchasers—she has millions. She can afford to build manufactories for special parts of machinery—as in pianos and organs, and bring these portions to the highest perfection at the lowest rate of cost; we, to compete with them, cannot afford to do this and must make every part of a machine in one shop, or else purchase them in the United States, with the extra cost of 17½ per cent. duty, freight, and other charges besides; nor does this difficulty end here, for it is a well-known fact that Americans will invoice certain kinds of goods to Canada far below what they sell them at in their own country, in order to keep their men in their large workshops employed; they are willing to sell at such small profits, and even at cost price, as would ruin similar trades in this country. Over this the custom-house officials appear to have no control, for even if the Government took the goods at their invoiced price, they would soon have an elephant on their hands not easily to get rid of. Now supposing that a Canadian manufacturer went to the expense of refurnishing his workshops with the finest machinery that could be made, by which he could effect a saving in mechanical labor of 30 per cent., and a saving in time besides, of what use would it be to him if, after so doing, he found that he had no market in which to sell his goods; that, although he could turn out machines in three-fourths of the time, he could not sell them, or even if he could sell them, that, owing to the increased facility with which he could manufacture, his outlay for capital for these improvements must lie dormant and unremunerative for a great part of the year. To draw a comparison, therefore, between England in her superiority, competing by free trade with other nations, her inferiors; and that of Canada in her infancy, endeavouring to do so with an adjacent nation with ten times her population, and more than ten times her wealth, shows that those who undertake to instruct us in such matters know very little of the true bearings of the case.

It has been argued by the free trade party that it is to protective duties the United States now suffer from so great a depression in her manufactories and trades. To those who have not studied the international affairs of our neighbours during the past twelve years, and have not travelled through the country and visited its numerous factories, and mingled with her people, such an argument is likely to have great force; they only see a cause, as they suppose it to be, through a clouded atmosphere. This view of the effect of protection on the United States is altogether erroneous. There has been a depression in trade and manufactures, for some years past, in almost every part of the world; it is still apparently increasing, and, therefore, the States are suffering from that general epidemic in trade, which has visited every nation; the argument, therefore, that protective tariffs have especially injured her, will not hold good. But why she suffers more particularly at present than other countries, and has not got over her difficulties with the quickness of her usual elastic nature, has arisen from over-manufacturing; the production of a supply far beyond the wants of her people; overstocking her markets, speculation, rashness, and dishonesty; and, also, from an extravagance among her people, the outgrowth of the war, which has resulted, to thousands, in absolute ruin, and impoverished the nation: they exhausted their resources without ever dreaming that a dark day was coming, and that their former rapid means of acquiring wealth would cease.

The principal cause, however, of the great lack of employment in that country may be attributed to two sources:—

First—the civil war between the North and South.

Second—to the Trades' Union Societies.

After the commencement of that great civil strife, the demand for recruits became greater each succeeding year, until every one capable of bearing arms was drafted into the ranks of both armies, unless, as in the Northern army, he was wealthy and could find a substitute; but the bulk of the young men, be it spoken to their honor and love of country, enlisted voluntarily. This enormous drain upon the youth, middle-aged men of the country, and upon their resources, became so constant during a period of six years, that women had to occupy the positions previously filled by men only, and the inventive genius of the nation was taxed to the utmost to bring machinery to the greatest degree of perfection to supply the place of manual labor that could no longer be obtained. It was at this time there occurred a great exodus of laborers, mechanics, and young women from this country to the States to become operatives at mills, or to take domestic service. Hundreds of families, at the same time, emigrated to that country, where, in the face of the bloody strife going on, wealth and prosperity seemed to be overflowing. Paper money, although of a most depreciated value, seemed to float through the country; it circulated with the greatest rapidity; the coffers of the merchants, manufacturers and farmers were overflowing; and every article of produce, commerce, manufactures, food and the luxuries of life was increased in value fourfold. Factories rose up like mushrooms in all the New England States, and every mountain stream capable of affording water power, had several small mills erected upon its banks. But it was not the mere necessities required for carrying on that war which alone created this immense demand for all kinds of manufactured goods, for the waste, destruction and robbery—the usual concomitants of civil war—was something enormous. The extravagance of the nation created an immense demand for manufactured and foreign goods to clothe itself in fine raiment, and pamper itself with luxuries, while its best and noblest blood was being shed on the field of battle and the flower and chivalry of the country were miserably perishing of fever, or in Southern prisons; therefore, during the six years' duration of that civil war, the manufactories and trade of the country increased fourfold. These goods were paid for, not out of the natural channel of commercial business, but by an issue of national paper which the nation was pledged to redeem at a future date, and which she is still nobly doing; although, she must now acknowledge, had more prudence, honesty and economy been used, that debt would not have been half so great.

With the sudden termination of the war came the re-

action that must naturally follow any great and over-strained exertion, either in physical life, or that of a nation. With its close there at once ceased to be any further demand for certain kinds of goods required by an army and navy composed of nearly a milion of men, including North and South—and it was immediately followed by the closing up of all the small cotton and woollen mills, and other factories for manufacturing ordnance and small arms. The smaller factories had at once to close as they could no longer compete with the older and larger establishments. Still, however, there was a certain vitality in the nation that could not subside all at once to its previous normal condition; many had returned from the war with large accumulated savings, and sought, with that national feeling of enterprise peculiar to the nation, to invest it in some form of traile or manufacture, although these had already far outgrown the wants of a nation in time of peace. Some invested in houses and landed property, which had increased in six years to a fictitious value, and on this value, in real estate, they had to pay an internal revenue tax in gold, for property that had been bought with greenbacks at a discount of 150 to 200 per cent., in addition to its abnormal value at the time.

Thousands of mechanics had done so well during the war, that they brought up and educated their children far above their previous position in life; they built for themselves expensive houses—many of them villas—and furnished them in an equally expensive way; in fact, the whole nation imagined that it was rich and prospering, when it was building its expectations on a fictitious basis. For the first and second year after the war ceased the reflux of the tide was not much felt; but soon the value of property began to fall, the price set upon manufactured goods decreased in value, when the abnormal demand that had been created ceased to exist; and the once well filled purses became depleted, as the sources from which the money came ceased to flow. The nation no more required to issue its national paper for goods no longer wanted, but called upon its people to pay back, in gold, the debt incurred. The stimulant to the nation was withdrawn, and like a man recovering from a crisis in fever, so she is prostrated at present, but will assuredly rise again to become a stronger and healthier nation in the future, although some years will elapse before society returns again to a safe normal condition.

Now the evil result of this war in the States was to cause to be erected a large number of manufactories—filled with machinery of the most perfect kind—far in excess of the requirements of a country in times of peace; it was in fact a stride fifty years in advance of the times. Machines were invented altogether to supersede manual labor, and to perform twice the amount of work, and better also, in the same period of time; the consequence has been that the number of factories in the United States are far in excess of its requirements, and will be so for some time to come; therefore, it is no wonder that there should be in that country a depression in business of nearly every kind, with so much money sunk in unremunerative machinery and speculations. Surely then, with the knowledge of these facts before us, we cannot attribute the cause of hard times with our neighbours to their protective policy. If England could now flood her markets with her cheap goods, and if even we could send in ours on equal terms of tariff, the condition of the States would be far more deplorable than it is at present.

The other cause which has militated to her disadvantage has been the formation and instrumentality of

TRADES' UNION SOCIETIES.

The high price paid for all classes of mechanics and laboring men in the United States, owing to the large number annually required to fill up the ranks of the army, which required to be yearly augmented in numbers, created in the minds of certain men of foreign element, who wished to set themselves up as demagogues, a desire to create certain societies which should control the wages to be paid to different crafts. They thought that by working in concert, and under a certain organization, the manufacturers and capitalists would be obliged to accede to their demands. The bulk of this class was composed of foreigners, or the descendants of foreigners; men who had come penniless to the country; mostly uneducated, and who, under the supposition of their power, had grown arrogant. They looked upon the proprietors of large factories as men of enormous wealth, who had grown rich by the sweat of the mechanic's brow, and their doctrine was that they were an oppressed and aggrieved body of men, and that by uniting they would force their employers to disgorge a portion of their large profits in higher wages to themselves. Ignorant men are unable to reason with much justness, and generally float along on the popular stream. The consequences that have followed these combinations have been fruitful of dire results both to the employer and the employed, as well as to the country at large; but to none more so than to the strikers themselves. Capitalists have hesitated to invest in any business that can be brought to a stand still, at any moment, by a body of operatives working under the directions of such societies, and many manufactories, that were barely paying working expenses, closed up altogether in consequence. The evils such societies cause, when one craft alone is forced to strike under the directions from a Head Centre Office, can be well illustrated by what occurred in New York City about five years ago, when by the strike of the masons and bricklayers, all other branches in house building trades, which depended upon these men to erect the walls, viz.: plasterers, carpenters, painters, roofers, &c., &c., &c., were thrown out of work for a whole summer in consequence, and a very large amount of capital kept out of circulation. Contractors and builders refused to do any work except at a percentage on men's wages, not knowing at what moment a strike would take place that would be their ruin.

To these two causes, then, is the United States at present suffering, but in connection, also, with that general depression that exists throughout the world, and which restricts her finding much demand in foreign markets to keep her numerous manufactories employed.

There can be no doubt that had her ports been open to free trade, her markets would have been glutted with certain classes of English and German goods, which, however they may claim to the contrary—they cannot compete with—it is her protective policy alone that has kept these back. The statements in the American journals that American goods are superseding those of English manufacture are not true. While no one can refuse to acknowledge the wonderful inventive genius of our clever neighbours in the construction of all kinds of labor-saving machines, and the improvements that they are making in some particular branches of hardware, in

which they have got the start of the Mother Country, they are silent to the actual fact that these improvements introduced into England have only had the effect of being a healthy stimulant, and that in steel and cutlery alone, Sheffield firms have carried the war into the enemy's camp, and are now producing knives which have hitherto been made exclusively in America, *at about half the price of those made in the United States and of a better quality;* in fact, the bugbear of American competition is as yet really only a "bogey."

In considering the *advantages* of protection in some cases, we have much to remark on its *disadvantages* on the other side; that is, so far as such a policy is likely to be beneficial to a country like Canada. We have first to take into consideration what may be the approximate number of persons who are likely to be affected by a tariff in any case.

The great bulk of the French Canadian population will hardly feel it. They manufacture their own sugar, raise their own produce, knit their own stockings, spin their yarn and weave their own grey cloth, and even make many of their agricultural implements. They are strictly economical in their mode of living, careful of their clothes, and will mend and patch and make last for a long time, what Upper Canada farmers would cast aside. There is hardly any restrictive duties on importations that would be felt by them one way or the other; and yet this class amounts to fully one million and a half of people. In fact, the increase of manufactories in this country has had rather a damaging effect upon them than otherwise, by drawing from the agricultural districts, into cities, a large number of men and women who would have been much better off and happier at home as cultivators of the soil, instead of flocking into cities to be at last thrown out of employment, and become demoralized by idleness and a burden to the community. There is another numerous body of our community who likewise would feel little or no benefit from a protective tariff, and that class is one which neither buys nor sells, but lives on the small produce of their small farms, or by fishing, hunting, lumbering, &c.; they are a very poor class, that barely eke out an existence from year to year, but still are so numerous that they probably amount to 500,000 men, women and children. Another class are clerks, travellers, religious communities and domestic servants, who pay nothing out of their own pockets directly for those goods that would be affected in price by a change of tariff, and these classes in all probably amount to 200,000 more; here then we have about 2,200,000 persons out of a population of, say 4,000,000 who will not be affected either by a protective tariff or free trade, leaving then about 1,800,000 whom it will either injure or benefit. Of these last figures only 300,000 would be male adults, the rest, according to the usual mode of calculation, would be women and children; these 300,000 are those then that are to receive the benefit or otherwise of the new policy. This number, of course, includes men of private fortunes, professionals, merchants, manufacturers and mechanics, tradesmen, clerks, &c., &c. This is certainly a very small number, and when thus brought down to actual figures, show pretty conclusively how small an amount of over manufactured goods and over importations will create a glut in the market, and how small a quantity of imported goods from the United States, when added to an overproduction of our own, is sufficient to produce the present troubles under which we now suffer.

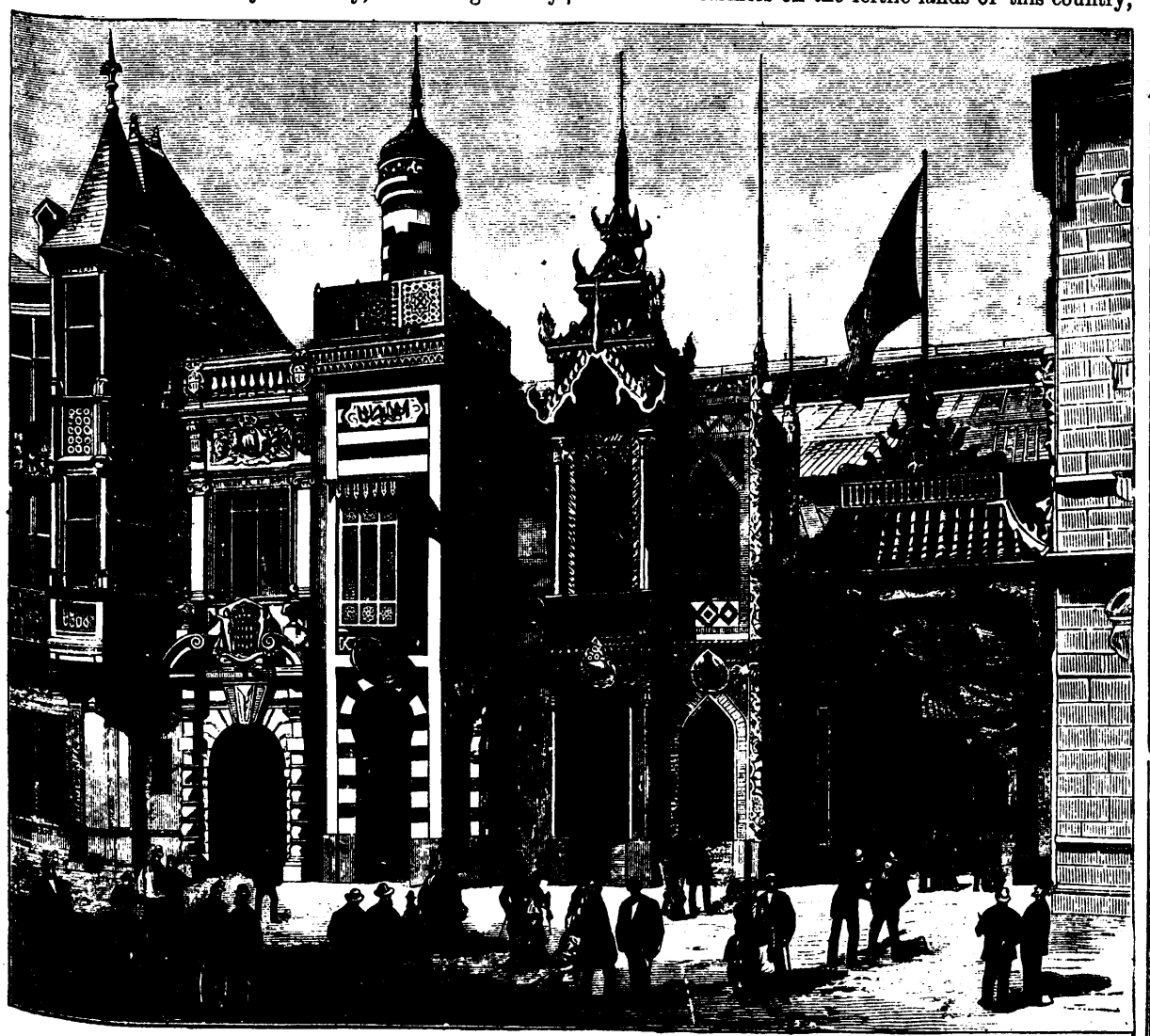
Another important point to be considered is the impossibility of granting protection to one trade or manufacture, without seriously injuring another class of the community. If a protective duty on coals—that prime mover of steam works and machine shops, and most necessary article of comfort to all during a long Canadian winter—should raise the price to $2 a ton extra, then every manufacturer in the country would feel that the benefit he received on one hand was taken away by the other; the tax would be considered an oppression by all classes of the community, and like a bonus given to a few proprietors of coal mines who merely employed a few thousand labourers, and for whose benefit so large a body would have to pay. To many families, living on a salary of from $800 to $1000 a year, such a tax would be equal to a loss annually of from sixteen to twenty dollars. Again, on the article of sugar, if for the benefit of a single one industry in the hands of one, or even two or three individuals, and which, at best, only employs about 500 to 1000 men annually, the price is raised again to 12½ cents per lb., when we have only been paying 10 cents for the last 5 years, it will be considered by the public as an unjust tax, particularly to the poorer classes, for sugar is an article which, from the force of habitude, has become one of the necessaries of life. Whatever protection may do for our manufacturers and unemployed, a high protective duty cannot be imposed without affecting the pockets of a very numerous class who receive no benefit from it in any way. So long as protection will enable us to compete with other countries and to be able to sell equally as good articles with a profit in our own country, at the same price as is paid for them in another, all will hail it with satisfaction; but if, through high protection, the bulk of the people find that they are paying higher for an inferior article, for the benefit of a few individuals, comparatively speaking, then, at the next general election, as great a revolution will occur in public sentiment as has been recently exhibited.

That many of our industries, and particularly new ones just starting into life, should be permitted to be swamped by another country having all the advantage of capital, machinery, experience and population on her side, is neither just nor politic; such industries should be protected until they have matured.

There are two great difficulties under which we labor in Canada: one is that there is but a small number of our population, as before remarked, who are directly affected by the question on either side, and therefore our manufacturers have, in fact, not four millions of people to manufacture for, but a little over one million and a half, so that too much home competition soon brings trouble to ourselves. It has been argued by the advocates of protection that when one manufacturer begins to take advantage of a high tariff in his favor, and raises his prices, that another will start up in competition and keep them down; but here is just where a calamity is likely to occur; for, although one party may raise his prices, it is no criterion that there is trade enough for two, and so one or both are likely to be bankrupted. The greatest safeguard we have in such cases is that when prices get too high, the Americans will enter into competition to the extent that the tariff will admit. We have too many factories already to supply the demand; and we have too many mechanics, of an inferior class, and laborers, who should be cultivating the soil; who should be producers and not idle consumers. These are

some of the causes of the present difficulties, and which the people, we trust now, from their past and costly experience, and the new parliament in the plenitude of its wisdom, will be able to remove. The question is indeed a very difficult one to be dealt with, and the Government of the country have no light task on hand. We all know that the professions of any party, before an election, cannot possibly be carried out to the letter; and it is to be hoped that those who returned them to represent their views before parliament, will be moderate in their expectations. Too great protection would probably be as great an evil as too little, and therefore we advocate the advice of Appollo to Phæton: "*Medio tutissimus ibis*,"—by steering a middle course we shall not give a monopoly to one party to the detriment of another. We trust that as the present depressed state of the country cannot altogether be set down to the want of high protective duties, but must be attributed as much to our own want of foresight and judgment and the general depression throughout the world, that the rock we have grounded on will, in future, bear a beacon and be avoided; and that we may sail for the next five years over smoother waters. It is the first duty of every political representative to serve his country faithfully, and in a great day of trial, like the present, he should, for the benefit of his country, sink all political bias and rancour and work in unity with any side of the House, in all matters introduced—which are not strictly political opinions—for the public weal, and bear in mind the statesmanlike and friendly advice given to us in the parting words of our late most excellent Governor-General.

And, as a warming note to all those following mechanical trades, we trust, when the days of prosperity again return, that they will remember the past, and not fetter the hands of their employers by vexatious strikes, under the erroneous supposition that the manufacturers were making fortunes gained through their labor, when, perhaps, they were on the verge of bankruptcy. Let them also remember the past in this way too, that as there is no knowing when an evil day may come upon them, to learn to save; a few cents laid by daily is something considerable at the end of a year, and small savings often bring about great gains. We would further advice many young men who are following mechanical trades, and who feel themselves wanting in that natural mechanical gift of eye and hand, which some men possess over others, to put aside their mechanical implements, and become farmers on the fertile lands of this country,



PARIS EXHIBITION—THE FACADES OF ANNAM, PERSIA, SIAM, TUNIS, MONACO, AND SAN MARINO.

where, after a few years of hard but healthy work, but never of want, they will become independent men. Indeed were but half the money expended by the Government in bringing out emigrants to this country and paying inefficient agents, employed in founding colonization companies for our own unemployed population, we would not have to-day so many poverty-stricken people in our midst, hardly knowing where, during the coming winter, to find food for their families, or even a home to shelter them.

BELLEVILLE.

West Hastings Agricultural Society Show.

Happening to be at Belleville during the days of the Annual Show, on the 2nd and 3rd October last, we visited the grounds, in order to examine the machinery, animals and agricultural products there exhibited. We regret that we cannot, in justice to the capabilities of the country, which ought to have had a much better display on the ground, pay any flattering remarks on the exhibit there made; there was evidently a want of life and interest shown this year in the exhibition. The cause of this falling off, for a falling off we were given to understand it was, from previous exhibits, we do not pretend to account for, farther than to remark that there appeared to be rather a feeling of growing discontent among exhibitors, and a desire that the judges should, on such occasions, be selected from a neighbouring county. Of course every allowance must be made for disappointed competitors for premiums, but these remarks were generally made to us on the first day of the show, before any prizes had been adjudged. We have always held the opinion that the introduction of young men into the committees for the management of all such societies has a very beneficial effect; they naturally are more active and ambitious to carry out the meritorious objects of all such societies in a way to prove satisfactory and with a certain eclat, and they are better able to take upon themselves the burthen of the most arduous portion of the duties. We do not know whether there is a deficiency of this youthful element in the Hastings Agricultural Society, but certainly the exhibit was not to its credit this year, and in making these remarks we do so in all kindness, for it is our greatest desire to see the industries and agricultural interests of the country encouraged by pleasant competition for excellence. We are not an advocate for the distribution of many prizes in the form of money, the amount of which, after all, is but a bagatelle to many of the farmers. We think that honorary badges, or medals, as a mark of distinction, would answer equally as well, in lieu of prizes, for all minor exhibits—but that the funds of the Society should be applied to granting one, two or three silver cups or salvers for continued merit or excellence in some particular line of agricultural machinery or produce, and that these valuable prizes should have to be won three years in succession before they finally became the property of the successful contestor.

