Scientific American.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS.

One copy, one year..... $3 00
One copy, six months..... 1 50
CLUB RATES { Ten copies, one year, each $2 50..... 25 00
Over ten copies, same rate, each..... 2 50

VOL. XXIX., No. 15. [NEW SERIES.] *Twenty-eighth Year.*

NEW YORK, SATURDAY, OCTOBER 11, 1873.

Contents.

(Illustrated articles are marked with an asterisk.)

THE FINANCIAL CRISIS.

One of the incomprehensible financial tempests, which occasionally rage with more or less fierceness in the monetary world, has appeared among the brokers and banking institutions of this city; and although now, it may be hoped, it has nearly passed over, it has left a path marked with victims, in the shape of several of the most prominent houses in a state of either failure or suspension. Why such a violent commotion should have arisen at a period when the business and industries of the country are flourishing, when there is no reason for a dearth of funds in circulation, and to what cause it may be justly ascribed, are questions difficult to answer. It seems as if people suddenly concluded not to lend or expend money or accommodate each other on any terms. Not only on railroad but on every other species of bonds, was it almost impossible to obtain funds; even governments could not be sold until the Sub-Treasury opened its doors for their redemption; and the banking houses not only declined to advance to their customers, even upon the deposit of unusually large collaterals, but in some instances refused to pay out the amounts of open accounts other than by certified checks.

The savings banks, sharing in the general grab, called in all funds due to them, demanding immediate cash payment; while they themselves, taking advantage of the law, refused to meet the drafts of their depositors until the thirty or sixty day notice had expired. This stringency, or rather emptiness, of the money market (for currency was thus completely locked up) created a panic; and, as usual, frantic appeals to the Government for aid, by placing in circulation the reserve fund in the United States Treasury, were made. This, being illegal, was justly refused by the President, so that the financial men of the community, among whom the storm arose and to whom it has been almost entirely confined, are left, with such aid as the redemption of the United States bonds (now ceased) may afford them, to return as best they can to their normal though never quiescent condition.

It has been the general impression that the effects of the panic would be felt by few other than the dealers in money and its equivalent; but it is to be feared that, although mercantile and manufacturing houses have not partaken materially in the disaster thus far, the result of the tightness of the money market will be seriously detrimental to the fall trade and the export of grain and cotton.

DISCOVERY OF AN OLD BOOT AND SHOE SEWING MACHINE PATENT.

The discovery is announced of an old English patent, granted July 17, 1790, to Thomas Saint, for a "Machine for Sewing Boots, Shoes, etc.," which is alleged to contain substantially the same mechanism as that which forms the basis of existing American machines.

We have looked over the drawings and specification of this old patent, and find them rather defective; still it is possible that the machine could be made to work. It makes the loop stitch, contains an awl for punching the hole for the needle, apparently employs the eye-pointed needle, and has a horizontal feed. But if any body expects by the production of this contrivance in court to invalidate any of our existing patents for shoe machinery, we think they are destined to disappointment. The Saint machine, while it is interesting as an old curiosity, could not possibly be substituted for the effective devices employed in this country. The Saint invention bears about the same relation to modern sewing machines that the ancient revolving pistols do to the existing repeating fire arms. The first, indeed, exhibited the revolving principle, but practically were good for nothing. So of the early attempts at sewing machinery, including that of Saint; they may show the eye-pointed needle, the loop stitch, and a feed, but still are, practically, useless. The ideas of American inventors had to be adopted before sewing machines were made useful to the world.

HOW PIANOS ARE INJURED.

According to a prominent manufacturer, there are more pianos injured by improper tuning than by legitimate use and the consequent natural wear of the instruments. The frame of a good piano, fully strung and tuned, is made to resist a tension equal to about seven tuns. This severe strain relaxes as the strings recede from pitch, but is renewed when the piano is tuned; and it is frequently discovered, as a result of this repeated process, that the frame is bent or bellied; and at the hands of an ignorant tuner or one lacking good judgment, an instrument at this stage is soon injured beyond remedy. With reasonable use, a piano is expected to remain in good condition for seven years, and the best makers will so guarantee their instruments; but the incompetence and malpractice of certain so-called tuners sets the seal of destruction on thousands of instruments in from two to five years.