In the exhibits of grains and vegetables, we far prefer the custom of the Old Country: there the crops have to be reviewed on the ground, and the mead of merit given, not to the man who can pick out, grain by grain, a bushel of the finest looking wheat or barley for an exhibit, or make a selection of roots, grown, perhaps, in a few feet of garden land brought to the highest degree of culture, but given to the man who can show the best field crop, the result of his superior farming.

Our remarks in a mechanical journal will principally be made on the vehicles and machinery exhibited. The most extensive among the former was the exhibit of Carriages, which, certainly, were extremely creditable to the exhibitors; the trimming, in particular, of some of these being deserving of all praise. The foremost among those exhibited in this line were Mr. C. Ashley, of Foxboro, and Brown and St. Charles of Brockville. Mr. Palmer exhibited a very neatly finished democrat; Messrs. Bristol and Brother, of Madoc, exhibited two exceedingly well finished buggies and a sleigh, to which was fitted a shifting and folding seat, by which contrivance a buggy could be converted from a two into a four seated vehicle; the arrangement is light, strong and comfortable; it struck us as being a style of vehicle that will soon come into general use, particularly as the mechanism is so exceedingly simple and easily adjusted.

Agricultural Implements.

The largest and best display in this line was by Messrs. G. & J. Brown, and by Messrs. J. M. Walker & Co. The latter, we observed, had a very superior threshing machine and separator on the ground, with horse power attachment—also, a very powerful straw cutter, besides grain and cider mills, and ploughs of improved style. We also noticed some excellent light ploughs by Martin Bros., of Brockville. The Massey Company, of Newcastle, also exhibited a very superior reaper and horse rake, and the combined drill and broadcaster of the Masson Manufacturing Company, of Oshawa, seemed to be very favourably noticed.

In the Fine Art Department, the exhibition of Canadian butterflies, moths and insects, was very good and attracted much attention, as well as a splendid specimen of a stuffed beaver. Among the paintings exhibited, those by Miss Goldsmith, Miss B. Walker and Mr. W. H. Gooding, of Trenton, deserved the palm of merit. We may here venture to remark, however, that we would sooner award a prize to the smallest drawing taken from nature, than to those, however well executed, that are simply copies. If our Canadian artists aim at perfection they must cease to copy. A well executed water color or oil drawing from nature, or the well executed portrait of some well-known individual (not a coloured photograph), would, in our estimation, deserve the highest prize in preference to the most perfect copy of another's art.

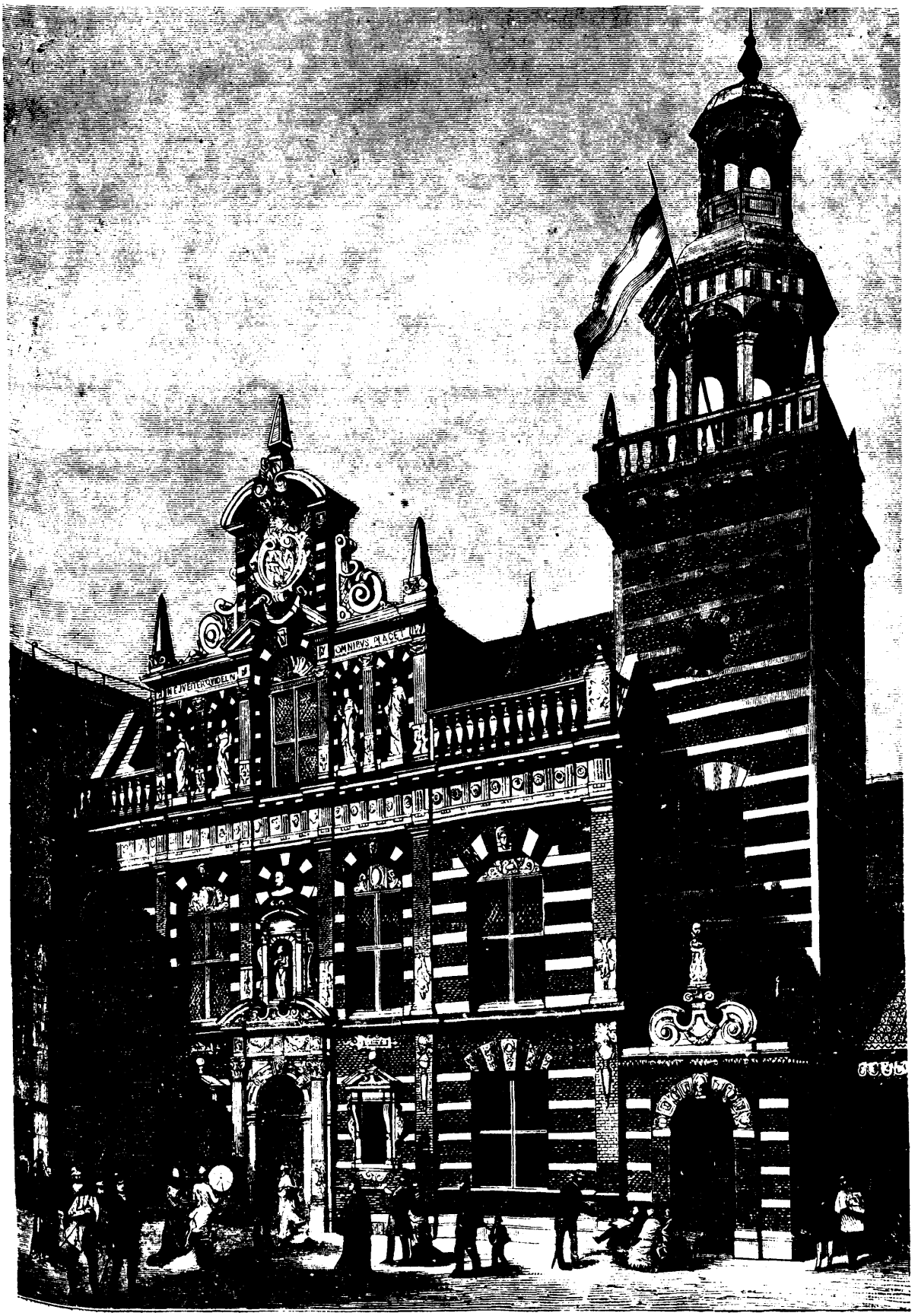
Mr. J. H. Ford had some very good colored photographs increased to nearly life size, but this is an art in itself, to which the above remarks do not apply.

The domestic manufactures in wools and cottons were very poorly represented.

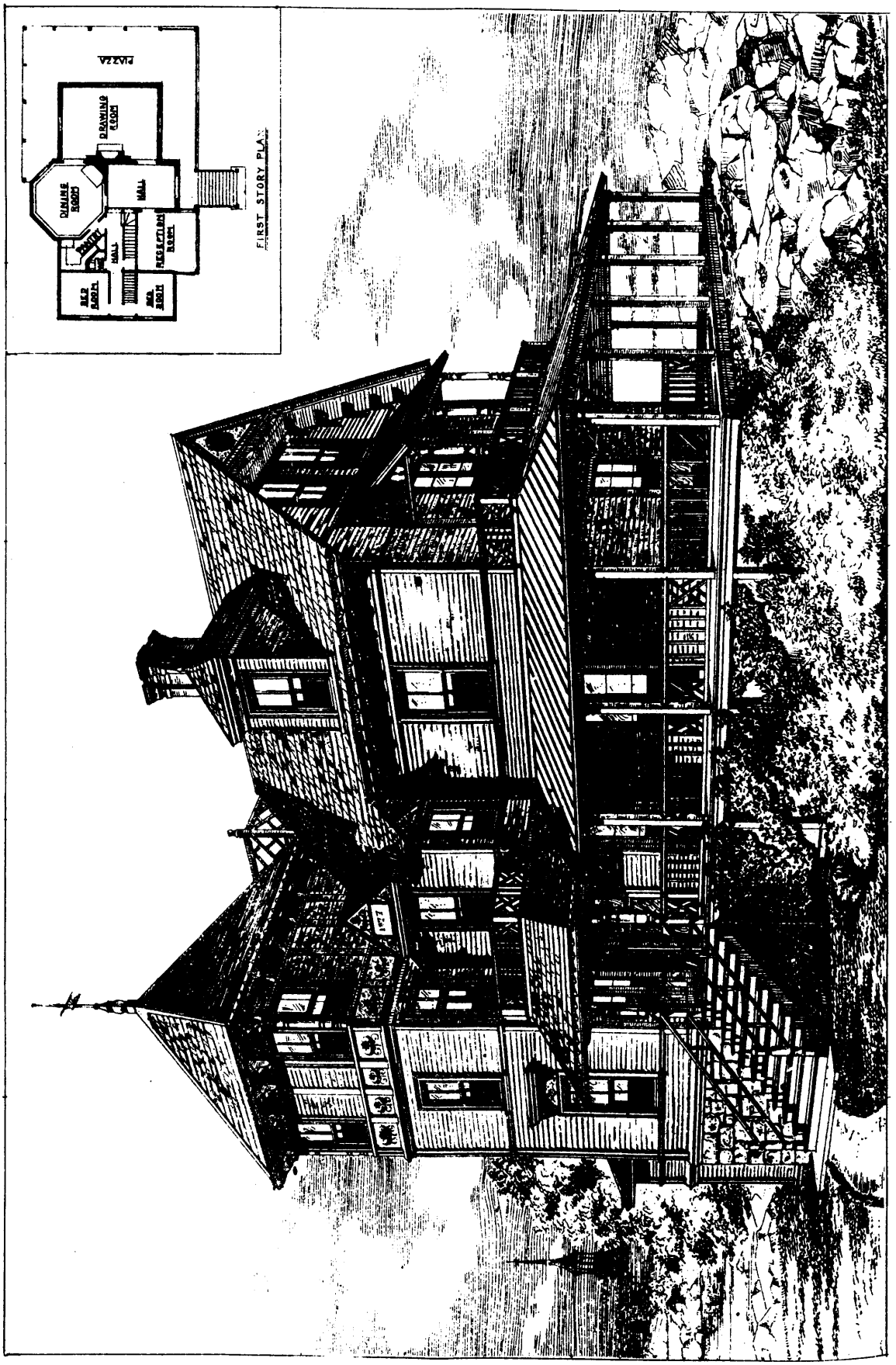
Mr. Beasley, of the Belleville Broom Factory, made a very fair display of well-made brooms. We had, however, previously visited his factory, and were very favorably impressed with their general excellence.

Owing to the lateness of the season the flower show was inferior—not up to excellence—but what fruit was exhibited was exceedingly fine.

We cannot close these few remarks without expressing deep regret that so much rudeness and ill-conduct was exhibited by several boys, and even young men, on the afternoon and evening of the last day. Such conduct is a disgrace to the city, and should be put down with a strong hand. In the Centennial Exhibition at Philadel-

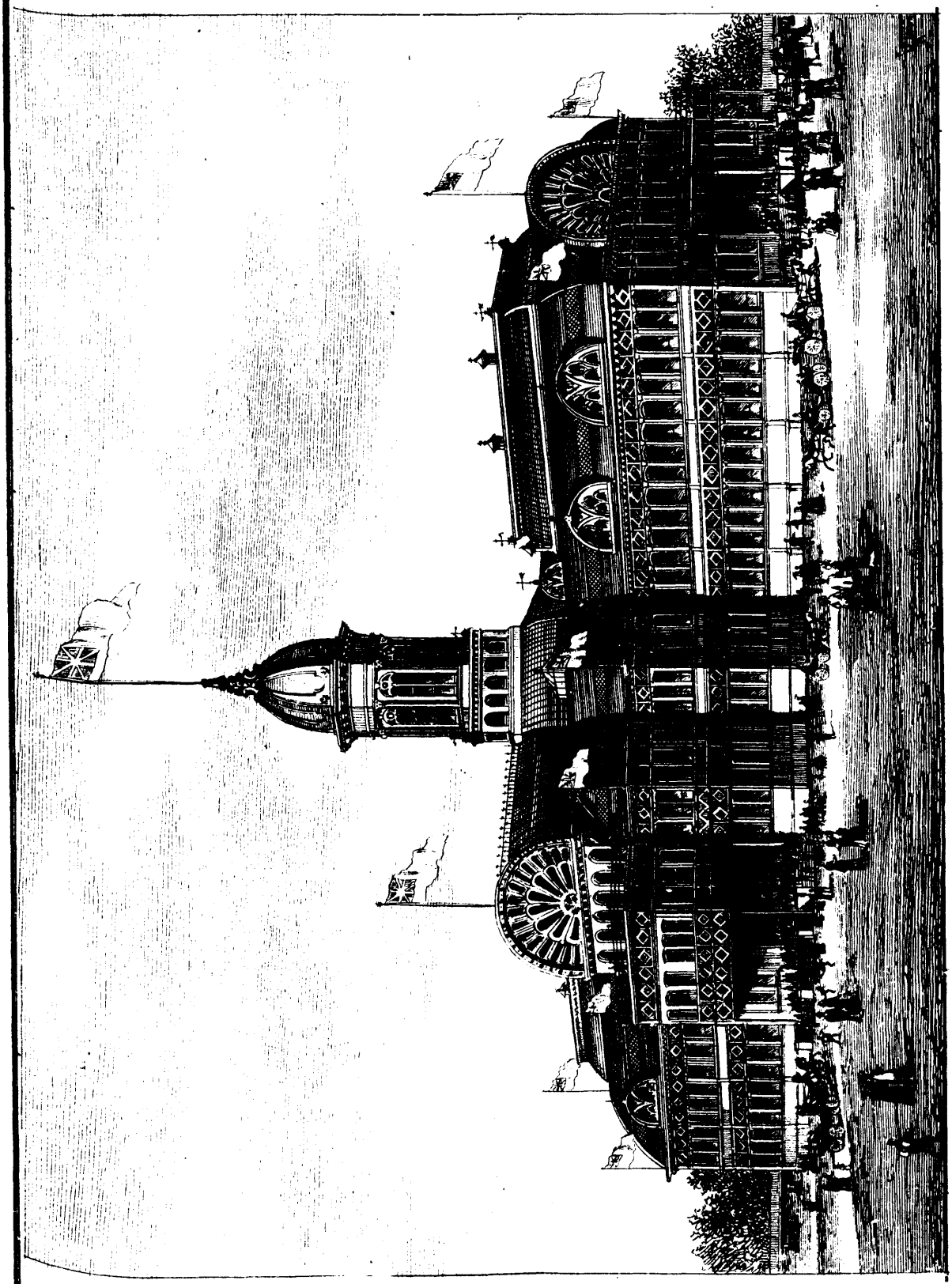


PARIS EXHIBITION.—FACADE OF THE NETHERLANDS.



DESIGN FOR A VILLA.

From the *American Architect and Building News*.



EXHIBITION BUILDINGS, TORONTO.

phia, one of its most marked features was the perfect order, courtesy, and conduct of the thousands present during several months. It is time that Canadian boys should have some respect for themselves and their country. Such conduct will undoubtedly keep many away from the next Annual Show. [ED. C. M. M.]

THE LANE CIRCULAR SAW MILL.

(See page 334.)

The following illustrations, with text, relate to the saw-mill of the Lane Manufacturing Company, of Montpelier, Vt., which contains many excellent features.

First may be noticed the Lane Lever Set. The most prominent feature of the set-works are the frequent bearers or head blocks, and the corresponding uprights or side supports; the set beam or slide, with its various attachments for securing logs or cants of all kinds, under widely differing circumstances; the setting mechanism, which enables the sawyer to move the cant readily forward as desired, and the device for quickly withdrawing the set-beam and uprights, preparatory to taking on a fresh log.

The horizontal and side-rests are placed at three or four-foot intervals for the whole length of the saw works, thus allowing of sawing a promiscuous lot of very long and very short logs, without moving the head-blocks; and also, by the increased stiffness given the cant, ensuring evenly sawed boards to the last cut.

Near each end, and at intermediate points in long set-works, are adjustable side bearings (see Fig. 2) for throwing forward the small end of a log, independently of the other.

These are operated by a simple lever movement, so arranged that, when the retaining part is lifted, the projecting centre-slide is drawn back by the falling of the lever even with the line of uprights. The taper-slide, as shown in Fig. 2, is thrown forward a little in advance of the upright. The device is efficient.

Attached to the set-beam are also the ordinary bail-log dogs; a frost-dog for holding frozen timber; dogs especially adapted to "live" or "through and through" sawing; and dogs for the last board—which latter are to be used after the cant is squared.

The bail dogs are forged with heads to strike against when driving. Patented rests hold the dogs in a safe and convenient position when not in use. Numerous "eyes" allow the dogs to be changed from one place to another, as needed. The double-pointed frost-dog is shown near the middle of the set-beam, in Fig. 1; and while its function is to hold frozen logs securely, the makers state that some sawyers use it (on account of its convenience and adjustability) even in summer. The short end reaching only half an inch in advance of the uprights, it should answer very fairly the purpose of a "last-board dog." The long end used in dogging logs swings automatically out of the way when the log is turned, and is held from possible contact with the saw by the forked casting.

The pivoted lever-dog attached to the center upright is for the purpose of catching the under side of a log and preventing it from rolling outward when sawing the first half through and through.

Connected with the compound uprights are dogs lifting vertically from the under side, operated by lever handles, and held in place by suitable pawls. These are intended to bring a half-sawn cant of round-edged lumber to an even and firm bearing, and there to retain it. One of these is shown partly raised in Fig. 2.

The "last-board" dogs slide in a planed recess on the right side of the large uprights. They appear to be kept out of the way until wanted, to be quickly applied, and to require no care or adjustment; and keep entirely clear of the saw. By a recent improvement, they can be instantly clamped and firmly held in the saw cant. The hand-dog, near the head end of the mill in Fig 1, is shown as out of use. The nearest the operator, as well as that in Fig. 2, is clamped to the upright in the position it would occupy in dogging a fair-sized cant. The act of seizing the handle of the hand-dog releases the car fastening, and would permit the ready return of the dog to its proper position when not in use.

The index to the elevated rule or indicator is attached to the front end of the set beam; and the scale (in plain sight of the sawyer) not only shows the distance of the uprights from the saw, but gives the proper starting-points after the log is turned for the last time when sawing ordinary thicknesses.

The mechanism for settling the log consists of a shaft turned in bearings attached to the wood slide, and having on each end pinions meshing into open racks secured to the side of certain of the head-blocks. Near the head end of this shaft is placed a series or "nest" of ratchets, arranged for setting various thicknesses. A double-pointed dog between the forked arms of the set-lever engages with the ratchet teeth and advances the set beam and the log. A sickle-dog prevents the slide or beam from giving back. A horizontal extension of the forked lever enables the sawyer to do the setting with ease and convenience.

A quarter-turn of the handle disengages both dogs and allows the slide to be moved back, preparatory to taking on a new log. Instead of running back the wood-slide or set-beam by raising the sickle-dog, depressing the rear end of the setting-dog, and working the lever as when setting a log forward — the "Lane-Pottee" footrig (shown in figs. 4, 5) runs the set beam both forward and backward by power. The sawyer turns the set-handle to raise the dogs, and by pressing his foot on the treadles C, while jigging past the carriage, recedes the uprights. This is also of service in turning a cant. Pressing the pedal C, while the carriage is feeding forward, brings the slide and uprights *toward* the saw. Using the upright gauge-roll, the log may be set for plank, scantling, etc., by the foot-rig alone. The friction of a pulley against a smooth wooden bar being depended upon to operate the foot-rig, no damage should be done if by chance the set and sickle-dogs are not raised.

The carriage proper is made (for convenience in shipping) in doweled sections of not more than fifteen feet in length. The mill-frames, either wood or iron, are heavy. The arbor runs in three long bearings; the end play being regulated from the middle; the makers affirming that this removes one of the most common causes of hot collars and badly-running saws.

The movement of the carriage is controlled by a single lever. Belting from the saw arbor over differential pulleys allows of four changes of feed; a paper friction pulley, out of reach of snow, dirt, etc., is made to revolve inside of the large flange-pulley on the feed shaft. Throwing forward the handle tightens a loose belt running over flange-pulleys, and gigs back the carriage.

The saw-guide (shown in Fig. 6) is adjustable in either direction (even while the saw is running), by turning a double-headed set-screw.

The splitter, or spreader-wheel, is thinnest at the middle, lessening friction Opposite the saw-plate, and nearly touching it, are cast-iron bearers, to hold short pieces as they drop.

On the front part of the frame is a Fairbanks upright gauge-roll (Fig. 7); and in the same standard, a horizontal roll for the cant to run over as fed to the saw. This is set at any distance from the cutting line by a hand-wheel and screw. Its special feature is a hinged arm, allowing it to be swung instantly back out of the way when slabbing.

The Brown dogging device (Fig. 8) has the upper and lower bits independently adjustable, and forced into the log by a partial turn of the crank H.

The advantages claimed are, that in through-and-through sawing, the small end of the log can be thrown forward in advance of the line of uprights, while doing "live" sawing, and that it holds sled-crooks and ill-shaped logs.

The double-mill (shown in Fig. 1) has a rigid upper frame of iron. As the saws decrease in size, they are adjusted to each other by turning two set-screws to lower the upper mandrel. Provision is made for adjustment in line. The upper and lower saws have the same center and pin-holes, so that, when the lower is greatly worn, it may be transferred to the upper mandrel.

The cost of a double mill is little more than that of a single mill with a saw of the size equivalent to its two saws; while the large saw is more difficult to run, and wastes more in saw-dust than the smaller and thinner saws.—*Polytechnic Review.*

CANADIAN MECHANICS' MAGAZINE.

WE gratefully acknowledge, and beg to return our best thanks for the large augmentation that is daily taking place to our subscription list. This rapidly increasing patronage, in hard times, is a strong indication of the estimation in which the Magazine is held; and when, in the next volume, we introduce the improvements alluded to in a previous number, it will render this scientific and mechanical journal one of the most popular, instructive and useful publications on this continent.

A METAL that will expand in cooling, is made of nine parts of lead, two parts antimony, and one part of bismuth. This metal will be found very valuable in filling holes in castings.

PARIS EXHIBITION OF 1878.

OFFICIAL TRIAL OF PLOWS.

The trial of plows at the French Exhibition took place at Petit-Bourg, in the department of the Seine and Oise, about 19 miles from Paris, under the direction of Monsieur Eugene Tisserand, the Director-General of Agriculture of France, on the 29th of July, 1878.

Fowler, of Leeds, England, had two sets of steam plows on the field, and Debains, of St. Remy, Department Seine et Oise, had one set. Both did good work, but I do not propose to refer to them at length here. Aveling & Porter's steam plows are to be tried at Gonesse on the 12th proximo.

The ground for each was marked off by a furrow, and each was given a field to plow. The farm itself is level and nearly devoid of trees and fences.

American plows are said to be preferred in France to the English, though, to judge by those exhibited in the French annex of agricultural implements, both are frequently copied. The true French plows, however, are in excess of those of either of the foreign nations mentioned, and there is an abundance of crude and heavy implements which may be termed Gallo-Roman, and probably not much unlike those used during the Roman occupation.

Wooden mould boards are not totally discarded yet. Manufacturers may do their best to introduce what they deem to be improvements, but after all they are obliged to make what the people are willing to buy. Such plows weigh from 80 to 240 lbs., and sell for from 30 to 75 francs; and a great many are sold for light and sandy lands. While the English plows have generally two wheels to gauge the depth, it is by no means so universal as in France, and the cheap plows, which are made as low as 35 francs, are frequently wheelless. Fig. 2 has a frame entirely of iron, and of an ordinary size weighs 132 lbs., and costs 85 francs. It is a very good implement and does excellent work. Its clavis arrangement is good both for draught and depth, and the draught chain is likewise commendable. The two-wheeled plow is the English form, with furrow and land wheels of unequal sizes, but the lever is French, and is used to lift the front end and tilt up the point so that the team will draw it out of the ground at the end of the furrow: a very good arrangement, and used also on the gang plows of France and of England, the plowman always

Fig. 1.—FRENCH WOODEN MOULD-BOARD PLOW.

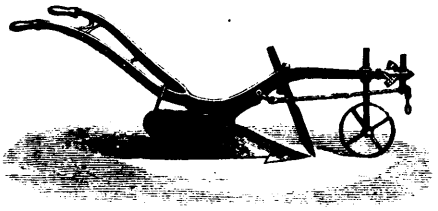


Fig. 2.—FRENCH ONE-WHEEL PLOW.

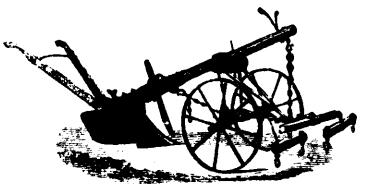


Fig. 6.—DURAND'S CHARRUE A CHAINE.

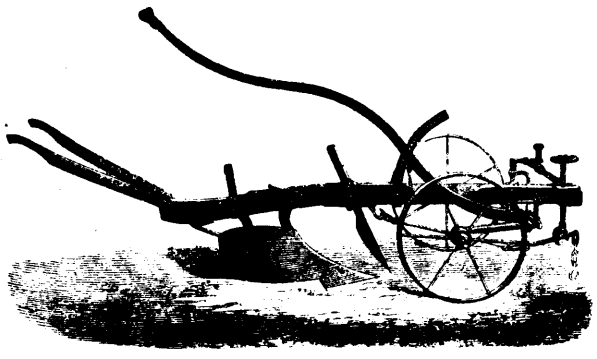


Fig. 3.—DOMBASLE'S TWO-WHEELED PLOW.

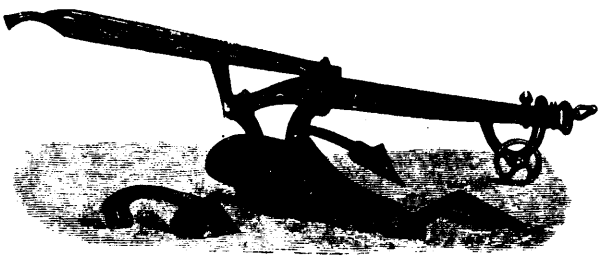


Fig. 4.—GALE'S MICHIGAN PLOW.

Fig. 7.—PLOW MOUNTED WITH DOMBASLE'S AVANT-TRAIN.

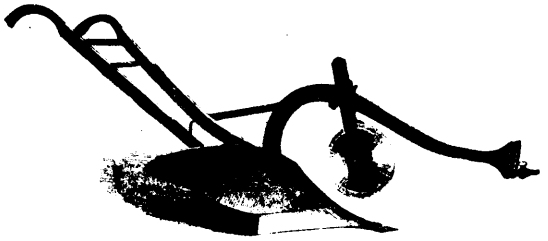


Fig. 5.—DEERE'S ILLINOIS PLOW.

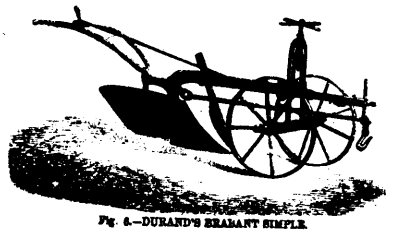


Fig. 8.—DURAND'S BRABANT SIMPLE.

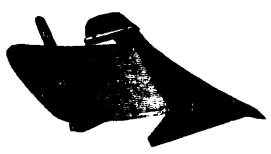


Fig. 9.—VIEW ON THE MOULD-BOARD SIDE.

Fig. 10.—VIEW ON THE LAND SIDE.

Fig. 11.—VIEW UNDERNEATH THE BODY OF THE PLOW.

PLOWS EXHIBITED AT THE PARIS EXHIBITION.

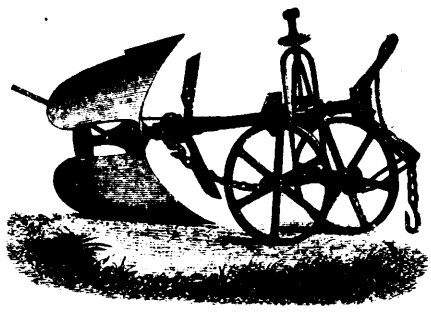


Fig 13.—BRABANT DOUBLE PLOW.

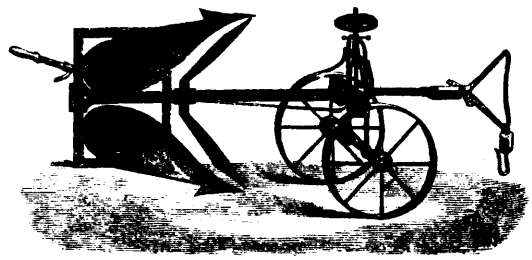


Fig. 14.—BODIN'S BRABANT PLOW.

Fig. 12.—View of the Separate Pieces of the Plow Body, minus the Mould Board.

Fig. 15.—BRUST FRERES' TOURNE-OREILLE.

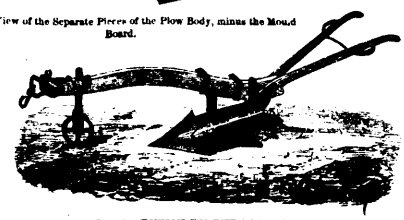


Fig. 16.—FRENCH TOURNE-OREILLE PLOW.

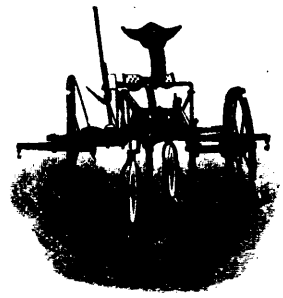


Fig. 17.—DEERE'S ILLINOIS GANG PLOW.

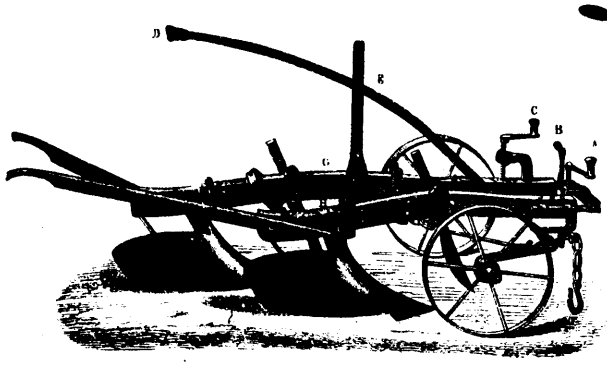


Fig. 18.—MEIX-MURON-DOMBASLE'S SIBOC.

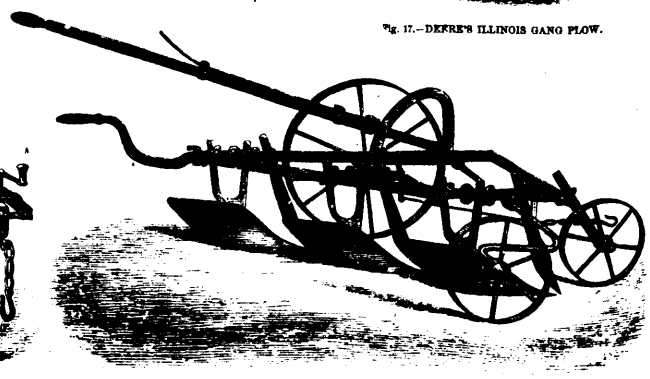


Fig. 19.—DALAHAYE-TAILLEUR'S CHARRUE A TROIS-SOCS.

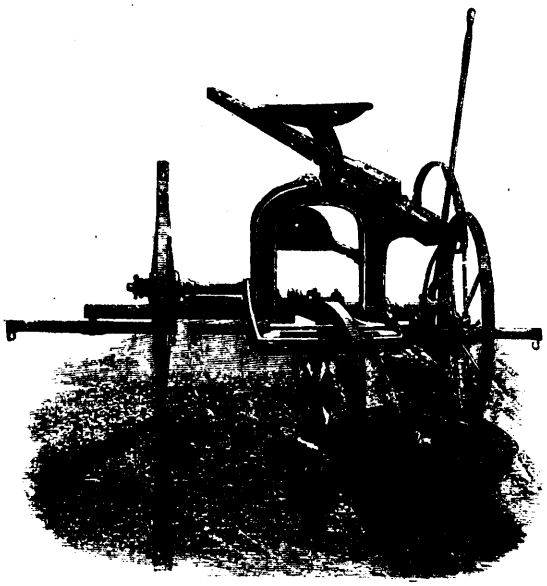


Fig. 20.—GILPIN SULEY PLOW, MOLINE, ILL.

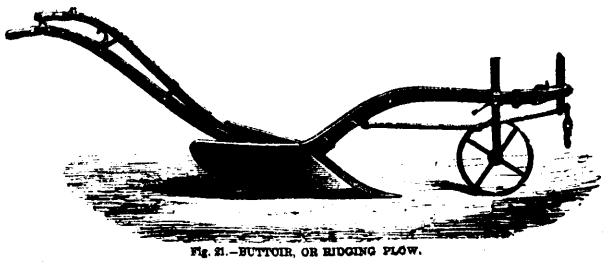


Fig. 21.—BUTTOIR, OR RIDGING PLOW.

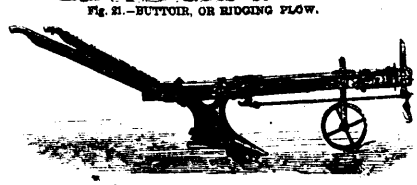


Fig. 22.—GARNIER'S SUBSOIL PLOW.

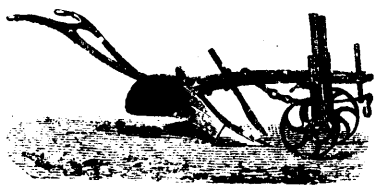


Fig. 23.—TRENCHING PLOW.

PLOWS EXHIBITED AT THE PARIS EXHIBITION.

PLOWS EXHIBITED AT THE PARIS EXHIBITION.

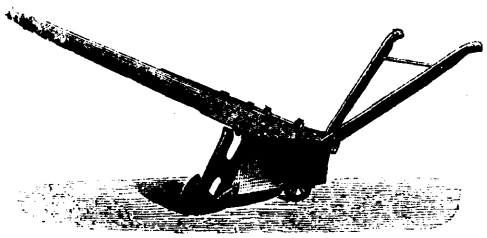


Fig. 24.—BILLOT'S TRENCHING PLOW.

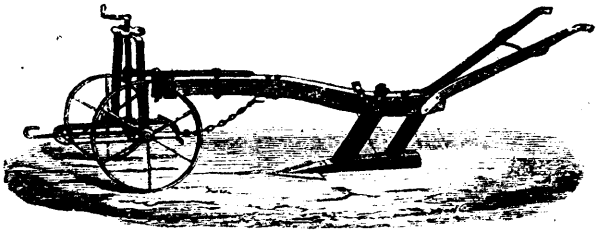


Fig. 25.—MOLE PLOW.

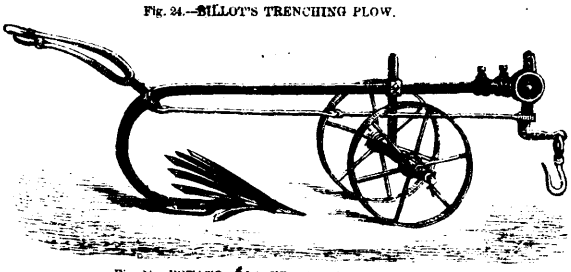


Fig. 26.—POTATO DIGGER (*Arrache pommes de terre*)

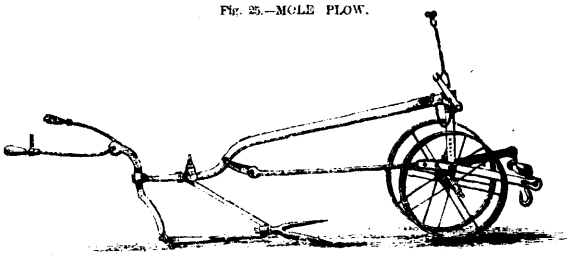


Fig. 28.—BEET-ROOT PULLER (*Arrache Betteraves*)

Fig. 29.—1. *Soc à fourche pour arracher les Betteraves*. 2. *Soc à fourche pour arracher les pommes de terre.*

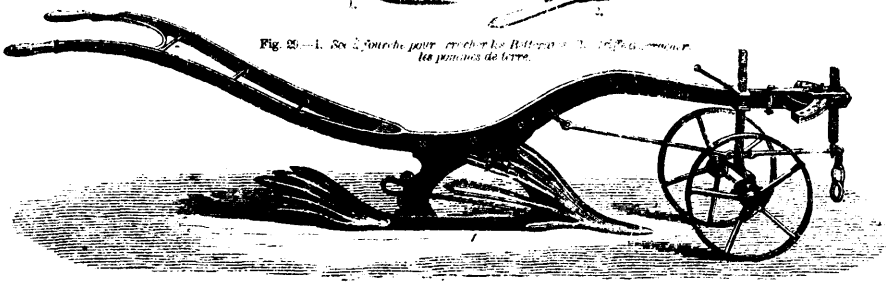


Fig. 27.—POTATO DIGGER (*Double-effet*).

walking at work. These plows are made heavy and are drawn by four horses or oxen.

It must be noticed by all who travel by day in France that the usual plows have a fore-carriage which is intermediate between the team and the plow. Many extremely crude forms of this are to be seen, both in the fields and in the Exhibition, and were also at work at the trials at Petit Bourg. Without attempting to give the cruder shapes, which might perhaps be taken as an exaggeration, the *charrue à chaîne* is offered to exhibit the idea, and is one of the best of its class. Unlike the English two-wheeled plows, these wheels are of the same size, and as one runs in the furrow and the other on the land, it looks as if the plow were tipped sideways, but the round beam adjusts itself in the socket of the fore-carriage (*avant-train*) and no harm results. These plows are made for four horses, and vary in price from 120 to 180 francs.

Fig. 7 shows a transition state, in which the nose of the plow is pivoted to the *avant-train*, instead of merely resting upon it and being drawn by a chain.

Another step and we assimilate to the modern English style. Fig. 8 shows Durand's single Brabant plow, in which the *avant-train* simply sustains the beam, and the draught is by a rod. In the circular handed to the spectators it is described as "intended for depths either ordinary or profound. It replaces with great advantage all the ancient models of plows. It will travel alone upon the earth without having care to hold the handles."

In Figs. 9 to 12, the portions of the plow body are shown. A is the standard, B the sole, C the corner-piece, D the share, E the breast, covering the front of the standard, F is the heel piece to prevent wear of the mould board, G the rear standard, and H the helicoidal mould board.

The *tourne-oreille*, or Brabant double plow, has, as its name indicates, a turning mould board, so that at the end of a row it can be revolved on the beam (or the beam rotated), and converted from a right to a left hand plow or *vice versâ*. This enables the team to return in the last made furrow, the near and off horses being alternately in the furrow. However clumsy it may look to us, it does excellent work, and if a whole community insists upon beginning to plow at the side of a field and plowing it furrow by furrow clear across to the other side, not plowing in lands, why of course they must have an implement to suit that mode of working, and here it is.

The Brabant plow is made of all sizes from the small plow adapted for one horse to the large one drawn by 5 yokes of oxen. They vary in weight from 165 to 770 lbs., and in cost from 140 to 300 francs. The depth of furrow for which they are designed is from 0.60 meter to 0.330 meter, say from 6½ to 13 inches, though the latter depth was much exceeded at the trial.

There are many different patterns of this implement, but all preserve the main feature of being convertible into a right or left hand plow, either by turning with a sleeve upon the beam or the beam itself turning in a socket, on the fore-carriage, or hinged to the beam, as in Fig. 15, which has a wooden beam, and no *avant-train*.

Another form of what we call a hill-side plow, as we seldom use it for other purposes, was also exhibited.

The Director-General, like many of us at home, regards the gang plow as the plow of the future in large farming operations, enabling one plowman or boy to do the work of two or more by adding to the capacity of the plow and increasing the number of horses to the required extent. Quite a number of French and one American gang plow were shown at the trials.

The Meixmoron-Dombasle *bisoc* is made of three sizes; the largest works to a depth of from 0.15 to 0.20 m. (6 to 8 inches); a land of 0.55 to 0.60 m. (22 to 24 inches) in the width, with 4 to 6 horses in ordinary land and 6 to 8 horses in hard ground. The smaller sizes use from 2 to 6 horses. The *grand bisoc* with cast iron standard and steel mould board weighs 544 lbs. and costs 290 francs.

The lightest size weighs 268 lbs. and cost 175 francs.

The Deere plow weighs 670 lbs. and costs 425 francs.

The Dombasle system, as is apparent by the cut, consists in rigging two plows to a single fore-runner with an inflexible bar which determines the latitude. In that respect it resembles our gang plow. The English system is to make an angular frame of iron, and the same plan has also been adopted in France, and several of the manufacturers had implements of this description on the ground.

(*Continued on page 349.*)

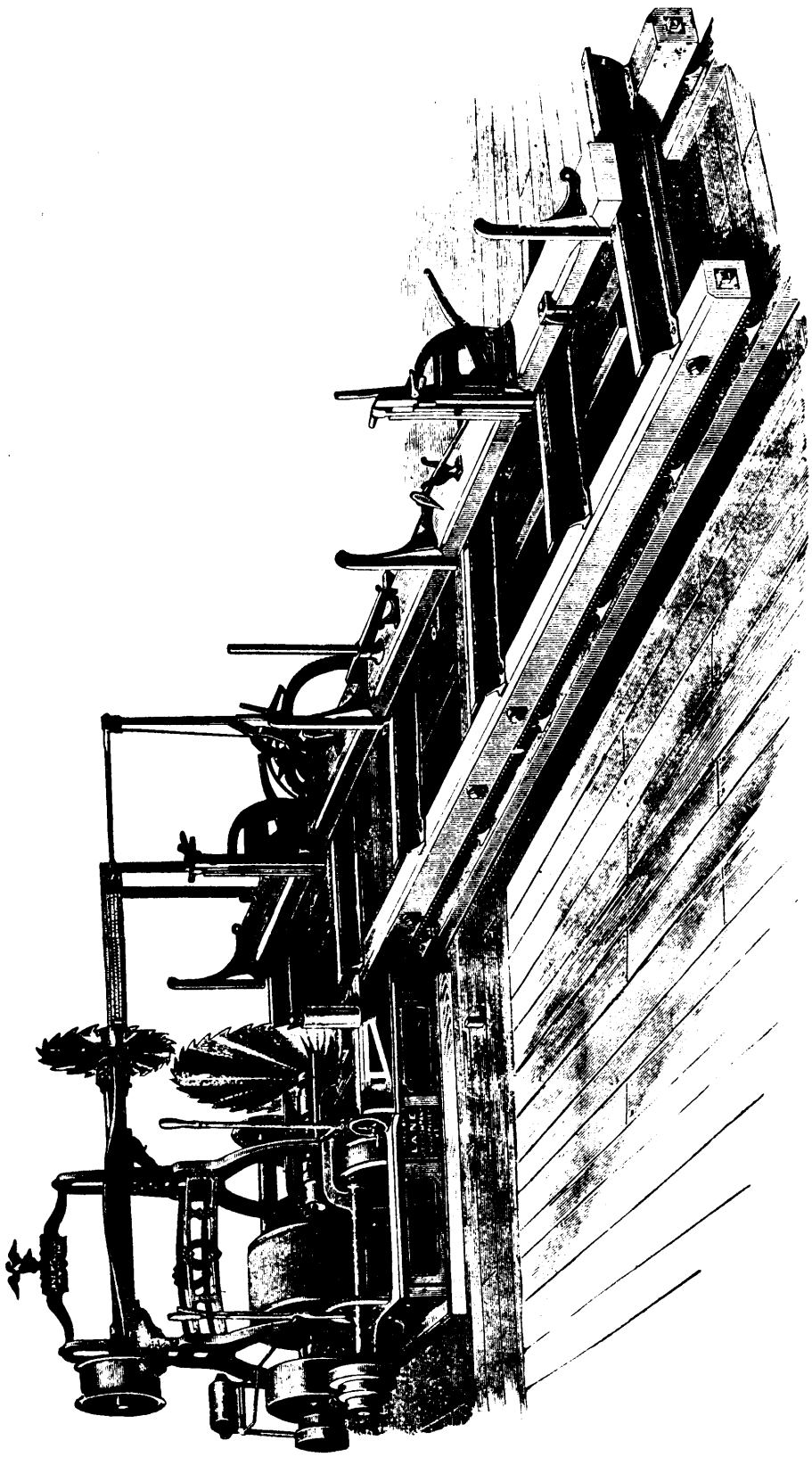


FIG. 1.