In tuning a piano, the correct method is to begin in the center of the instrument, on what is called middle C. Yet many tuners, when leaving middle C, instead of going down the scale and tuning the lower notes and heavier and longer strings first—thus immediately bringing the greatest tension to bear upon the frame, and forming, as it were, a solid foundation upon which to operate,—will go up the scale, beginning with the shorter and lighter wires and higher notes, leaving the bass strings until the last, with the invariable result that, when the tuning of the lower portion of the piano is completed, the upper octaves are found to be decidedly away from pitch. Every time a piano is tuned in this manner, it increases the liability of bending the frame and renders the instrument more difficult to tune and keep in tune. The apparent physical effect may be so infinitesimal as to be impossible of measurement, yet a change in the out line of the frame equal to but the thickness of a sheet of tissue paper will produce a difference of nearly a half tone in the sound of any given note. If the lighter strings are tuned first, they relax when the greater strain is brought to bear in keeping the heavier wires up to pitch, with the effect referred to above.

Many tuners do not carefully note the condition of the frame of a piano, and adapt their treatment to the circumstances of the case, with full knowledge that a bent, weakened, or very old frame will not stand the extreme tension or sustain the strings at the high pitch which can be put upon and borne by a frame and wires which have never been injured through ignorance or neglect, and hear no special marks of time or use. There are very few pianos, and those of the best description, that will stand at concert pitch. The piano manufacturers advise purchasers to have their instruments tuned by representatives of the respective factories from which the pianos are sent, as they are aware of the terrible ordeal through which the instruments must pass at the hands of tuners of every degree of intelligence and ability. It is but a fair presumption that the maker of an instrument ought to know how to tune it properly and without injury to its most important parts; yet there are, comparatively, very few persons who profit by the well meant advice, an impression prevailing in some minds that the suggestion is not entirely disinterested, as the makers charge $2 for tuning, while professional tuners and the music stores ask but $1.50, and some of the Bohemians but $1. But were the matter fully and generally understood by the owners of pianos, they would consider it greatly to their interest, even in the light of an investment, to have their instruments tuned by parties in whose hands there is the least possibility of accident or injury.

SAND AND MUD BATHS.

Baths of sand or mud have had a reputation, more or less deserved, for centuries; and at the present day are employed to a considerable extent in different parts of the world. By the former, the inhabitants of the eastern shores of the Mediterranean expect to cure their rheumatic and scrofulous troubles. The process of taking this "cure" is very simple; the patient buries himself almost completely in the hot dry sand, and remains thus, some time after a profuse perspiration has broken out; the perspiration is soon followed by a rash upon the skin, which subsides in a few days.

The little benefit arising from this cure is due in the main to the sweating, which frees the blood from impurities through the pores of the skin, which latter is locally irritated and excited to greater action by direct contact of the sand.

But the latter, the mud baths, so popular on the continent of Europe, among which those of Salzburg, Franzenbad, and Marienbad in Germany have the highest reputation, are really more beneficial. They are prepared in the following manner: Bog mud is thoroughly dried and sifted, then saturated with mineral water, the mixture being made so soft that the body can sink into it; the temperature is raised to about 112° Fahr., and the bath is ready. The baths may be either partial or complete, according to the part of the body to be treated; but in either case, the duration of a single bath is from thirty to fifty minutes; after which the body is cleansed by a warm water *douche*. They are taken daily, early in the morning, until relief is obtained. The diseases to which they are particularly suitable are some kinds of paralysis, muscular rheumatism, and the dull nervous pains which follow severe bruises and which are called weather pains. In former times, their efficacy was thought to depend upon the large amount of iron and salts contained in them, and which were absorbed into the blood through the pores of the skin. It was even supposed that there existed a magnetic current in the mud, which acted as a strong nervous tonic: but at present, the general belief is that the action is simply that of a universal poultice, giving to the entire surface of the body the heat and moisture which we apply to a sore finger in the bread and milk.