LANE'S IMPROVED DOUBLE CIRCULAR SAW MILL.

LANE'S IMPROVED DOUBLE CIRCULAR SAW MILL.

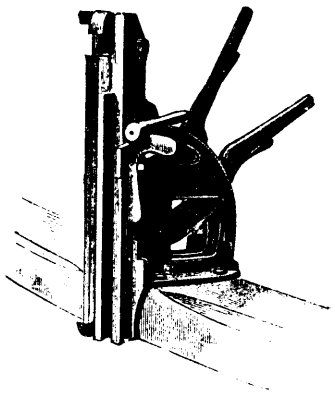


FIG. 2.—SIDE BEARING.

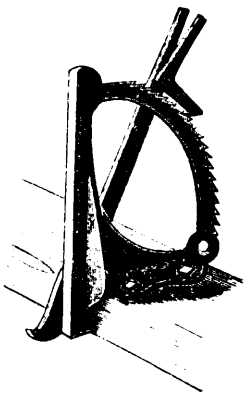


FIG. 3.—PIVOTED LEVER DOG.

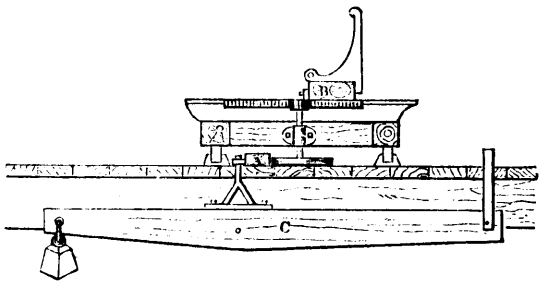


FIG. 4.

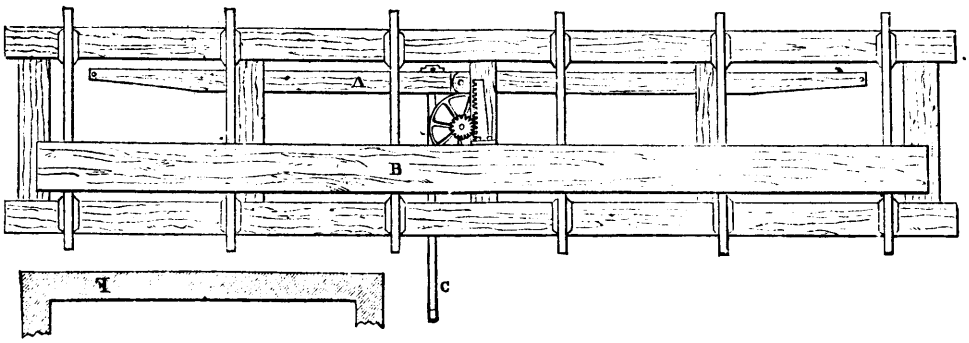


FIG. 5.—THE LANE-POTTEE FOOT-RIG.

A, jointed foot-bar. *B*, set-beam. *C*, treadle-bar under floor. *D*, portion of saw-frame.

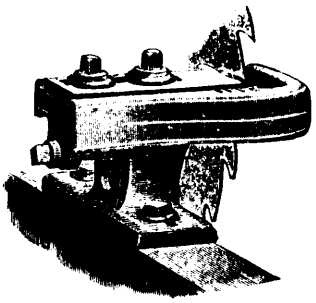


FIG. 6.—SAW GUIDE.

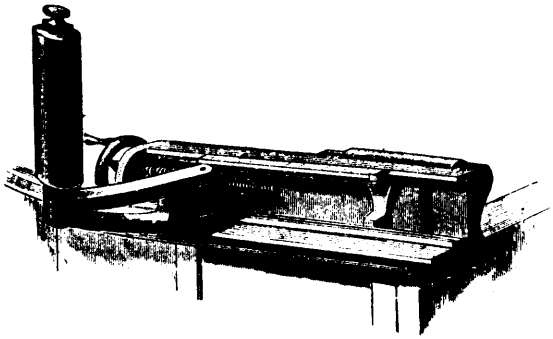


FIG 7.—FAIRBANKS GAUGE ROLL.

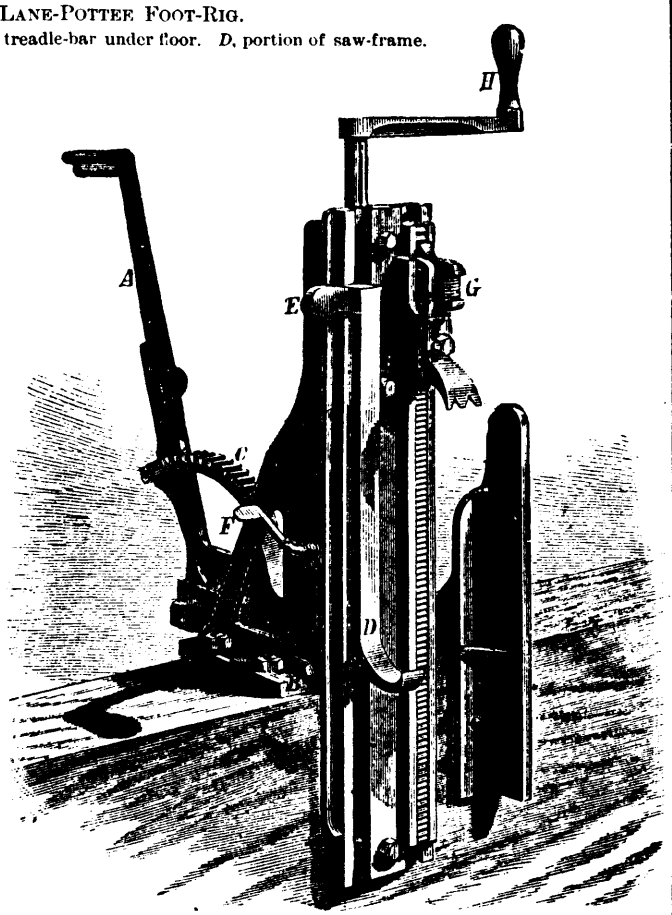


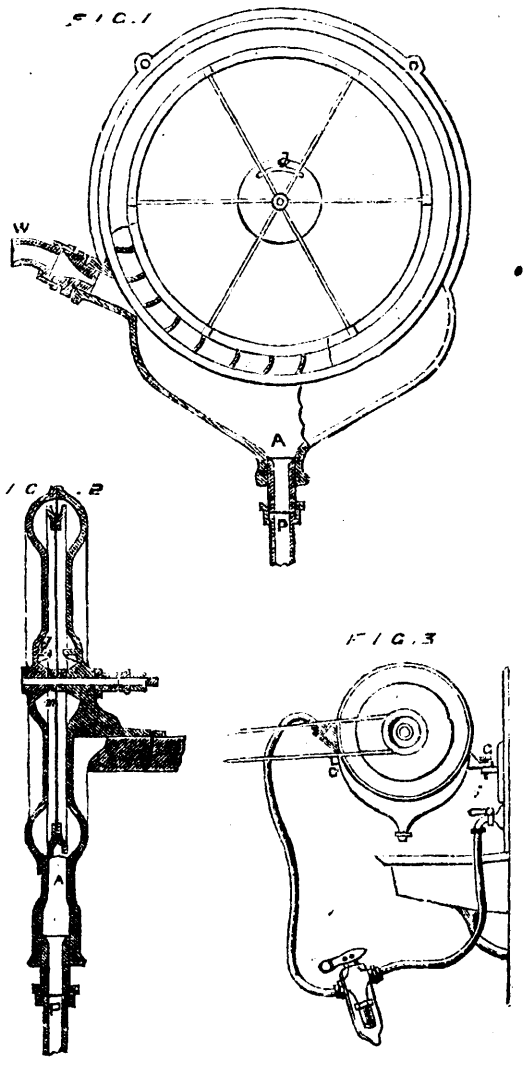
FIG. 8.—BROWN'S PATENT DOGGING DEVICE.

A SIMPLE WATER MOTOR.

The useful little water-wheel motor illustrated in the annexed engravings has been patented by Mr. O. J. Backus, of Newark, N.J. Fig. 1 is a sectional view of one plate of the wheel case, showing the wheel partly in section; Fig. 2 is a vertical section through the wheel and case; and Fig. 3 shows one method of putting the motor to work. The invention consists of a wheel carrying bucket suitably shaped and disposed around its periphery in such a manner that when water is forced against them the wheel is caused to revolve with considerable power, sufficient even when of small size (about 7 in. diameter), to drive a sewing machine. The water wheel chamber is made up of two casing plates bolted together. Each plate has an annular rib to receive the bucket-carrying portion of the wheel, and also a central annular depression surrounding the bearing of the shaft. The lower portion of the casting or casing is provided with an upwardly flaring pocket A, of less width than the casing itself, taken through the annular space, but of a length nearly equal to one-third of the circumference of the casing; the bottom of this pocket converges to a discharging nozzle, which connects to the waste pipe P. The ingress pipe forms part of the upper edge of the pocket, having a finely perforated nozzle to which the water inlet pipe W is secured. In Fig. 2, the casing is shown with a bracket to secure the motor to the top of a sewing machine or other table, so formed that while it serves to hold the motor to the table top, it also forms a part of one of the long bearings for the wheel shaft. This bracket extends sufficiently below the point at which it forms one of the bearings of the shaft, to elevate the same above the table when the motor is in position, thereby enabling a direct connection to be made between the shaft of the motor and the driving shaft of the machine to be operated. The pocket A, nozzles, and bracket are all cast with, and form a part of, the plate forming the one-half of the casing. The other plate has neither a bracket nor a pocket formed in it. The two plates, when bolted together, form the bucket chamber of the wheel, and an annular laterally extended chamber *m*, to receive the "eyebrows" or water sheds *d*. This chamber surrounds the shaft and bearing, and owing to its concavity the water, flowing down the inner face of plate over the eyebrows *d*, will be conveyed past and below the shaft without escaping from the wheel case between the bearing and the shaft. By the peculiar form of chamber *m*, that part of the wheel case can be contracted laterally, as shown at Fig. 2; and besides this the bearings can be made long enough to support the wheel shaft without occupying more room laterally than the width of the wheel case. The buckets of the wheel are struck by a minute stream of water from the nozzle, directed downward and inward on a line tangent to a circle within the circumference of the wheel, thereby receiving all the force of the stream to operate the wheel. To prevent the reaction of the water upon the buckets the pocket A commences directly below the injecting nozzle, and conducts all the water down to the discharge pipe.

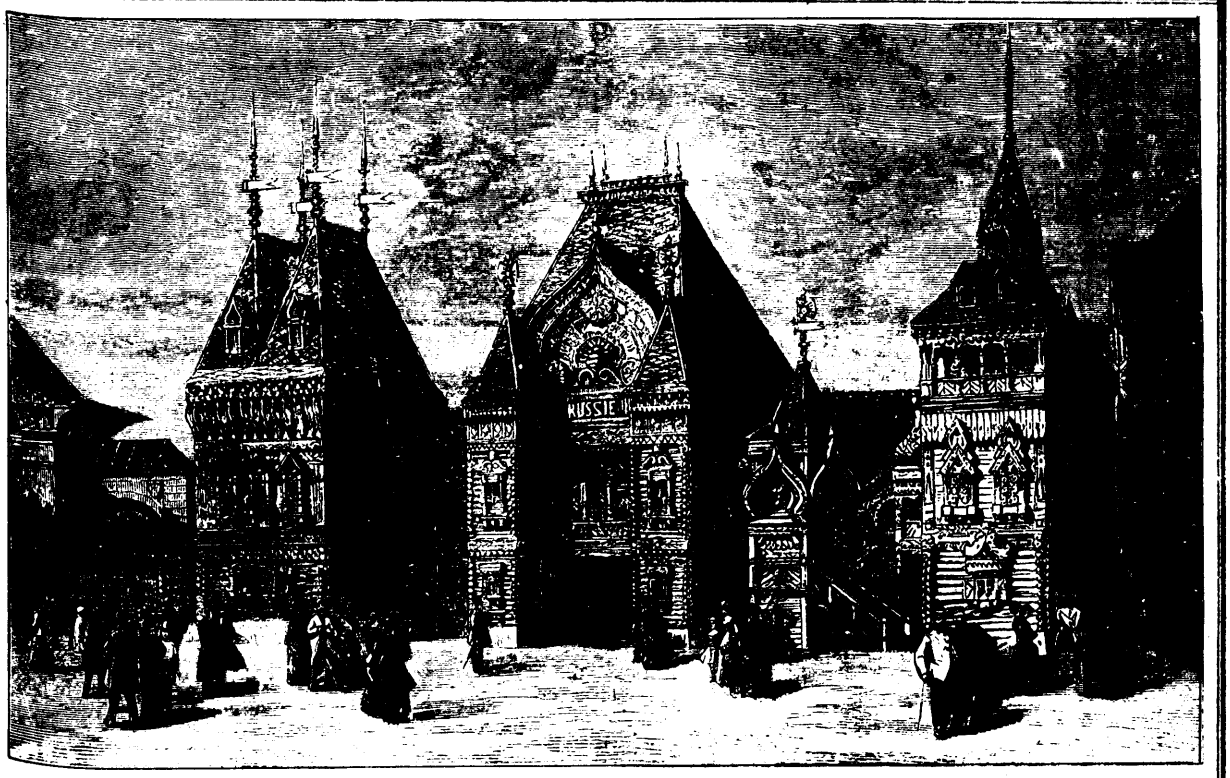
To obtain a very light wheel, wire spokes may be used to connect the buckets to the hub of the wheel secured to the shaft C, yet this part of the invention is not confined to the above, as any suitable construction of wheels may be used. For the purpose of starting and stopping the machine a single-way cock is employed, through which the water passes on its way from the service pipe to the wheel case; this cock is mounted upon standards fixed in a drip pan. The plug of the cock extends so as to form a support for a pedal or foot lever by means of which an operator regulates the flow of water at will. Between the cock and the supply nozzle is applied a vessel made in two detachable parts, and provided with a perforated diaphragm to prevent any foreign matter in the water from collecting in and closing up the nozzle. This vessel, being in two parts, may be removed for cleaning without stopping the flow of water to the cock L.

The peculiar advantages of the arrangement depicted by Fig. 3 are that the motor or wheel is sat up upon an adjustable swinging bracket to operate a sewing machine or lathe at different angles and locations without crossing the belting, and without disconnecting the water pipe. Fig. 3 is, then, a side elevation of reversible water motor provided with projecting lugs G and G1 fashioned to fit into a dovetail slot of the swinging section of a bracket; this bracket is secured to the wall or wainscoting, and the swinging section is secured to the horizontal projecting portion of the bracket by means of a thumbscrew or pin, which forms the pivot or hinge upon which the motor is swung either to the right or left. The dovetail projections G are cast upon, and form an integral part of the case A, by which means the motor is reversed, without crossing the driving belting, to operate sewing machines in any part of the room.



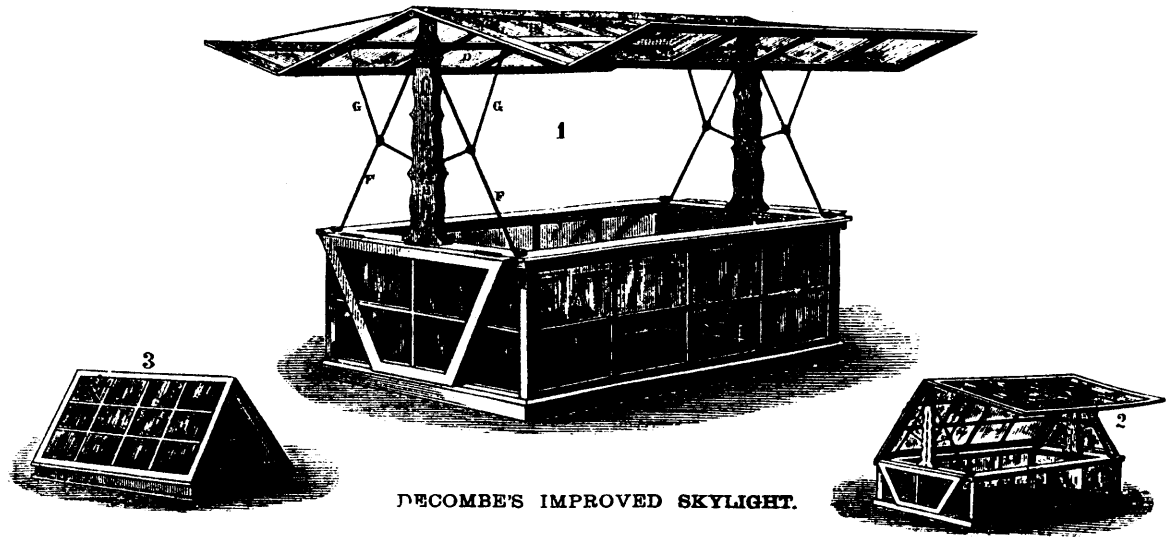
THE sale of German hardware is gaining ground in Great Britain. A Sheffield correspondent writes that he was shown, in the warehouse of a leading Sheffield merchant and manufacturer, samples of tailors' scissors which were quite equal to those made in Sheffield. This is an important branch of the scissors trade, and was for many years monopolized by Sheffield makers. The difference in prices is astounding. The Sheffield-made tailors' scissors cost 18s.; the German article, similar in size and equal in quality, costs only 7s. 3d. They look well, cut well, and, we are informed, wear well. Does this speak well for England's trades-unions, with their obnoxious restrictions? As the organ of the hardware trades, we regret that the backbone of England, namely, her workingmen, should be so stupid in their demands as to cause their employers to be beaten in the market like this by our German competitors. The masters have been to blame at times; but when they have come to the front and laid down expensive machinery, they have frequently found themselves checkmated by the very workmen who are now reaping in comparative poverty, the fruits of their folly.—*Ironmonger.*

SILVERING MIRRORS, ETC.—Boettger suspends tartrate of silver in very fine powder in distilled water, and carefully adds ammonia until the tartrate is dissolved, stopping at a point where a small access of silver still remains undissolved, and where the liquid gives off no ammoniacal odor. The objects to be silvered are placed in this bath, after thorough cleaning, and in about 10 minutes they will be found to be coated with a uniform film of silver.—*D. Indust. Zeitung.*



PARIS EXHIBITION.—THE RUSSIAN BUILDING.

PARIS EXHIBITION.—THE UNITED STATES BUILDING.



DECOMBE'S IMPROVED SKYLIGHT.

DECOMBE'S UNIVERSAL VENTILATOR, SKY-LIGHT, AND EXHIBITOR.

(From the *Mining and Scientific Press.*)

It represents the lower portion of the sky-light. The vertical end timbers *B*, are extended upwards, as shown, and their upper ends are formed of metal, by the extension *C*, being formed with a socket, which fits over the ends of the timbers *B*. Each side of the cover or top *D*, is made with rafter and glass; but the rafters are fastened at top and bottom to horizontal timbers, which work each side of the top or roof separate and distinct from the main structure, these horizontal timbers not being secured to either plates or apex permanently. Through its upper iron portion *C*, of the end timbers *B*, are pivoted the bolts, forming part of the hinges, attached to the sides of the top. These hinges admit of the sides of top being raised or opened, as the lower edges of the rafters are not secured to the plates.

The side braces *F* are secured to the plates of the lower portion and to the lower portion of the arm extension *C*, of the uprights, thus forming braces for the uprights and drawing the extension pieces *C* firmly into place, where they hold them. On these side braces *F* are pivoted the hinged braces *G*, which, when not in use, hang down under the side braces *F*. When the top is raised, however, these hinged braces *G*, having their outer ends turned at right angles, as shown, engage with the holes in the plate of the under part of the sides of the roof, as shown in Fig. 1, and on one side of Fig. 2. The hinged brace may then be put in any hole in the plate, so as to set the top at any angle. When it is desired to close the top by lifting this brace out of the holes in the plate, the top may be lowered and closed as shown in Fig 3.

The gables are also hinged so as to be dropped down. When they are up, however, and the top dropped, the top covers the laps of the sides or gables and holds them in position as shown in Fig. 3.

It will be seen that the combination of braces in this at once renders it very strong, and that the roof can be set at any desired angle. The roof can be set so as to cause a draft of air to pass either one way or another. Only one side need to be raised, if desired, as shown in Fig. 3.

This same construction may be applied for portable houses, fruit and vegetable stands, &c. In such cases with a wooden or cloth roof, the side from the sun can be secured and the front be placed on the stand in the shade. The sides can be dropped so as to be locked at night.

This invention serves the purpose not only of a sky-light, but is adapted in a marked degree for use as an exhibitor and ventilator. Shelves may be arranged under the glass, on which any article may be placed for exhibition in public places. The roof may be lifted out of the way during the exhibit and afterward shut down and locked for safe keeping without disarranging the articles within. As a ventilator this invention claims advantages over all others. The different parts move independently, so that they may be arranged in many different ways, according to the state of the weather. If the day is warm and air is wanted in the house, even a light breeze can be made to descend and all of it used in cooling the apartments. Suppose, for instance, the breeze blows diagonally across the sky-light. It may be collected and sent down by arranging the parts as follows: Put up one end piece and shut down one roof piece, so that a corner will be formed, opened toward the wind. The wind rushing into this corner and against the inclined roof piece will be collected and shot vertically down into the house. It is evident that an infinite number of combinations are possible, according to the strength of the wind and the amount of air wanted below. On very hot and quiet days the full ventilating capacity of this invention can be utilized and at the same time the whole of the top covered, so that a full shade is obtained along with as much air as possible. Rain will not prevent ventilation, for the parts may be so fixed that openings will be presented only in such positions that the rain, coming from one direction only, cannot enter. So this patent provides for protection from rain and too great light, and at the same time affords most complete ventilation.

THE STRONGEST STEAMER IN THE WORLD.

The Italian Government has just launched the ironclad "Dandolo," sister ship of the "Duilio." Both are to be armed with 100-ton guns, and be armored with 29 inch plates. Not content with these ships, which carry heavier metal than any one in the English navy (the English "Inflexible" has 24-inch armor, and carries a pair of 80-ton guns), the Government is constructing two others, which are to be armored with 24-inch plates, and are to carry cannon of perhaps 200 tons.

It is a matter of general surprise that Italy should be expending enormous sums for such an irresistible navy. Simple pride of possession cannot be the only impelling motive.

THE INFLUENCE OF ONE MILL.

A single woolen mill in the city of Lawrence produces every week a million yards of dyed or printed cloths. It pays $160,000 as wages. It employs 5,300 persons, paying them at an average rate of 95 cents a day to women and girls, and $1.40 a day to men. It consumes 500 tons of starch, and expends $400,000 for printing and dyeing materials every year. The wool it requires calls for the fleeces of 10,000 head of sheep. It secures food, clothing, and usually respectable savings to 5,300 persons and their dependents—not less than 10,000 souls altogether. This, with the freights paid for transportation of its materials and products, show what one mill contributes to the wealth, power and prosperity of the country. The woolen industry of the whole country amounts to more than $200,000,000 a year. There are nearly a thousand woolen mills in Ohio and other Western States.

☞Subscribers not receiving their numbers regularly are requested to report the same at once to the Editor, P.O. Box 205, Montreal.

HAINES' PATENT UPRIGHT SELF-FEEDING DRILL.

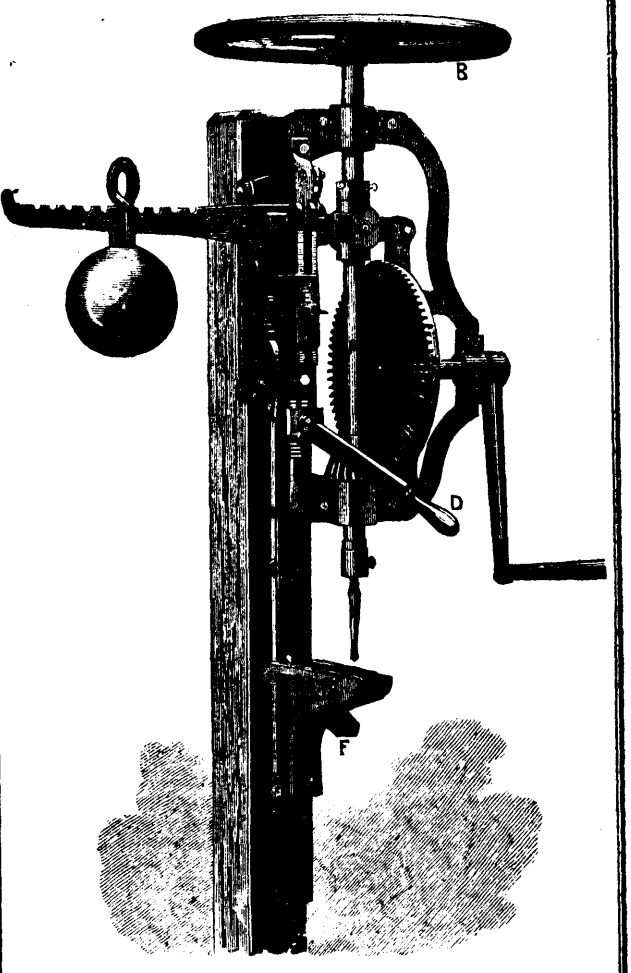
The drill represented by the annexed engraving is for boring iron, steel, &c.

The manner of feeding, the ease of regulating the feed for either light or heavy work, the facility for raising the drill-shaft from the work when completed or at any time desired, the advantage of the adjustable stop for limiting the downward motion of the drill-shaft, will readily appear from the following explanation of the engraving:

A is the drill-shaft, having the fly-wheel *B* at its upper end. To the upper part of the shaft are attached collars, and between them is a sleeve which is secured for vertical movement of the shaft, by means of the collars, and prevented from revolving with it by the trunnions, which attach it to the beam *C*. The shaft *A* is free to move vertically within certain limits, it being made loose in its bearings and loose vertically in the pinion. Its vertical position is regulated by the beam *C*, which is attached to the shaft by the sleeve above referred to. The short end of the beam is connected by a link to the frame. The long arm is notched so that the weight may be adjusted upon it to cause more or less downward pressure on the drill-shaft, as required for either light or heavy work. This beam is operated by means of a lever *D*, the short arm of which is cogged and engages with the cogs of the bell-crank shown, which latter is connected to the beam by means of clevises. By bearing down on lever *D*, the long arm of the beam is elevated, and consequently also the drill-shaft. This is a quick way of raising the drill-shaft from the work; and it can be kept up if desired, without holding on to the lever, by catching the lever in a hook attached to the frame for that purpose. In order to limit the motion of the beam, and through it of the shaft, an adjustable stop *E* is provided, which may be secured in any desired position by a thumb-screw. When a number of holes are to be bored to a certain depth, the stop *E* can be adjusted so as to stop the downward motion of the shaft at the proper point.

The table is likewise adjustable, and is placed as desired by means of the dog *F*, which engages with a rack upon the standard, requiring only a moment in changing its position.

In drills fed by gearing, the feed must be always alike for iron and steel, and different sizes of drills. This difficulty is here entirely obviated by the adjustable weight causing a fast or slow feed as required.



COMBINED LATCH AND HASP.

A combined latch and hasp, affording double security, is represented in the engravings. The hasp is made to combine the convenience of the latch, by simply putting a strap over it, to hold it in place, as shown in Fig. 1. The staple (Fig. 2) has a raised portion on each side, to catch and hold the latch. By this simple device, a door to a box-stall, or other door or gate, which it is often desired to close quickly, may be shut, and firmly fastened without delay; additional security may be obtained by slipping a pin into the curve of the staple, as seen in Fig. 2.

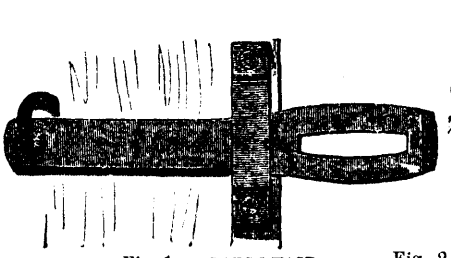


Fig. 1—A LATCH-HASP.

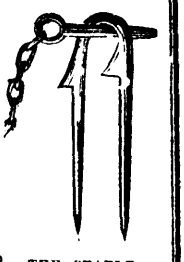


Fig. 2.—THE STAPLE-CATCH.

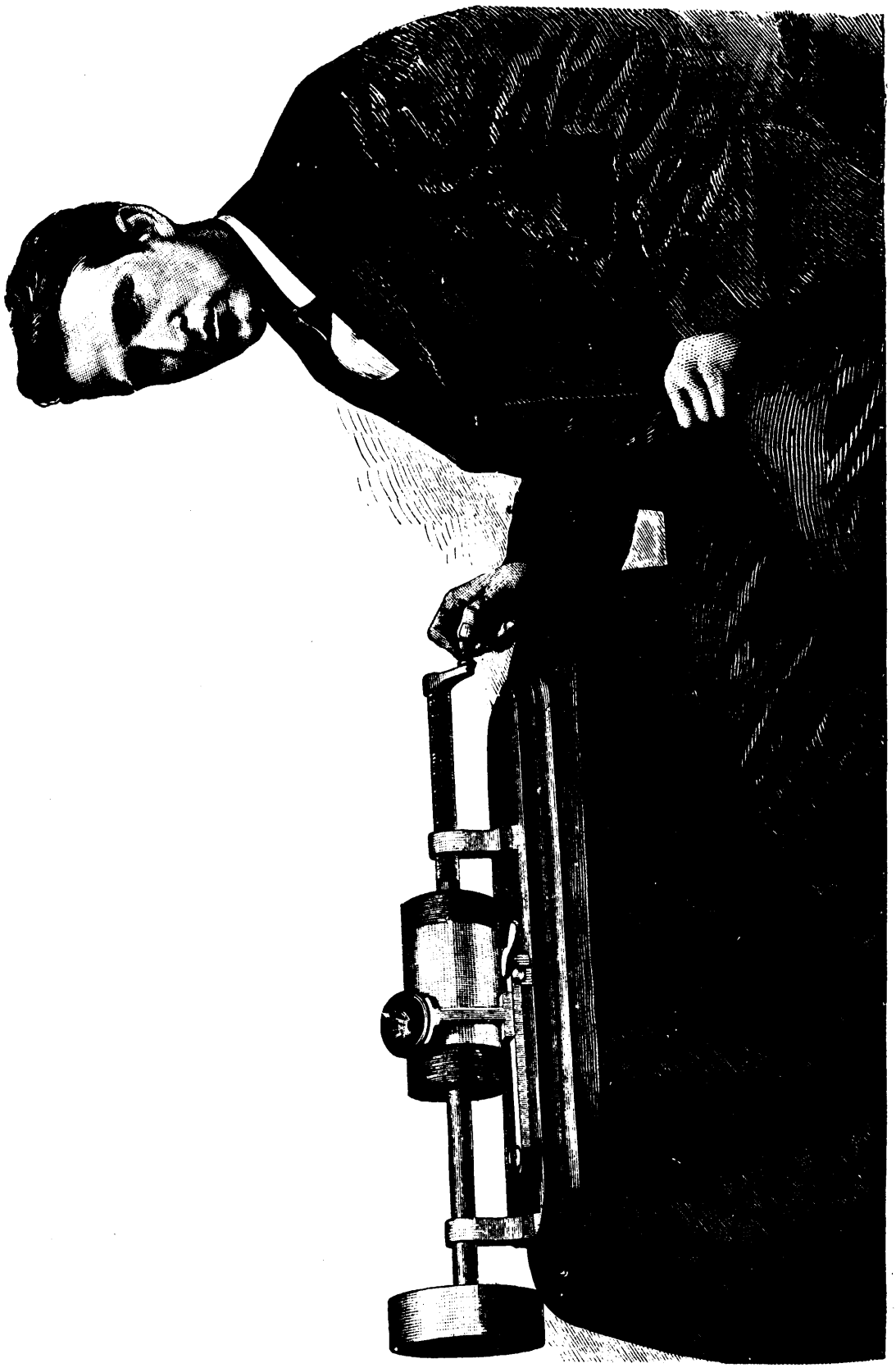
CLEANING AND BURNISHING IRON.

This tool is in use in the Prussian army, for polishing the bits, stirrups, and other parts of the harness or trappings made of iron. It is simply a piece of hardened steel, 4 or 5 inches long, inserted in a handle, as shown in the engraving. The cross section is an oval: or, if round, it would probably do just as good work. It is made of ½ inch steel, with the surface smooth and polished. To brighten a tarnished or rusty piece of iron or steel, the instrument is simply rubbed vigorously upon it, making it bright and clean in a short time. Where there are facilities for the work, an old, half-rounded file may be readily ground and polished to form a similar burnisher.

AN IRON POLISHER.

THE QUALITY OF CANADA PLATES.

An important question as to the quality of Canada plates was raised in an action tried at the last Liverpool Assizes. The action was Gillespie & Co. *vs.* Marshall (Mr. John Marshall, of the Monway Works, Wednesbury.) Mr. Marshall received an order through Mr. Fox, broker, of Liverpool, for 500 boxes of Canada plates, Marshall's make, for the above firm. Mr. Marshall made and sent his plate of the usual make, which were shipped in due course to Kingston. Gunn & Co., the real buyers, objected to the plates, contending they were not Canada plates, as the grain of the iron ran crosswise and not the whole length of the plate. The contract was for "Marshall's Canada plates" of merchantable quality, and not "Canada plates" alone, and they were not to be cold rolled or close annealed, the defendant having no plant for this to be done. The jury found the contract was for plates as manufactured by Mr. Marshall, and that they were of good merchantable quality and condition, and a verdict was given for the defendant.



EDISON, THE INVENTOR OF THE PHONOGRAPH.

EDISON, THE INVENTOR OF THE PHONOGRAPH.

The inventor of the phonograph, Thomas Alva Edison, was born in Ohio, thirty-one years ago. He commenced his enterprising career as a newsboy on the Grand Trunk Railway. Very soon he had obtained a monopoly for the sale of papers over one line, and employed four boy-assistants. By and by he conceived the idea of publishing for himself. There was an old, springless car, with a smoking-room, attached to the train on which he sold his papers; and as no one would travel in it, Edison got leave to use it. He bought an old press and a quantity of type, fitted it up in the smoking-room, and regularly issued a small weekly print called the *Grand Trunk Herald*, price three cents, containing gossip of the neighborhood, accidents, and other matter. George Stephenson, at work on the Montreal tubular bridge, found Edison engaged on his paper, and was so pleased with the boy's earnestness that he ordered an extra edition for himself. This connection with the press introduced him to the telegraph, which he straightway determined to master. Having learned how to send and receive messages, at the age of seventeen he obtained a situation as telegraph operator in Stratford, Canada. Thence he went from city to city of the States—west, south and east—Cincinnati, Indianapolis, Louisville, New Orleans, Boston and New York, leading an unsettled operator's life; now being discharged, now leaving on his own accord. All his spare cash and time were spent in providing experimental electrical apparatus to illustrate his studies or to try some of the original ideas which thronged his brain. At Indianapolis he produced his first inventive success, an automatic signaling instrument, and at Cincinnati, in 1865, he perfected a duplex system for sending two messages in contrary directions over one wire at once. He was pooh-poohed and ridiculed until he went to Boston, in 1868, where an appreciative superintendent of the office recognized in him the fire of suppressed genius. It happened that eight years ago there was unusual excitement in the gold market, and at the climax of the hurry the company's indicating instrument broke down. The superintendent was out, and no one could set it right. In the midst of the confusion Edison stepped up and volunteered to do it. The manager looked somewhat dubiously at the new comer; but the emergency was great, and Edison's offer was accepted. In a few moments the instrument was working as before, and Edison was forthwith engaged at a good salary in the service of the company. From this time his career is that of an electrician and inventor. He soon patented several valuable inventions, and became well-known, was appointed Inventor-in-Chief to the Western Union, the colossal telegraph monopoly of America, and to other companies. Two years ago he retired to Menlo Park, a sequestered spot on the Pennsylvania Railway, twenty-four miles from New York. His establishment here consists of his laboratory, dwelling-house, and the cottages of his workmen, including a restaurant started by a smart Yankee for the convenience of Edison's visitors. The laboratory is a plain woolen building, two stories high, isolated on an eminence. The lower part is occupied by Edison's office and library, and a mechanic's shop, where a dozen fitters are forging and shaping his ideas into iron and wood. Upstairs is the laboratory proper, a long room lined from end to end with an array of chemicals. On tables and in show-cases about the room are lying all manner of telegraphic apparatus, lenses, crucibles, and pieces of his own instruments—telephones, phonographs and aerophones. A perfect tangle of telegraph wires from all parts of the Union is focused at one end of the room. An ash-covered forge, a cabinet organ, a rusty stove, with an old pivot-chair, a table well stained with oils and acids, complete the furniture of this curious den, into which the sunlight filters through the chemical jars, and falls in parti-colored patches on the dusty floor. The moving spirit of this place by day and night is best described as an overgrown schoolboy. His face is pale and beardless. His nose and chin are well shaped and prominent; his mouth thin; his forehead full and expansive, but not high; his hair is dark chestnut brown, and silvered with gray. The most striking feature of his face are his eyes, which are blue-gray, deep-set, intense, and penetrating. His smile is boyish and pleasant, and his manner somewhat shy. Edison is an inventor by sheer dint of native genius. His scientific knowledge of electricity is by no means thorough; mathematics are repulsive to him. As soon as his mind lights upon any new or peculiar fact, at once he conceives an application of it. The phonograph was discovered in the following manner: He had invented an apparatus for recording ordinary telegraph signals by a stylus or yielding material, so that the record could serve to retransmit the message automatically. One day, while experimenting with a vibrating telephone diaphragm to which a pricker was fixed, the pricker pierced his finger by the force of the vibrations, and drew blood. In an instant there flashed into his mind the idea of the phonograph. He saw that the voice had power to cause a similar pricker to indent its vibrations in a sheet of tinfoil, so that they could be automatically reproduced. As proof of his power of work, it may be further said that the idea of the phonograph occurred to him one Wednesday afternoon, and he worked on all Wednesday night, Thursday, Thursday night, Friday, and Friday night, till Saturday morning. By that time he had constructed a completely successful phonograph; then he went to bed, and slept with hardly a break till Monday evening.

Edison has been described by the United States Commissioner of Patents as the young man who has kept the path to the Patent-Office hot with his footsteps. During the last ten years he has taken out 157 patents, and applied for seventy-seven more. Of these, however, only fifteen or twenty are important inventions, the rest being obtained to fence them round. His yearly income from his patents is now over 10,000*l.*, and he has realized in all over 80,000*l.* from them. This sum has been sunk, as soon as it was earned, on books and experiments. As for the phonograph his faith in it is boundless. In future, he believes, letters will be talked, books read, sermons preached, languages and music taught, parlor operas played, announcements made, and reporting done by phonograph. Voice-albums will become the fashion, and the memorable words of great men mill be treasured in museums. "There was a fortune in the Pope's last blessing," says Edison, somewhat irreverently; "the phonograph record of it, multiplied by electrotyping, would have sold for five dollars a piece easily." It is said that Doré gets suggestions for profiles from the shadow of a piece of crumpled tissue-paper thrown on the sunlit ground; and so will the phonograph, driven backward, hint all manner of new musical combinations to the musician. Edison is now making one with a sapphire point, which will record even a whisper, and contain a complete novel of Dickens's—50,000 words—on a sheet of tinfoil 10 in. square. There are other marvels yet to come. By the aerophone he hopes to make ships converse at sea, though several miles apart; and his boast is that he will make the statue of Liberty, to be set up in New York harbor, read the declaration of independence so loud that all Manhattan Island shall hear it. Another new thing is the "mega-phone," a kind of small ear-trumpet, doing for the ear what the opera-glass does for the eye; and slightly deaf as he inclines to be, Edison declares that by its aid he can hear a cow chew her cud an eighth of a mile distant. These are things of the future. Meanwhile it is enough that his actual achievements stamp him as a prodigy in mechanical invention.—*World.*

CORROSION IN SOIL PIPES.

Cases of corrosion in lead soil pipes are common in the experience of every plumber. Sections of a drain will be found fairly honeycombed with holes, varying from the size of a pin-head to a quarter of a dollar. They are almost invariably located on the upper side of the pipe, and hence are difficult to detect, as there is no fluid leakage from them. Their origin has been laid to the over-use of disinfectants, particularly carbolic acid, but chemical analysis shows that sewer gas alone is sufficient to cause such corrosion in unventilated lead pipe. Proper ventilation will undoubtedly guard against the evil by carrying off the gas before it can do harm.

Several cases of corrosion have come to our notice. In one instance a vent flue was carried to the roof through an attic extension which was not occupied, and there slanted across the side wall. The family were taken sick. The plumber when called suggested that a leak in this pipe might be the cause, but was only laughed at. He insisted on making an examination, and found a score of holes along the upper surface of the pipe. Just about that time the occupants began to smell something. In another case damp spots on a parlor floor led to opening a brick wall in which the soil pipe was cased, and it was found in a like state as the one first named. In still another case, a corroded pipe passed through a bed-room, which for some months was occupied by a malarial fever patient, just adjoining a water closet and bath-room.

We would thank any of our readers to send us full particulars of the location and circumstances under which they find corroded pipes, as it is a subject of considerable interest just now.

THE system of lighting lamps by electricity, which was tried recently in Pall Mall, London, is said to be a failure, and the local authorities have ordered the removal of the apparatus.

THE MICRO-TELEPHONE.

BY GEO. M. HOPKINS.

The Edison carbon telephone and the instrument known as Hughes' microphone, which according to general belief

Fig. 1.

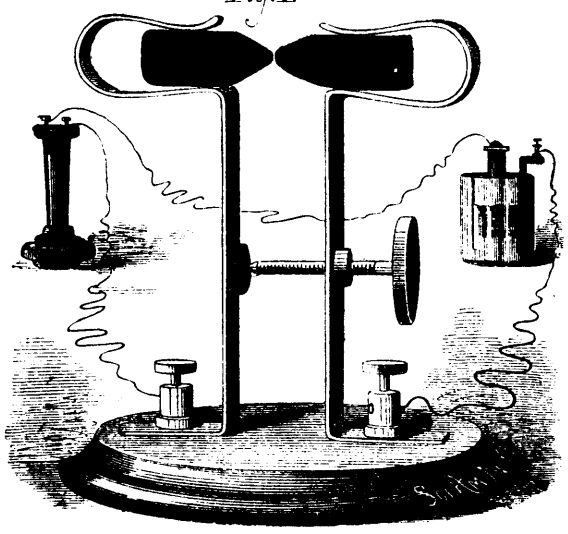


Fig. 1.—A NEW MICRO-TELEPHONE.

are identical as to principle, depend, according to the inventor's theory, upon the changing conductivity of carbon under a varying pressure. It has been generally admitted that no instrument that would make and break the electric current could transmit articulate sounds. Nor has such an instrument to my knowledge been produced prior to the one shown in the accompanying engravings. My instrument, so far as I know, differs materially from the multitude of other forms of telephone or microphone, which are all based upon the principle discovered by Edison.

Fig. 2.

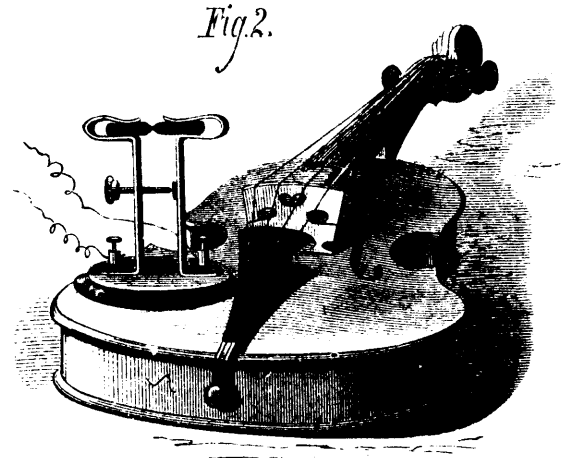


Fig. 2.—MICRO-TELEPHONE ON A VIOLIN.

The instrument which is the subject of this article consists essentially of two springs secured to a small base piece, and each supporting at their upper end a piece of ordinary battery carbon. These two pieces of carbon are placed in light contact, and the two springs are put in an electrical circuit in which there is also a receiving telephone of the Bell form.

Fig. 3.