Any one who lives near a bog swamp can extemporize a bath, almost as efficient as those of the celebrated watering places, if he have the time and patience to make it; but instead of mineral water, he can use ordinary boiling water or water in which is dissolved a quarter of a pound of green vitriol and half a pound of rock salt. As the heat and moisture are considered the principal parts of this cure, other substances than mud may be used, which, although more expensive, are yet more cleanly; as, for instance, a fine sand or bran, orany material which will mix well with water and retain the heat for some time.

THE MECHANICS OF THE BRAIN.

"There is a just criticism," considers Dr. Edward Fournié, in a paper on the human brain, recently read by him before the French Academy of Sciences, "which may be applied to the efforts of Gall and of those who have followed his teachings in endeavoring to divide, classify, and localize all the manifestations of the human mind. It is that, in place of determining the seat and functional part of the elements which conduce to cerebral activity, a research which constitutes the physiology of the organ, the localizers have attempted to place a mass of manifestations resulting from the working of the brain without pretending to explain the working itself. In other words, they have replaced true cerebral physiology by a synthetic expression of a certain number of phenomena which they have associated with this or that portion of the brain; or, to illustrate, we are told that the faculty of articulate language has its seat in the anterior lobes, while we are left in darkness as to by what mysterious means the idea of speech is formed."

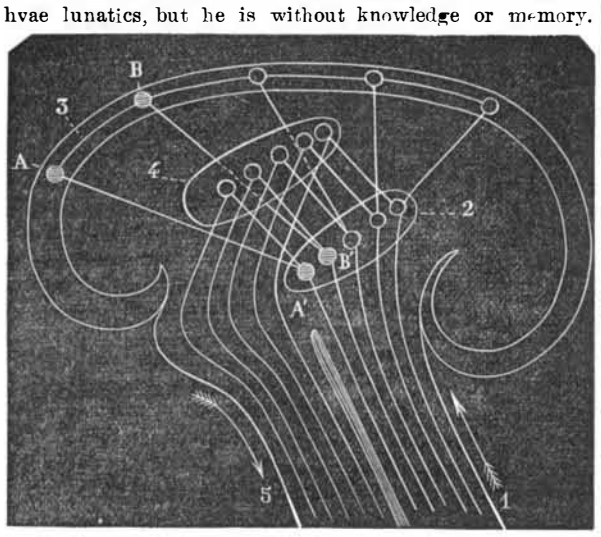
In the living body, three orders of organs may be recognized, the operations of which may be referred either to the laws of physiology or of chemistry. The liver, for example, furnishes a chemical product. A muscle is governed by mechanical laws; it is a motor; while the brain is referred to the laws of molecular dynamics. Like the electric battery, it is the seat of a movement which escapes our observations; but while the pile acts upon apparatus submitted to its influence, the brain manifests itself by its effect upon the muscular system. It is by the movements of the latter that we know that the brain acts, and the full value of this assertion will be better apprehended in considering that the speech (*parole*) with which we think was primitively a muscular movement provoked by cerebral activity, and that we repeat tacitly while we think. Now the essential property of the brain is to feel that which provokes its operation, as well as the act resulting from the latter. The liver does not feel the blood which it modifies, or even that it makes bile; the muscle has no knowledge of the nervous influence which contracts it, or of the displacement which it provokes in the parts, and the electric battery cannot feel that it is in activity and causing motion. Herein the brain stands alone; and in its faculty of sensation, we trace the special properties of the organ.

There are two rival methods of studying the brain—the experimental and the psychological. The latter classifies the manifestations of the mind, but does not explain its functional mechanism. The former, or phrenological system, but demonstrates the material substances through which the efforts of the mind receive a stable, permanent, and sensible form. The one refers to results, the other to physical means. It is only by using both methods, the boundaries between which have been but dimly defined, that our author believes he determines the seat of the anatomic elements which lead to the mechanism of cerebral functions.