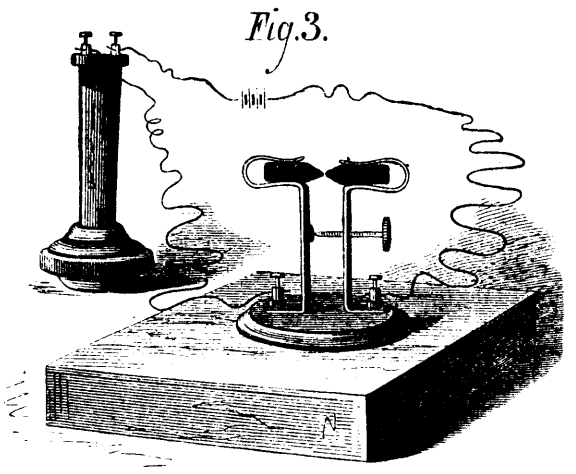


Fig. 3.—MICRO-TELEPHONE ON A PLAIN SOUNDING BOARD.

This instrument is represented full size, in detail, in Fig. 1. In Fig. 2 the micro-telephone is placed upon a violin. In Figs. 3 and 4 it is secured to a small sounding board. The two carbon supporting springs are fastened to a single base by the binding posts which receive the battery wires.

Fig. 4.

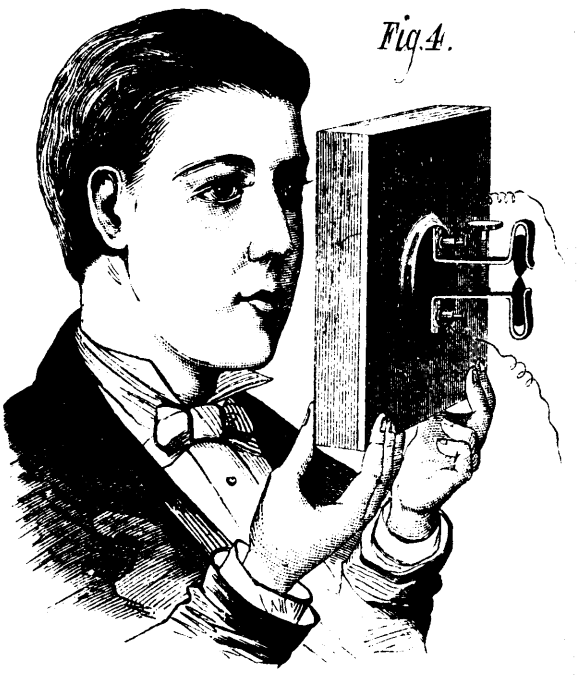


Fig. 4.—MICRO-TELEPHONE USED AS A TELEPHONE.

An adjusting screw passes through one of the springs at or near its center, and bears against a rubber button projecting from the other spring. This simple device when placed on a table indicates in the receiving telephone the slightest touch of the finger on the table or on the instrument. Blowing on it makes in the receiving instrument a deafening roar; drawing a hair or a bit of cotton across the carbon is distinctly audible in the receiving instrument.

When the device is placed on a small sounding board every sound in the room is received and transmitted. An ant running across the sounding board can be plainly heard. And a touch upon the instrument or the table which supports it, which without the micro-telephone would be entirely inaudible, can be distinctly heard in the receiving telephone by aid of the instrument, even though miles intervene.

When it is placed on a violin, as in Fig. 2, blowing lightly upon the strings produces Æolian harp tones in the receiver, and a song sung to the violin is rendered in the receiving instrument with an Æolian harp accompaniment. When mounted on a violin or sounding board it will transmit articulate speech uttered in any portion of a room of ordinary size; it will receive and transmit the music of a piano, and even the turning of the music may be heard. Whistling, flute music, and other sounds are transmitted with their characteristics of volume, pitch, and timbre.

This instrument, although so very simple, is capable of doing all that has been done by other instruments of an analogous character, and it will be determined by further experiment whether it will do more.

Although carbon contact points are preferable, they are not absolutely essential to the operation of the instrument, as metallic points will do the same things, but not so satisfactorily.

THE MICROPHONE CONTROVERSY.

A Letter from Sir William Thomson—He Deprecates the Personal Accusation that have been made.

To the Editor of the New York *Tribune*:

Sir,—The pleasure with which those beautiful discoveries and inventions—the telephone, the phonograph and the microphone—have been appreciated by the world has been, unhappily, and I must say I think unnecessarily, marred by one of the most disagreeable things that can be thrust upon the public—a personal claim of priority, accompanied by accusations of bad faith—especially when made against any one with whose name and fame the public has come to feel concerned.

Before troubling the public at all with such a matter, Mr. Edison might surely have reasoned out his claim with Mr. Preece, with whom he had been from the beginning in correspondence, or he might have written immediately to the public journals, pointed out the close relation between his own "carbon telephone" and Mr. Hughes' subsequent "microphone." The scientific public could then have calmly judged, and would have felt much interest in judging, how much in common, or how much not in common, there may be in the physical principles concerned in the two instruments. But by his violent attack in the public journals on Mr. Preece and Mr. Hughes, charging them with "piracy" and "plagiarism" and "abuse of confidence," he has rendered it for the time impossible for either them or others to give any consideration whatever to his claim.

Nothing can be more unfounded than the accusations. Mr. Preece himself gave, at the Plymouth meeting of the British Association, last August, a clear and thoroughly appreciative description of Mr. Edison's carbon telephone, and published it in the printed reports of his lecture which appeared in the public journals. The beautiful results shown since the beginning of the present year by Mr. Hughes with his microphone, were described by himself in such a manner as to leave no doubt but that he had worked them out quite independently, and that he had not the slightest intention of appropriating any credit due to Mr. Edison.

It does seem to me that the physical principle used by Edison in his carbon telephone, and by Hughes in the microphone, is the same as that used by M. Clerac, of the French "Administration des Lignes Télégraphiques," in the "variable resistance carbon tubes," which he had given to Mr. Hughes and others for important practical applications as early as 1866, and that it depends entirely on the fact long ago pointed out by Du Moncel, that increase of pressure between two conductors in contact produces diminution of electric resistance between them.

I cannot but think that Mr. Edison will see that he has let himself be hurried into an injustice, and that he will, therefore, not rest until he retracts his accusations of bad faith publicly and amply as he made them.

I remain, Sir, your obedient servant,

William Thomson.

Yacht Lalla Rookh, Cowes, Isle of Wight, July 30, 1873.

INTERESTING ITEMS.

Cleaning the Teeth.—A writer says: A good way to clean the teeth is to dip the brush in water, rub it over genuine white Castile soap, then dip it in prepared chalk. I have been complimented upon the whiteness of my teeth, which were originally anything but white. I have used the soap constantly for two or three years, and the chalk for the last year. There is no danger of scratching the teeth as the chalk is prepared; but with a good stiff brush and the soap it is as effectual as soap and sand on a floor.

How to Kill a Tapeworm in an Hour.—Dr. Karl Bettelheim, of Vienna, narrates, in the *Deutsches Archiv*, a heroic method and nearly sure cure in the short space of time of three quarters of an hour to two hours. It is this: He inserts a tube in the œsophagus, to the stomach, and pours down from 200 to 400 grammes of a very concentrated decoction of pomegranate root, having previously had his patient fast for 24 hours. The worm is stupefied, and passed, head and all, to a certainty; the patient has no sickness of the stomach, and no nauseous swallowing to do; and the drug is cheap.

Cutting Rails.—The difficulty of cutting red or nearly white-hot rails, so that they may be all of the same length when cold, has been met, says the *Engineer*, in some German and Russian rail mills by an ingenious method; The rails are looked at through a dark glass; when they have cooled to a certain temperature, they cannot be perceived. If a dark-blue or an orange-yellow glass is used, the rails may be still at a red glow, but the light radiated from them does not reach the eye. It may be considered that the light from two rails, observed through the same dark glass, disappears at the same temperature, and thus a rule is obtained for cutting the rails to the same gauge. Each rail is allowed to cool till it can no longer be seen through the dark glass, and is then cut. The result is said to be satisfactory.

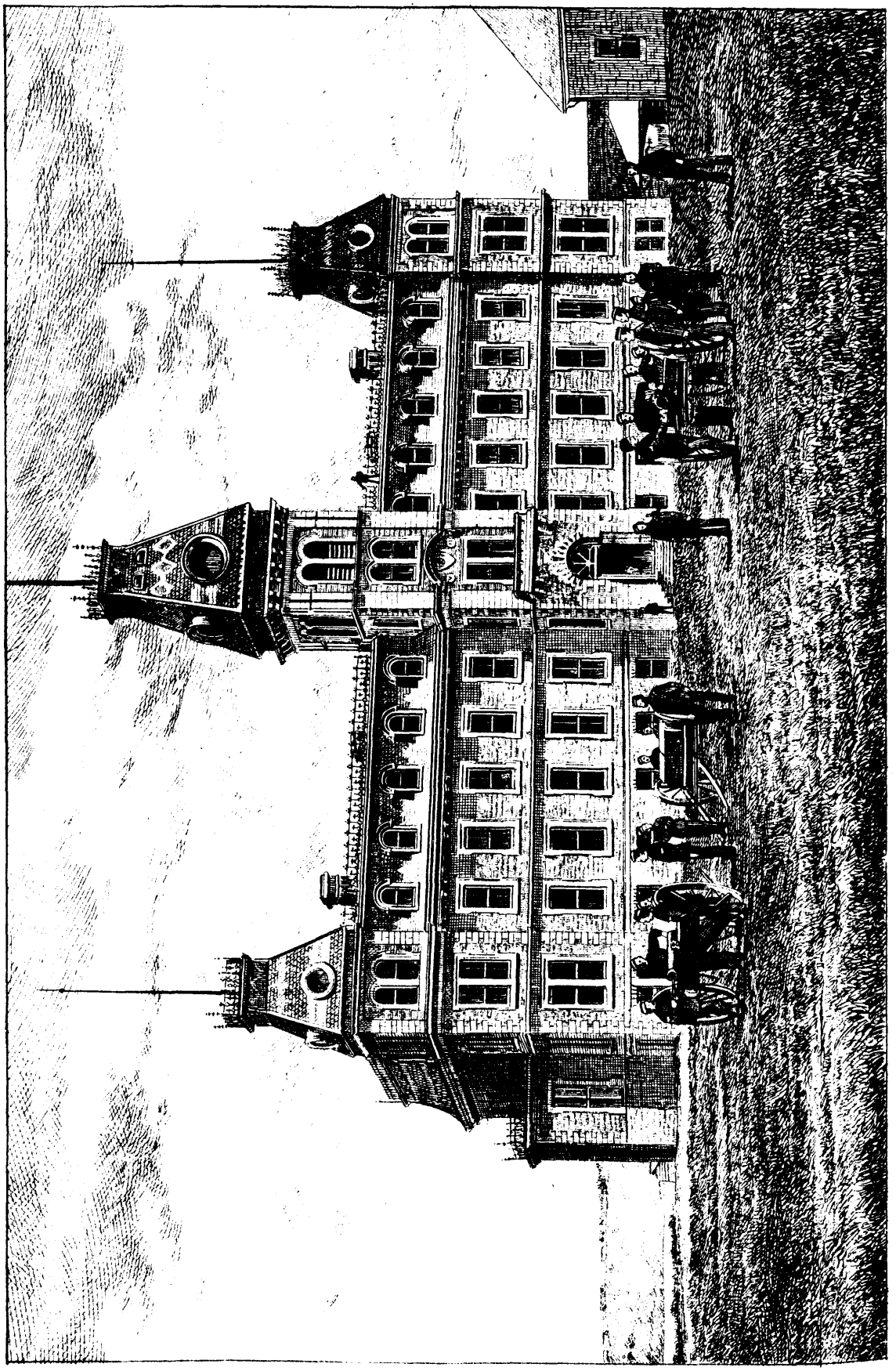
A sharp controversy has lately been carried on in the columns of the *Times* with respect to the application of iron or steel horse-shoes to the feet of our equine favourites. It is simply a revival of the old dispute whether horses require to be shod or whether they should remain shoeless like colts and wild horses. Mr. Sidney remarks that the idea of dispensing with iron shoes is not new; on the contrary, "it is as old as anything in the shape of horsey literature." We are asked to follow nature, but nature did not make macadamized roads. We are told how horses in some foreign countries travel long distances daily, without shoes, with no evil results. But neither do these horses travel on granite-made roads, but principally over elastic turf, or beaten tracks, on which a shovelful of road metal has never been placed. Riding on unshod horses has been tried over and over again in England, but the system has proved a failure, and the practical experience of nine hundred and ninety-nine horsemen out of every thousand is against it. Even the "Charlier" shoe receives little support from practical men, notwithstanding the frequent periodical attempts to push it into common use. The almost universal verdict is in favour of using the common shoe on English roads, in town and in country alike. A retired Birmingham manufacturer has lately patented an improved form of horse-shoe, which is, we hear, likely to eclipse everything of the kind yet introduced. *Nous verrons.*

REMARKABLE STEAMBOAT SPEED.

The highest speed ever attained by any boat or ship was that obtained by the steam launches recently built for the English Amiralty by Messrs. Yarrow & Co.

The boats are each 85 feet long, 11 feet beam, and draw 3 feet. They are constructed of steel, and have engines capable of indicating 420 horse-power.

Run with the tide the one made 22 59 knots, or 26 miles per hour; the other, 23·92 knots, or 27·56 miles per hour. Against the tide, one made 17.69 knots; the other, 18·09. The mean of the two was, respectively, 20·14 knots, or 23·2 miles, and 21 knots, or 24·2 miles.



KINGSTON—THE MILITARY COLLEGE.

NOTICE TO SUBSCRIBERS.

As the information we afford to subscribers is gratuitous, all those asking for such are requested to forward a postage stamp for reply.

THE NEW BAPTIST TABERNACLE, OTTAWA.

(See page 352.)

The material used in construction is Gloucester lime-stone. The exterior dimensions are 100x60 feet, the walls being relieved with buttresses of cut stone. The main entrance is ornamented with two handsome pillars of Nova Scotia marble. Immediately over this is a stained window. The tower has an elevation of 170 feet, and on the north-west there is a neatly finished turret which gives the main tower a more imposing appearance. The seats are arranged in amphitheatre style, so that every one in the church faces the officiating clergyman. They are elevated on a scale of 2 feet 6 inches. The baptistry and platform are located in the centre of the western wall, and immediately above is the choir gallery. In rear of the baptistry, it is understood that Mr. Howe, one of the deacons, will produce an imitation of the River Jordan, which will certainly have a pretty effect when viewed from the body of the church. Two doors, one on either side, lead to the font and conceal the candidates from the congregation until the immersion ceremony is performed. There are two dressing-rooms in the rear. The ceiling is arched and relieved by three centre pieces, from which are suspended brass gasaliers. The ceiling is tinted a light blue, and the walls a light pink. The whole building, in fact, is a credit to the architect, Mr. Mather, the pastor, and the congregation, who exerted themselves so energetically towards its successful erection. When completed, it will cost $20,000.

KINGSTON AND THE MILITARY COLLEGE.

This is a view of the beautiful old city and its harbor taken from Fort Henry. Its main features will be easily recognized, and the more that they have not materially changed, at least the water approaches, for several years.

CUTTING LARGE LOGS FOR FIRE.

"A Subscriber" wants a method of using a horse-power with a drag-saw for cutting large logs into firewood. A simple arrangement for doing this may be made as follows: A drag-saw is attached to the balance wheel of the horse-power, the wheel having a crank rod attached, as indicated in the illustration. This rod may be made of tough hickory or oak. The saw is pivoted to the shaft, as shown in Figs. 1 and 2. The forward part of the crank rod rests and slides in a groove or guide in a post of the foundation timber (Fig. 1). This guide is arranged so that the saw will not drop lower than the bottom of the log, and not cut into the log carriage. In Fig. 2, the crank is made to give a reciprocating motion to the saw by the lever *a*, the guide being at *b*. The log carriage may be a common sled, upon which the log may be rolled and drawn to the saw; the log should rest upon rollers so as to accommodate the saw, and be blocked up to keep it steady. The supporting frame is shown in section in both of the above illustrations.

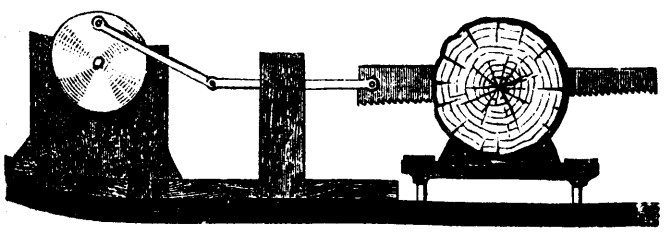


Fig. 1.—DRAG-SAW FITTED TO HORSE-POWER.

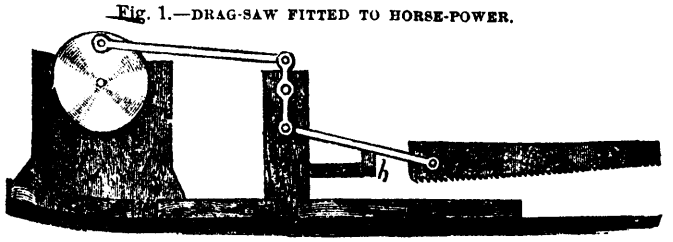
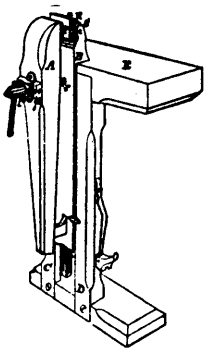


Fig. 2.—SHOWING CRANK AND LEVER ATTACHMENT.

CARPENTER'S VISE.

The object of this invention is to provide a vise which will hold firmly in its jaws tapering pieces as well as straight. A vise-screw *F* of the ordinary kind works through a nut fixed as usual in the stationary jaw, while in the loose jaw it works through a tapering mortise which allows the jaw to have a good deal of play. This screw and jaw have a bearing-plate and stops, so that the screw may work through the loose jaw as though the mortise were plain and not tapering. The change can be effected at will by disengaging the stops. At the top, on the inner face of the fixed jaw, is an adjustable force-plate, which is composed of a bed-plate *S*, a top-plate *R*, and side-plates *P*. *P* and *R* are hinged together at the top, and *P* is also hinged by its middle to the bed-plate *S*. A short spiral spring below the central hinge, between the lower part of *P* and the bed-plate, keeps the face of *P* parallel to the face of the movable jaw *A*. When a tapering piece is to be held, *P* and *R* are disengaged at the top, which allows *P* a certain freedom of motion about its central hinge, which, taken in connection with the motion allowed the loose jaw, when the removal of the stops makes the mortise in it a tapering one, will enable the vise to hold securely tapering and oblique objects of many shapes.



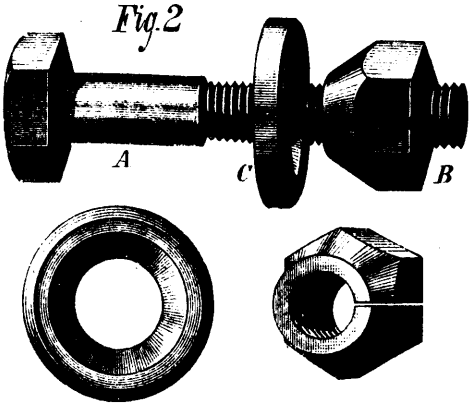
A NEW NUT LOCK.

A novel nut lock is shown in the accompanying engraving Fig. 1, representing the device as applied to the fish plate of railway rails, and Fig. 2 shows the bolt, nut, and washer in detail.

While this improved nut lock is designed more especially for the purpose indicated, it may be used wherever a secure bolt is required.

The threaded portion of the bolt A decreases gradually and slightly in diameter from the outer end inward toward the head, and the nut B, which is split lengthwise on one side, is made conical, and is fitted to a countersunk washer C, or to countersunk holes in the fish plates, as represented in Fig. 1. The nut, when screwed down on the washer or fish plate, is contracted by the engagement of the two conical surfaces, and is thus made to bind the bolt so that it cannot become loosened accidentally by jarring or concussion. The conical nut and countersunk washer may be used advantageously in connection with ordinary bolts.—*Scientific American.*

Fig. 2



WHITMARSH'S NUT LOCK.

VENTILATING SEWERS.

The Board of Health of San Francisco have begun again to bore holes in the covers of sewer openings. While we do not profess to know all there is involved in the practice, we may cite the testimony against the practice of ventilating sewers. Mr. Henry E. Knapp, a civil engineer of New York City, read a paper recently before the Polytechnic Branch of the American Institute, in which he attacked the theory of ventilating sewers and drains. He said that the conclusion seemed almost unanimous among engineers that the poisonous and mephitic vapors should be allowed to escape into the atmosphere so that the sewers should be purified, thus to contaminate the atmosphere and transpose the pure air into the sewers where it is not needed, and from the sewers bring the poisonous gases where they will act detrimentally to animal life. The prevalence of this theory, which Mr. Knapp declared to be an egregious error, he attributed to the writings of Robert Rawlingson, K.C.B., a personal friend of the Prince of Wales, who, after the illness of the latter by typhoid fever, devoted much attention to the subject, and spread his views by means of the press.

The first objection Mr. Knapp urged against the theory was that the liberated gases are heavier than atmospheric air, and if liberated from the sewers would hug the surface of the earth, so that invigorating air could not be had inside the city. It would be as sensible to ventilate graves. The sewers, like corpses, ought to be buried, mainly because the earth is the best absorbent of the products of the decay of animal and vegetable substances.

The proper way to deal with sewers, he contended, was to give them plenty of water, which carries the matter contained in them to the sea, impedes decomposition as long as the solid matter is sufficiently immersed, and is a powerful absorbent of sewer gases, especially the ammoniacal, which it takes up to the extent of about one-third its weight, or some four hundred times its own bulk. If this be done, and proper traps are constructed, no evil results will follow.

MORE SIGNIFICANT FACTS FOR THE AMERICANS.

Edge-tool manufacturers generally are well employed—in one or two instances they are exceedingly busy, chiefly for foreign and colonial markets. It is satisfactory to find that the American competition in this line is not exactly slackening, but suffering. In several Transatlantic markets the edge tools of Birmingham makers are displacing those of United States manufacture, and even in Australia and the Cape a strong reaction of feeling in favour of English-made tools is apparent. In Brazil, the River Plate, Venezula, Mexico, and other central American States, the orders for Birmingham-made hoes, axes, hook-knives, &c., are rapidly increasing, while the demand for American-made tools declines. This preference, we are glad to find, is not due only to the lower price of English-made tools, but to their superior quality. Even the famous American Collins axe is now produced here by a well-known maker of superior quality and appearance for about 20 per cent. less money. Of this fact we have had ocular demonstration within the last day or two, having examined samples from a newly-arrived consignment of American Collins' axes side by side with those of Birmingham make. The superiority of the English-made Collins axe is especially manifest in the eye through which the haft passes—the American-made eyes being for the most part very unequal and imperfect, while those of English make are as true and even almost as if gauged by machinery. Some admirable specimens of miners' picks, for the Cape, and hoes of every variety, for Cuba and divers markets of South America, are being produced to order by the same firm in thousands of dozens; but perhaps the most active markets just now for edge-tools are the tea-planting districts of Northern India.

Wood Pavements in London. — The asphaltum pavements, which were being extensively laid in London six years ago, have been mostly taken up in the business sections, and wood pavements substituted. The greater portion of the Strand is now laid in wood, and it is being laid at various points, of Cheapside, Fleet street, up toward the Bank of England. Some of the suburban streets are also paved with wood. A bed of asphaltum is at first laid, and allowed to harden, and on this the blocks are laid. They are of hard seasoned wood, and are first kyanized. After being laid, coal-tar is poured in all the crevices, and when opened for travel it presents a very solid and enduring appearance. It has been in use for a couple of years in the neighborhood of Charing Cross, and it is solid and perfect as when first laid. The asphaltum caused great injury to horses, as it became very slippery in wet weather, and for this reason was removed and abandoned.

THE OFFICE OF PERSPIRATION.

A writer on hygiene for the *Prairie Farmer* makes the following allusions: The amount of perspiration that exudes from the surface of the skin is greatly varied by circumstances. As for example, it is large when the body is surrounded by hot, dry air, even to the extent of five pounds in 24 hours, while in a cold and moist one the amount in the same time may be but one pound. The results of these conditions are often strongly felt by man and beast. We should naturally suppose that if we loose five pounds of water in 24 hours, we should need that large amount of water to supply the place of that which has passed away. And to some extent this is no doubt true. It may have been observed by all who labor that they feel the want of a large amount of drink. The sensation of thirst does not arise from dryness of the mouth or throat alone, but in part from dryness or need of moisture felt by all the tissues. They all employ the throat and mouth to make known their wants. Another fact is not to be forgotten, that the kidneys have duties so similar to to those of the skin, that they aid each other. On a cold, moist day the skin is disabled and cannot execute its usual amount of secretion. Moisture checks evaporation from the surface, and cold lessens the caliber of its pores. In this disability of the skin, the kidneys lend a helping hand in relieving the system of its impurities. And so if the air be hot and dry, the skin is well able to do extra duty and grant the kidneys a recess from their usual toil.

Another fact is worth a passing notice, namely, that the dryness of the skin retains the heat generated within the system and so creates a fever. Relieve the skin, help it to do duty by warm baths or in some other way, and the fever disappears. No moisture came upon the surface and so no evaporation and no cooling of the system could occur. On this fact is based the habit of washing the surface two or more times a day, because this process induces evaporation, cools the skin, opens the pores and lets off the heat retained.

In health, perspiration is graduated by the temperature of the air and amount of exercise. On reducing our temperature in hot seasons of the year, not only our health and comfort but our life depends. The ordinary heat of the human body is 98 ° Fahr. If the air surrounding us is higher, we suffer more or less. Heat disease begins to manifest its power, and the great remedy is the free application of cold water to reduce the temperature of the body and induce free perspiration. Thus it seems perspiration contributes largely to our health and comfort. But to reap its greatest good, we should daily wash the surface and so prevent the absorption of what is waste and poison. Excessive bathing, as practiced by some boys, may be harmful. All that health and comfort can require is simply washing away the excretion deposited on the skin.

PATENTEES REWARDED.

The following, compiled from the *Tribune*, indicates the manner in which Great Britain rewards her inventors:

Since 1860, England has paid 102,775*l.* to inventors for discoveries in connection with ordnance and small arms. Mr. Henry got 5,600*l.* for breech-loading rifles and improvements in fire-arms; Wr. Westley Richards, 2,375*l.* for his breech-loading carbine; Mr. Snider, Mr. Wilson and Colonel Roden, 16,000*l.* for their plan for converting muzzle-loaders into breech-loaders; Colonel Snider got another sum of 5,000*l.* for the Snider rifle, and Mr. Lancaster 4,000*l.* for his plan of rifling guns and small arms. In artillery, Major Palliser got 15,000*l.* for his chilled projectile, 7,500*l.* for his plan for converting cast iron guns, and 1,500*l.* for improvements in artillery; Captain Moncrieff got 10,000*l.* for his method of mounting guns, with 1,000*l.* a year and 5,000*l.* when his engagement ended in 1875; Mr. Hale got 8,000*l.* for rockets; Mr. Frazer, 5,000*l.* for construction of guns; Captain Scott, 2,000*l.* for improvements in gun carriages, and 8,000*l.* for other gunnery inventions, and Commodore Harvey, 16,000*l.* for torpedoes, during the Crimean War, Major General Boxer, R.A., got 5,000*l.* for his improvements in shells and rockets, besides which he holds a patent, in his own right, for the Elie-Boxer Cartridge; Mr. Elie being merely the manufacturer of them.

Protecting Iron from Rust.—Mr. Bower's process of protecting iron from rust by coating it with a film of magnetic oxide has been tried at Dudley, in England, and has proved to be of so satisfactory a character that there is reason to believe that henceforth iron structures may be regarded as practically indestructible.

HORSES WITH AND WITHOUT SHOES.

The European papers are discussing the question of shoes or no shoes for horses, with the argument apparently in favor of those who advocate barefeet The fact is cited that wild horses, necessarily unshod, always have fine feet, as also do the horses of most savage and barbarous peoples, even in rocky and mountainous countries. Against the assertion that the hard, macadamized, and paved roads of cities and towns demand a metallic shoe, is opposed the fact that in Porto Rico, at least up to 1840, no shoes whatever were used, yet the streets are paved and macadamized. The races of St. John even, where horses go a mile in less than 4 minutes, are run on the stone paved streets of the town of San Juan; and a writer in the *Live Stock Journal* (Eng.), who spent many years in that island, says that he almost never saw a sore-footed horse there. But the celebrated veterinarian, Mr. Fleming, comes out strongly in the *Veterinary Journal* against barefeet, claiming that their moist climate and hard roads demand a metallic protection to the hoof, as proved by experience. At any rate the new-old idea is attracting attention, and some horse owners have adopted it in practice. After removing the shoes, the horse is driven only a short distance daily, on a hard road, increasing gradually to from four to six miles in the course of a week. Water is not avoided, but grease is, as then nature is imitated the closest. Until the nail-holes have disappeared, *i. e.*, grown out, the hoof will look rough, and crack off more easily than afterwards. The results of the trials reported seem favorable to the shoeless practice. At first the hoof chips off badly, but soon becomes hard, and the horse seems to like it as much as the urchin likes his bare-footedness. But the experience of generations of shod horses, and the facts and arguments in favor of no shoes, suggest a middle ground, viz.: for paved or stony streets and roads, a metallic shoe; and no shoes for smooth, even hard roads, for country roads free from stones, and for field work, especially on prairie and other farms where there are no stones, or very few. We are not familiar with any instance in America where the use of horses without shoes has been thoroughly tried, but considering the great saving and possible benefits that might ensue, we suggest that the question is worthy of careful consideration, as it is certain that at no time is the horse's foot in so healthy a condition as when unshod. A near approach to nature, which allows of the foot resting squarely on the ground, yet at the same time protects the hoof from injury, is the Charlier system of shoeing which now finds considerable favor in Europe. The method is fully described in the excellent work on "Horse-shoeing," by Mr. Fleming, (1) who says: "Leave the hoop in a natural condition, so far as frog, sole, and wall are concerned, and imbed a narrow rim of iron, no thicker than the wall, around the lower circumference of the foot—that exposed to wear—like the heel of a man's boot, and we obtain an idea of the method."

The crust or wall is beveled off with the rasp, and by means of a knife with a movable guide, a groove is made to receive the shoe, as illustrated in Fig. 1. The groove is a little shallower than the thickness of the sole, and somewhat narrower than the thickness of the wall, "not extending beyond the white line separating the sole from the wall." The shoe is a narrow but deep band of iron, narrower at top than at the bottom, and so forged that its front surface follows the slope of the hoof, as seen in Fig. 3. Its upper inner edge is rounded by the file, and a little of the horn is removed from the angle of the groove in the hoof, which prevents undue pressure of the shoe against the soft horn at that place. In strong hoofs, the shoe is almost buried in the groove; but with flat soles and low heels, it is not safe to imbed it so deeply. Four to six light nails are used; with light driving horses four are sufficient, placed wide apart at the toe, and close to the heel, as in Fig. 4. Fig. 2 represents the shoe. It cannot be used on all feet, and to make the groove and shoe fit well requires some care; but when once understood by the farrier, the shoeing is said to be very simple. The advantages are: leaving the foot in its natural condition as to frog and sole, "the small number and size of nails required, lightness of the shoe, and security to the horse in progression," as it places the foot fairly upon the ground. It is used on horses at all kinds of work, and it is said that the combination of horn and metal stand an astonishing amount of wear for so light a rim of iron. These shoes are usually applied to only the forefeet, as the hindfeet are thought to be not so well adapted to them.

(1) "Practical Horse-shoeing," by G. Fleming. Published by Orange Judd Company. Price 75 cts., post-paid.

One hundred and eleven thousand nine hundred and fifty-five persons visited the Paris Exhibition on the 15th of August, one of the chief holidays of the year.

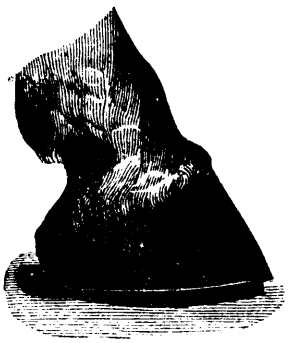


Fig. 1.—HOOF FITTED FOR CHARLIER SHOE.

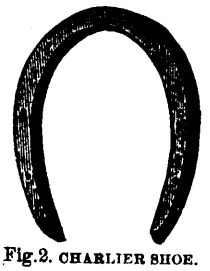


Fig. 2. CHARLIER SHOE.

Fig. 3.—THE SHOE IN PLACE.

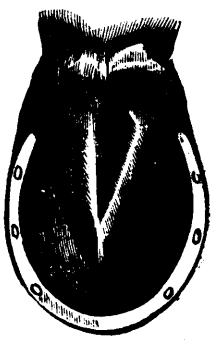


Fig. 4.—MANNER OF NAILING.

The Population of the World.—The latest edition of Behm and Wagner's *Bevolkerungder Erde* gives the present population of the earth at 1,439,000,000 as compared with 1,424,000,000 as given in the previous issue. These figures are based upon the most recent censuses taken in various countries. The population is divided as follows. Europe, 312,398,480; Asia, 831,000,000; Africa, 205,219,500; Australia and Polynesia, 4,411,300; America, 86,116,000.

Dangers that Beset Submarine Cables.—Every one who has at all studied oceanic telegraphy perfectly, understands the dangers to which the shore ends of the communicating wires are exposed from the action of currents, the anchors of ships, &c. But the general idea prevailed that once the cable was laid in the gloomy depths of the ocean it was in safety. Such, however, is not the case, for the inhabitants of those regions seem to resent the intrusion. In many cases, owing to the inequalities of the bottom of the sea, the wires cannot rest wholly on the bed, but in some places hang in festoons. Then they are liable to accidents from the larger denizens of the sea, among which we may particularly mention the sun-fish (*Orthagoriscus*). That peculiar but little known animal is nearly circular, of a brilliant silvery white, and at night emits a powerful phosphorescent light, whence its name probably arose. When swimming it turns round like a wheel, and moves with great rapidity. It grows to an enormous size, often attaining four feet in diameter, and some of them are said even to reach eight feet. Specimens have been caught weighing 500 pounds. It is found in all seas from the Arctic to the Antarctic Circle. Where the tail is in ordinary fishes, this curious creature has a sort of flattening in its circular shape from which bony spines project. Not long since, an interruption occurred in a cable, and on examination it was found that it had been penetrated by one of the caudal spines of the sun-fish. Even when the wire lies quiet at the bottom it is not safe; for a species of marine weevil attacks the gutta-percha and gradually destroys the conductivity. But the most curious instance of damage inflicted on a cable is that which lately befell the one from Portugal to Brazil. A fault having been found, the tests were applied and the precise spot indicated. The wire was fished up and was discovered to be broken. In one of the ends was entangled a large whale. The monster was covered with parasites, and, in attempting to free itself from its tormentors, had broken the cable, and then managed so to twist itself in the coils of one end that it was held fast a prisoner, and, not being able to rise to the surface for air, was drowned.

FIRE-PROOF LADDERS.

When recently at Kingston, we noticed, particularly, several iron ladders on the roofs of houses and stores, and which led also from the eaves to the ground. These ladders are manufactured by Geo. A. Rumrill, of Kingston, and of course are of wrought iron.

It is seldom we notice patents in the columns of this Magazine, and never, unless the patent is really of a useful and practical kind; but in this instance we deem it a duty to the public to strongly recommend the adoption of this ladder, not only from the facilities it affords for the escape of the inmates of a house on fire, but from its safety in other ways, and its great durability. Iron attachments can be thrown out from windows, and fastened to it, in the form of light platforms, thus affording an easy means of reaching such a ladder from a window on every story of a house. We particularly call the attention of the public to this safety ladder and recommend its attachment to every hotel and public building.

THE WILD RABBIT IN AUSTRALIA.

Something like half a century ago the wild rabbit was introduced from England to Southern Australia, and now we learn, but certainly not with surprise, that the colonial farmers and graziers are even more anxious to see the "scut" of the last of these rodents disappear from their fields than they were to welcome their introduction for acclimatization. Every one who has any acquaintance with rural matters must be aware how very difficult it is even to keep rabbits within bounds by trapping, and the extraordinary rapidity with which they multiply immediately the keeper's trapping operations are relaxed, in order to give more attention to pheasant rearing and other kindred duties, is marvellous. It is a perennial trouble to most land owners in this country, and has probably been the cause of more dissensions between landlord and tenant then anything else. Rabbit shooting is a very enjoyable and exciting sport, but when a man knows that he is losing at the rate of 300*l.* a year by these prolific creatures, it is somewhat conducive to uncomfortable reflection, and he is naturally anxious to be rid of them. Rabbits have been allowed to increase to such an extent in South Australia, that it would appear that one district of 150 miles long by 30 miles wide is infested to such an extent that the matter has for some time been attracting the attention of the legislature. All kinds of means have been adopted for their destruction, one of which is the blowing of sulphur down the burrows by means of a machine constructed for the purpose; but this has not been found to answer, as the sulphur, being lighter than the air, returned again to the blowers. At the second reading of a rabbit bill, which was passed in June last, it was stated that one farmer had lost 1,000*l.* from rabbits during the last three years. The principle on which the bill is framed is that the proprietor of every estate that harbors the rabbits shall be compelled, as far as possible, to eradicate them. This principle is to be enforced in the case of the large as well as of the small landholder, and the Government are not to be behind hand in their duty, but undertake to co-operate in the general crusade by destroying the rabbits which are found in such swarms upon Crown Lands.

As shooting and trapping have been found to be ineffectual, poisoned grain is in some instances laid for them during the winter months, when other food is short. Hundreds are destroyed in a single night in this way, but great caution has to be used in the use of the poison. The grain is subjected to treatment with strychnine, and it is stated that experiments have proved that the flesh of rabbit destroyed by strychnine is not affected by the poison. We are not prepared to offer any testimony on this point, but we think we should now scarcely sit down to Australian tinned rabbit with any very great gusto.

At a great shoe manufactory in Lynn, Mass., recently, a pair of kid side-laced woman's boots was made from the stock in just eleven minutes, in sight of visitors.

Out of 294,382 men admitted into the French army in 1877, only 4,992 were unable to read and write. This is regarded as a very strong proof of the stride education has made in that country.

THE SERPENTS' CAVE, MANITOBA.

A STRANGE FACT IN NATURAL HISTORY.

About thirty miles north-west of Winnipeg there exists a large upheaval of lime-stone. This strange mountain of rock stands on the level and stoneless prairie, and is about eighty feet high and nearly a mile in diameter; the rock is level on top and covered with gravelly earth. It is on this strange elevation that the penitentiary has been erected. But the natural curiosity for which this rock is celebrated is a subterranean recess extending towards the interior. To this cave all the snakes from the immense extent of encircling prairie congregate to spend the winter months. How so many thousand reptiles of apparently all ages and sizes know where to find the only available shelter from the extreme cold of a northern winter, is not easy to discover, but it is certain that on the approach of cold weather all the snakes within many miles of Serpents' Cave repair to their winter home, where they spend the time in retirement, to emerge in the spring from their seclusion and scatter over the surrounding prairie.

During the mild weather of last winter, some of the convicts of the penitentiary were set to work to build a wall around the entrance to the cave. When the time arrived for the snakes to seek their summer haunts they found their progress impeded, and soon the strange gathering was increased by fresh arrivals from the interior, until many thousands of snakes were racing and wriggling around the entrance, vainly seeking an opening in the wall. Heads with small eyes and red tongues were projected in hundreds from every crevice in the rock, and a most unearthly hissing was kept up.

CHEMISTRY, PHYSICS AND TECHNOLOGY.

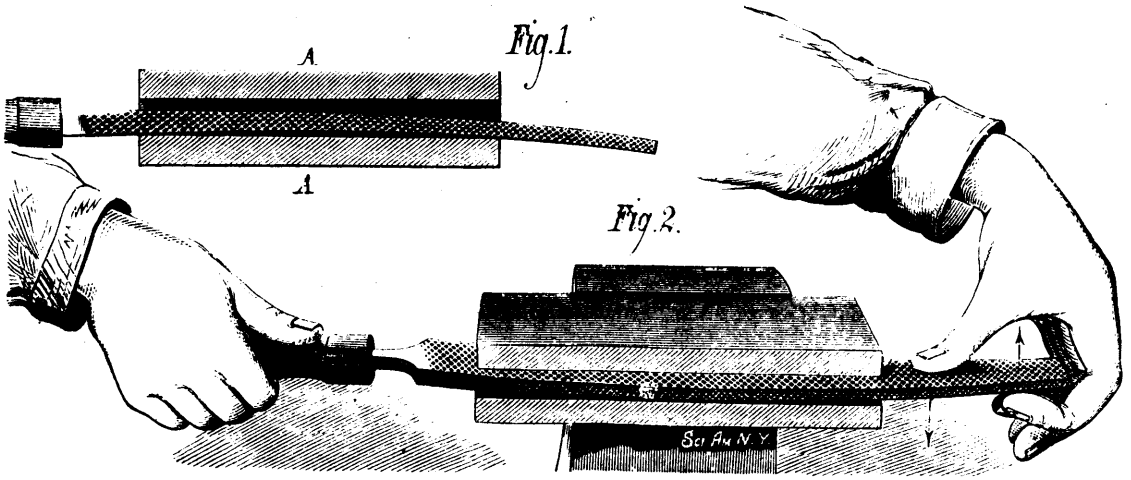
Utilizing Solar Heat in Algeria.— M. Mouchot, the inventor of a successful form of sun-engine, has presented to the Paris Academy an account of his experiments with it in various parts of Algeria. In that country he has demonstrated that solar heat can be utilized for cooking food, baking bread, and distilling alcohol, besides furnishing the motive power for machinery.

Niello.—According to the *Berliner Tagblatt*, the firm of F. Zacher & Co., in Berlin, have discovered the method of manufacturing the Russian tula or Niello silver, the real composition of which has been guarded hitherto as a secret, and have made it in large quantities. It consists of nine parts silver, one part copper, one part lead, and one part bismuth, which are melted together and saturated with sulphur. This mixture produces a gorgeous blue which has often been erroneously spoken of as steel blue.

Making Gems.—A general idea of the process by which MM. Feil and Fremy have succeeded in making real gems has been made public in Paris. The materials used are aluminate of lead and silica. The alumina is crystallized into white corundum, by exposing these substances to a red heat for twenty days. To make rubies, a little bichromate of potash is added; to make sapphires, a little oxide of cobalt. The quality and beauty of natural gems are said to be reproduced in the precious stones thus obtained.

Improvement in Eye-Glasses.—An attachment to the ordinary spring eye-glasses, by which they can at will be transformed into spectacles, and as quickly relieved from the attachment, is among the most recent and useful devices that have been brought forward. It was Dr. Cid, the well-known Paris surgeon, who found that the spring eye-glasses injuriously compressed the arteries by which the nose is nourished, making that organ long and thin. The effect of this improved mechanism is to remove all pressure from the spring, and at the same time to hold the glasses firmly in position, and thus is avoided the irritation caused by a continued use of ordinary spring glasses, as in reading, writing, &c. The advantage of being able thus to convert at once the same lenses into eye-glasses or spectacles is obvious.

Large Belts.—We read that, at the Paris Exposition, some fine main driving belts, made after Sampson's patent, are shown by Mr. Edwards, of Manchester, England. There is one double belt, 207 feet long, 63 inches wide, which weighs 2,962 lbs., and is made to transmit 600 indicated horse-power. Another is 184 feet long, 53 inches wide, whilst a third is 163 feet long, and 63 inches wide. These two latter weigh together 4,378 lbs., are without cross-joints from end to end, and are intended for a large cotton mill, to drive direct a flywheel 30 feet in diameter, and 10 feet 3 inches on the face. The combined horse-power they are made to transmit is 1,000.



A WRINKLE IN FILING.

(Continued from page 330.)

There does not seem to be anything to urge against the principle of these, and they work well, but the plow Fig. 18 was preferred. In each case the long backwardly extending lever raises the forward end, so that the plows come out of the ground as the team reaches the end of the land ready for turning.

The Gilpin sulky plow made by Deere & Co., of Mouline, Illinois, was an object of much attention.

Besides the plows for executing the usual work, at this *concours* there were ridging, subsoil, trenching, and mole plows, implements for digging potatoes, pulling up beets; harrows, rollers, clod-crushers, potato-planters, grain and seed drills.

The ridging plows, *buttoirs*, were stocked with wooden or iron beams, and are much used in the potato and beet culture; the rows of these are so close that the *buttoir* will ridge up against the plants on both sides going once in a row. These plows weigh 120 lbs. and cost 85 francs.

The subsoil plows are those which work behind an ordinary plow to break up the hard pan, but not to elevate it above the surface mould. Quite a number were exhibited, of which Fig. 22 is fairly representative. The price is 45 francs.

The trenching or ditching plows exhibited at Petit-Bourg were of two kinds. One had a deep cutting share, a sloping breast, and a curved board which directed the excavated soil on to the land at the side of the ditch. This is shown in Fig. 23.

The other one is adapted for cutting drains in natural prairies. The sloping cutter and curved share cut the sod, which is lifted and thrown equally on each side of the ditch. The plow has an ordinary *avant-train*, not shown in the figure.

The *sous-sol*, or underground plow, known to us as the mole plow, from the mode and effect of its work, is used as with us as a mode of effecting drainage of soils where water stands too persistently.

The potato diggers were of single and double effect. One has but one set of lifting fingers, the other has two grids. The first runs beneath the hills of potatoes and lifts them, the soil falling between the bars of the grids, leaving the potatoes on the surface. The second grid repeats and completes the operation.

A beet puller, such as shown in Fig. 28, will deplant two and a half acres of beet roots per day, and is converted into a potato-digger, by detaching the fork, 1, Fig. 29, and attaching the grid, 2. The point of excellence in an instrument of this kind is that it shall not cut the beet, and that it shall raise it and turn it over and not wrench it out in such a manner as to break the tap root and cause it to bleed. The price of the machine, made in three sizes, is from 170 to 200 francs. — Abridged from the *Scientific American*.

A NEW patent law has just been passed by the Spanish Senate by which the cost of a patent in Spain and her colonies is much reduced. The term of a patent is extended to twenty years on payment of a small annual tax.

GRASPING AND CARRYING THE FILE.

In their new work entitled *Hints on Filing*, the Nicholson File Company, of Providence, Rhode Island, make the following points:

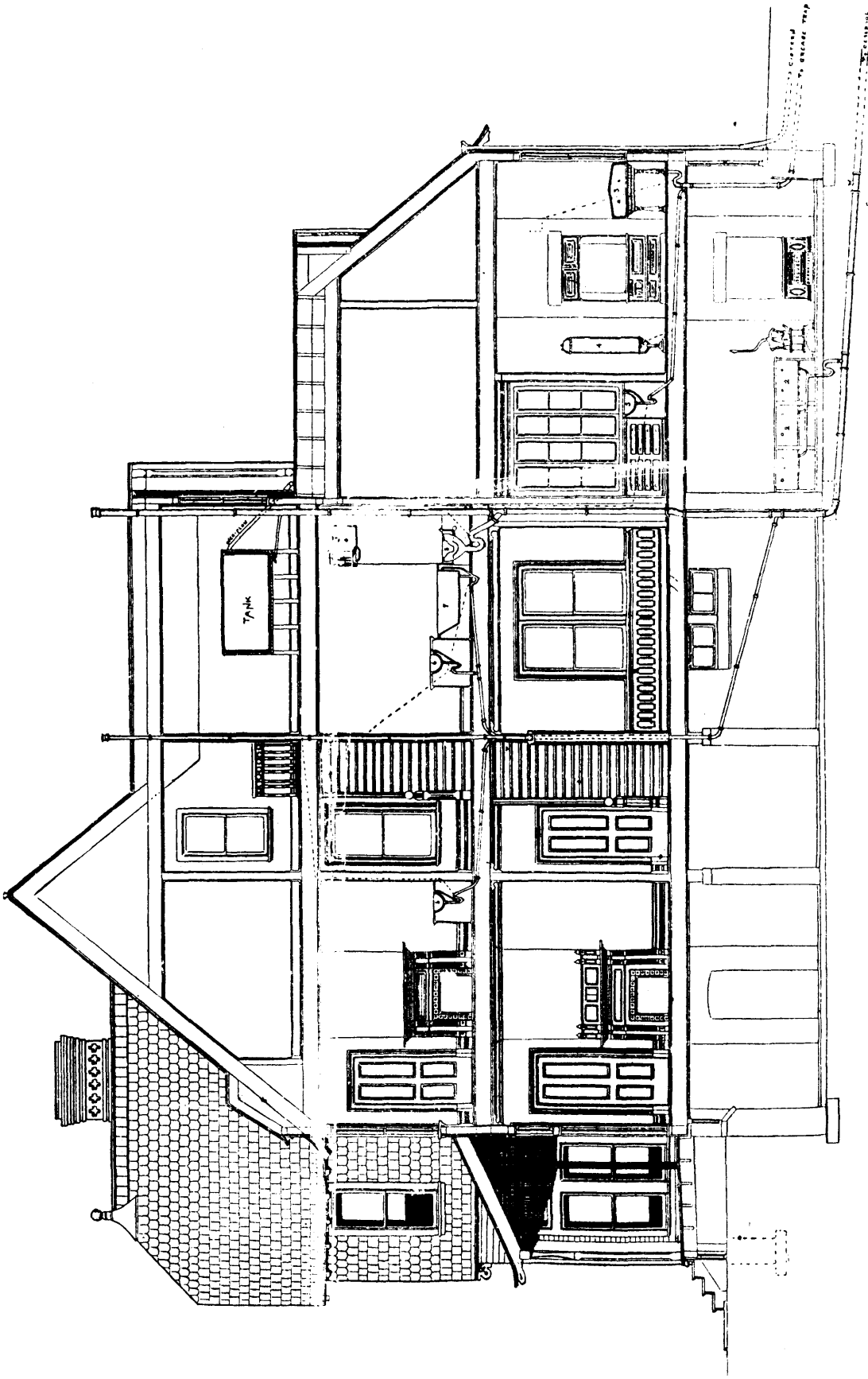
In using the larger files, intended to be operated by both hands, the handle should be grasped in such a manner that its end will fit into, and bring up against, the fleshy part of the palm, below the joint of the little finger, with the thumb lying along the top of the handle, in the direction of its length; the ends of the fingers pointing upward, or nearly in the direction of the operator's face.

The point of the file should be grasped by the thumb and first two fingers, the hand being so held as to bring the thumb, as its ball presses upon the top of the file, in a line with the handle, when heavy strokes are required. When a light stroke is wanted and the pressure demanded becomes less, the thumb and fingers may change their direction, until the thumb lies at a right angle, or nearly so, with the length of the file; the positions changing more or less, as may be needed to increase the downward pressure.

In holding the file with one hand, as is often necessary in filing light work, pins, &c., the handle should be grasped as already described, with the exception that the hand should be turned a quarter turn, bringing the forefinger on top, and lying along the handle nearly in the direction of its length. In this position the freest action of the hand and wrist may be had upon light work. Amateurs will find that by following these directions, the movements of the file will be simplified, and made somewhat easier than if grasped at random and without consideration.

The most natural movement of the hands and arms in filing is to carry the file in circular lines, the several joints of the limbs being the centers of motion; this movement of a convex file would apparently give a concavity to the work; the real tendency, however, especially on narrow work, is the reverse (owing to the work acting as a fulcrum, over which the file moves with more or less of a rocking motion,) giving an actual convexity to its surface, except when in the hands of a skilful operator. The real aim, therefore, should be to cause the file to depart only so much from a true, right line as will be necessary to feel that each inch of its stroke is brought into exact contact with the desired portion of the work.

The movements here referred to have reference to those in which both hands are used upon flat work, requiring nicety and trueness of finish, and the difficulties to be overcome in producing even a comparatively true flat surface with a file require much practice on the part of the operator. In point of economy, the pressure on the file should be relieved during the back stroke; this will be apparent to any one who will examine the formation of the points of the teeth, when it will be seen that the file can only cut during ordinary or advancing stroke, and that equal pressing during the back stroke must be very damaging to the points of the teeth.



DESIGN FOR A VILLA.

From the *American Architect and Building News.*

FROM THE *AMERICAN ARCHITECT AND BUILDING NEWS.*

SPECIFICATION OF PLUMBING WORK AND MATERIAL.

As shown on plans, furnish and set one 2½ [*state the kind*] double acting lift and force pump to draw water from well and cistern. Connect pump with these by 1¼ lead pipe weighing 3 lbs. per foot, said pipe to be run four feet below the surface of the ground, outside of house and down to a point one foot from bottom of well and cistern, and to have 1¼-inch round way stop cock placed on each pipe so that water can be pumped from either by closing the stop cock on the line not needed. Carry a branch of ¾ lead pipe, weighing 2 lbs. 3 ounces per foot, from a point just below the retaining valve of pump to cold water cock over kitchen sink. Connect to pump and continue up to and over top of tank in attic a 1¼-inch lead pipe, to weigh 3 lbs. per foot.

As a tell-tale or alarm pipe, carry down from tank, four inches from top of same, a line of ½-in. lead pipe, to weigh ¾ lbs. per foot, to wash-tubs in basement. (If roof water runs into tank, this tell-tale pipe may be omitted.)

(*In that case, say, connect gutter to a point 4 inches from top of tank with 5-inch lead pipe, to weigh 10 lbs. per foot, and to run to within 6 inches of bottom of tank. Put a proper brass wire strainer over end of said pipe at gutter.*)

OVERFLOW. Connect a 6-inch lead pipe, to weigh 12 lbs. per foot, a few inches (say 6) from top of tank, and run to outside of building, and connect to leader or run into some gutter or roof lower than where the tank stands. At outlet end of this pipe place a brass flap valve to keep out cold.

TANK. Line a tank (tank to be furnished by owner) with 5 pound sheet lead; wipe the seams and dot the sides, leaving the lead smooth all around; dots to be 2½ inches in diameter and 2 feet from centres; (tinned copper nails only to be used.) Connect tank with soil pipe by a 1¼-inch lead pipe, weighing 3 lbs. 11 oz per foot, placing on said pipe, as near tank as practicable, a 1¼ open way valve [*state kind preferred*] for the purpose of emptying tank.

COLD SUPPLY. Run a ¾-inch lead pipe, weighing 3 lbs. per foot, down from tank to boiler in kitchen. From this pipe take out the necessary branches to supply the different fixtures with cold water, except sink in kitchen; place a ¾-inch rough lever handle stop cock on said pipe under tank, to shut off water from house at pleasure.

WASTE AND SOIL PIPES. Connect with 6-inch vitrified drain pipe just outside cellar wall a 6-inch cast iron pipe, and continue same with proper ascent to the point where the ¼ bend receives the main soil pipe, which is to be 5 inches and continued up, full size, through and three feet above roof, and properly secured, and to be surmounted with a hood or ventilating cap.

As shown on plan, carry from main soil-pipe a 3-inch branch up to and through the roof, secured to same and surmounted with hood as hereinbefore described; this pipe to receive wastes from basins and baths.

RANGE. Furnish and set complete one range with waterback [*here state the kind*].

BOILER. Furnish and set one 40-gallon copper boiler, Brooklyn pressure, dome head, and set the same on a Lockwood pattern boiler stand, supplied with water through ¾-inch AA lead pipe, weighing 3½ lbs. per foot, to be connected to range with same kind of pipe; said boiler to have the necessary ¾-inch sediment pipe and cock said sediment pipe to be connected into waste from pantry sink, so as to empty and cleanse boiler at pleasure; also place ¾-inch stop cock on supply pipe.

WASH TRAYS. Furnish and fit up the plumbing of three wash trays as per plans, and supply each with hot and cold water through ⅝ AA lead pipe, to weigh 2¾ lbs. per foot; and two ⅝-inch flange and thimble bibb cocks [*state here the kind*], 1½ inch brass plugs and chains, and the necessary length of 2-inch lead waste pipe, to be trapped with a 2-inch [*state kind, if any special one*] 1½ S lead trap and trap screw—said 2-inch trap to be connected to main drain by 3-inch lead waste pipe as shown.

KICHEN SINK. Furnish and fit up one cast-iron sink, size indicated on plan, and to have cast-iron back and legs [*if any special kind of sink, state it here*], to be supplied with hot and cold water through ⅝-inch AA lead pipe, to weigh 2½ lbs. per foot; and two ⅝-inch flange and thimble bibb cocks [*state kind of bibbs here*], one to have hose screw for filter; to waste through 1½-inch lead trap and trap screw [*if any special kind of trap, state it*]; to be connected into 2-inch cast-iron pipe at a point just below the ceiling in cellar with a 2-inch brass ferrule, and from that point to the grease-trap outside of house it is to be 3-inch cast-iron.

PANTRY SINK. As marked on plans, furnish and fit up one copper butler's sink (size 20 x 14), and set the same in a best Italian marble slab, with counter-sunk face, molded edges, and base 12 inches high, supplied with hot and cold water through ½-inch AA lead pipe, to weigh 2 lbs. per foot, and two upright pantry cocks [*here state kind of pantry cocks and kind of plating*], and to waste through 1½-inch waste-pipe, to weigh 3½ lbs. per foot, and be trapped with a 1½-inch lead trap and trap screw [*if any special trap is preferred, state it here*], connected with the 2-inch cast-iron pipe, with 2-inch brass ferrule, and branch into 3-inch pipe under kitchen sink.

BATH. As on plans, furnish and fit up one 14-oz. stamped and guaranteed copper bath [*if any special make preferred, state it*], and supply same with hot and cold water through ⅝-inch AA lead pipe, to weigh 2¾ lbs. per foot, and two ⅝ plated flange bibb cocks [*state kind of bibbs and kind of plating* *], to be emptied through 1½-inch waste, with plated plug, with chain and the necessary 1½-inch 3 lb. lead waste-pipe, 1½-inch heavy lead trap and trap screw, and connected into Y branch of 3-inch iron pipe by 2-inch brass ferrule and 2-inch cast-iron pipe.

WASH BASINS. As per plans, furnish and fit up 14-inch marble pattern, common overflow wash basins, each to be set in a best Italian marble slab, counter-sunk face, molded edges, back and sides ⅞-inch thick, 12 inches high, and two plated basin cocks [*state what kind and what kind of plating* *], plated plug, chain and chain stay, and be supplied with hot and cold water through ½-inch AA lead pipe, to weigh 2 lbs. per foot, and the necessary length of 1½-inch D waste-pipe, to weigh 3 lbs. per foot, 1½-inch lead trap and trap screw, [*if any special trap, say what kind*], and 2-inch brass ferrule to connect waste-pipe into Y branch of 2-inch iron pipe. There must be a line of 1½-inch lead pipe run from back of the two traps under basins, second floor, and continue up to a convenient point above, when they will be connected into the 3-inch cast-iron pipe, as indicated by dotted lines. There will also be a pipe run from back of trap of bath and water-closet on second story and connected into the 5-inch soil pipe two feet above these fixtures in same manner.

All lead connections with iron pipe to be by brass ferrules, which must be soldered to the lead waste-pipes, and be calked with oakum into the iron hub, and the joints run with molten lead. All the lead pipes must be secured to walls by hard metal tacks and screws, and not by hooks.

There must be safes placed under basins, bath and water-closet on second story and tank in attic, the size of spaces occupied, and to be turned up two inches all around, made of 3 lb. sheet lead; have a separate 1-inch lead waste-pipe with 1½-inch convex strainer to run to cellar direct from each safe, leaving the end open, and *not to be connected to anything in cellar.*

There must be a line of ¾-inch AA lead pipe run from boiler direct to bath-room for hot water, to weigh 3½ lbs. per foot, and to have stop and waste cock placed on it so as to shut off hot water from the upper part of the house when necessary. There must be a ½-inch AA lead pipe, to weigh 2 lbs. per foot, connected to the ¾-inch lead pipe in bath-room, and to run down to below boiler, and which must be connected to sediment pipe inside of sediment cock for the purpose of keeping up a continued circulation of hot water. *Care must be taken in putting in this, as well as the ¾ hot water line from top of boiler to bath-room, so as to insure a free circulation, and it can only be done by not allowing any depression to be made in the pipes after leaving the boiler—that is, they must be kept rising from the head of boiler to bath-room.*

Run a line of ½-inch AA lead pipe, to weigh 2 lbs. per foot, from the top of ¾-inch hot water supply in bath-room, up to and over top of tank in attic, leaving the end open for steam escape, and to prevent collapse of boiler.

WATER CLOSET. Furnish and fit up, as shown on plan, a water closet [*here state what kind of closet: if pat. valve closet, whose? if cistern closet, what make? if cistern is to be any special one, state whose ; if to be made by the plumber, give the size, weight of lead it is to be lined with—size, and weight of lead in the service box—size of cistern valve, and what kind of ball cock; if closet selected requires trap, say so*]; to have 4-inch heavy lead trap, to be connected to the Y branch of soil pipe by the necessary 5-inch 6 lb. lead waste-pipe and brass ferrule. (*If closet called for requires separate bowl, state French water-closet bowl for valve closet, and oval bowl with fan and screws, if cistern closet is used*), supply pipe to cistern to be ½-inch AA lead pipe, weighing 2 lbs. per foot; and ⅝ AA, weighing 2¾ lbs. to foot, if to supply a valve closet.

Chain for wash trays to be No. 2 Safety Brass Chain; for bath, No. 1 Plated Safety Chain; for basin, No. 0 Plated Safety Chain.

The contractor to plug up all openings in waste or iron vent pipes, and fill the same with water from highest point of said pipes. If any leak is shown, the defective joint to be made tight—in other words, to satisfactorily demonstrate the waste pipes are gas and water tight; this to be done before scratch coat is put on the walls.

Over-flow pipes from basins and bath to be branched into dip of traps of same. All soldered joints to be wiped joints, except at couplings of basin cocks, which may be cupped joints. Leave out all necessary Y branches for work, as marked on plans. Cast-iron pipes to have a coat of coal tar inside, and all work to be done in a workmanlike manner. Where this specification varies or conflicts with the drawings, the contractor to be governed by the specification.

* (*If basins are to be supplied with any special faucet, or emptied by any special appliance, state what kind is wanted*); *the same applies to bath tub.*

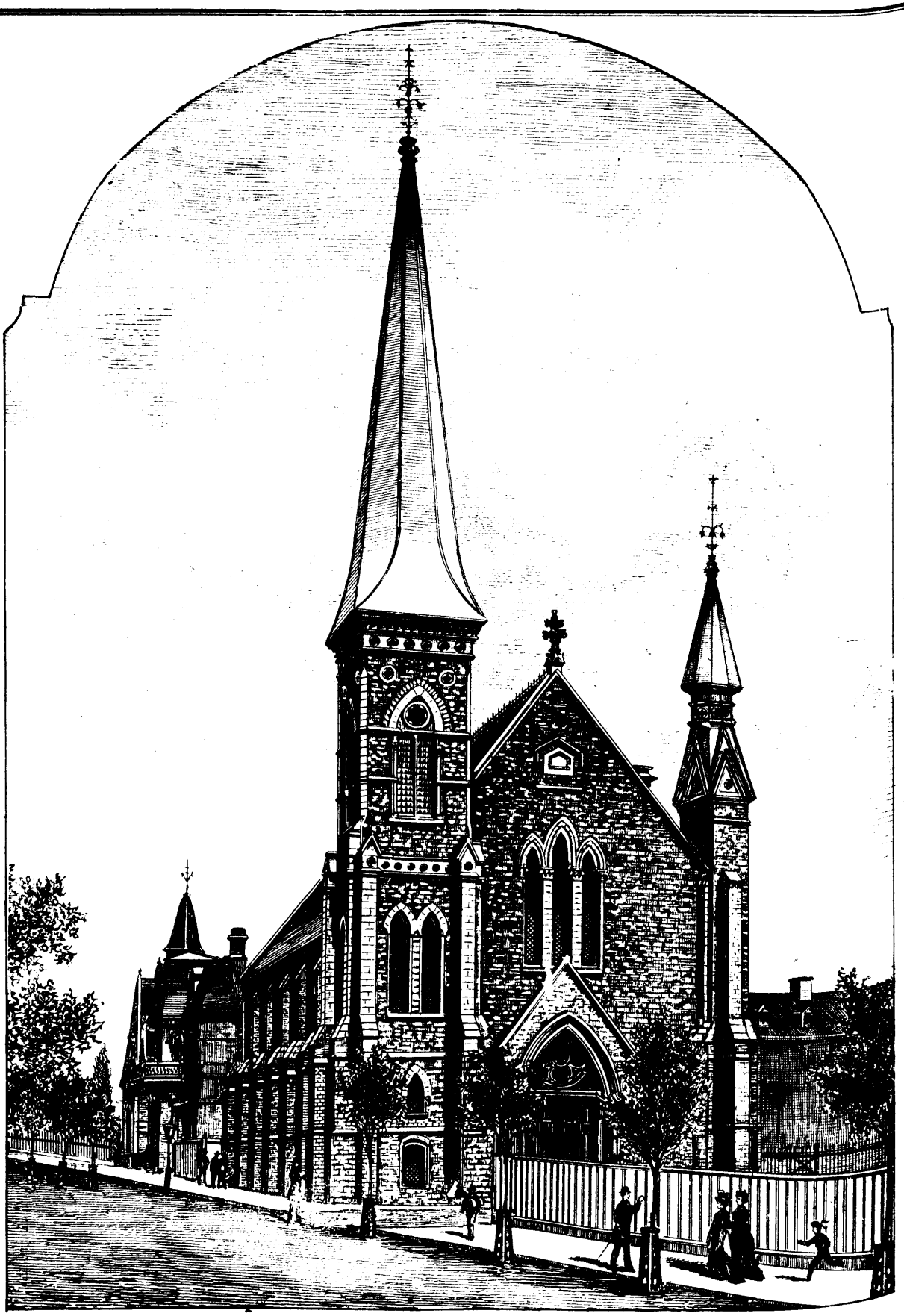
SUGGESTIONS. *When faucets are to be plated, state whether nickel or silver plated, and if "silver plated," whose silver plate is required. Know that there are so many new appliances in plumbing materials, it is absolutely necessary to state explicitly just what is wanted, otherwise the contractor is justified in using whatever he can buy for the least money.*

NOTES.

Plumber must never be allowed to place any water or waste pipe on an outside wall of a country house; on account of cold, they should be run in or on the surface of partitions.

In all cases, the waste pipe into which the trap empties must be of larger area than the trap and from the point of its junction (this refers to lead traps under fixtures).

The architect can judge from the character of trimmings and interior finish of the house how elaborate the fixtures should be, in order to be in keeping with the surroundings.



THE NEW BAPTIST TABERNACLE, OTTAWA.