The accompanying figure will render clearer the problem which Dr. Fournié sets himself to solve. In the region marked 1 are the nerves of impression, that is to say, the nerves which carry toward the brain the result of an impression received, and which occupy the posterior part of the medulla. These nerves end in region 2, known under the name of optic couches, and are composed largely of nervous cellules. Fibers leading from this center, under form of radii, place it in communication on one side with region 3, composed of cellules, and called the cortical couch of the brain; on the other, with region 4, similarly formed of cellules, and known as striated body. From this last portion lead the nerves which occupy region 5, the anterior part of the medulla. These five regions represent the principal localizations determined by science. It remains to determine their functional *rôles*.

Resembling, in this particular, all living organs, the brain, in order to operate, requires the intervention of an especial excitant. This is an impression received at the peripheric extremity of an impressing nerve. Its effect is to modify the vitality of the nerve, nearer and nearer, until the optic couches are reached, and there the nerve, in its turn, acts upon the cellule in which it ends. The result of this last modification of the cellule is the wonderful phenomenon known as simple perception. This faculty, then, has its seat in the optic couches, a fact capable of experimental demonstration, for if that region be destroyed in a living dog, the animal is insensible to any impression; for example, he cannot smell or see; in a word, he lives but does not feel. In man, when the optic couches are impressed, he simply feels —simple perception and no more. To feel *with knowledge* is, however, a different matter; it is simple perception *plus* something else. What that something else is, is the object of our investigation.

It has been already stated that a motion of the cellules of the optic couches is provoked by the nerves. This movement does not expend itself, however, in that particular region, for the couches are not isolated; hence it continues over the fibers of the white nucleus to end in the cellules which form the peripheric layer of the brain. These cellules are thereby, in turn, modified, and experiments upon living animals and pathologic observations enable the determination of phenomena corresponding to such influence. It has been known for a long time that, in the case of lunatics, the cortical couch of the brain is softened or more or less injured. If that region (3 in the engraving) be destroyed in dogs, a sort of foolishness ensues. The animal has all his sensations, as hvae lunatics, but he is without knowledge or memory.



Hence, while in the optic couches lies simple perception, in the region above alluded to live the reasoning powers just named.

In order to trace the connection which, therefore, must exist between them, let it be supposed that a brain, free from any impression whatever, is submitted to the influence of an odorous body. The movement of the olfactory nerves is transmitted to cellule, A′, of the optic center, and the person recognizes an odor. The vibration continues its course to cellule, A, of the cortical couch, and modifies that region. If, now, the exciting body be removed, the man returns to his former negative condition—perceives nothing. Then, by any means, let the cellule, A, be supposed to be impressed with its proper movement, and thus to be transmitted backward this time to cellule A′, which re-awakens to its special activity. The latter, however, corresponds to a perception of an odor and, consequently, the man will again perceive the same, although the object capable of provoking such a sensation is totally absent. Such is the first condition of memory. But this is merely an elementary fact; in order to remember, a relation must be established between what is and what has been felt—a link formed between past and present. Suppose that the odorous body is an orange, and that the senses of sight and smell are both provoked thereby. The visual impression will awaken the center, B′, at the same time as the odorous impression excites A′; the former will then provoke cellule B, and the latter cellule A, as already shown. The person perceives in two ways, that is all. Now, after withdrawing the orange, suppose it to be submitted to a single sense; let it be held so that the person can see but not smell it. The cellule, B, is excited to activity as before, from the optic couches at B′; and moreover, being united by its prolongation to cellule A, it will determine in the last the special activity pertaining thereto. This, as already described, is reflected back to A′, and the perception of an odor is awakened. Here, then, although the man is too far removed from the orange to smell it, that sense is nevertheless excited, and he will remember that the orange is an odorous body of such a perfume. Not only, therefore, will simple perception be excited, but perception with knowledge.

The cellules of the cortical couch of the brain represent, under form of dynamic modality *in posse*, all acquired ideas, and it is to the anatomic connections which unite these cellules to the optic couches that they borrow the possibility of awakening successively the center of perception to give birth to the phenomena of memory. A dream is nothing but the awakening of this center of perception, by the activity of the cellules of the cortical couch, while this same center is shut off from exterior influence. All the cellules of that couch are united among themselves, and they can mutually awaken their respective activities. It is enough if one operates to cause the rest to follow. The classification and admirable ordering of our knowledge is the work of the Creator; the brain is like tapestry, of which God gives us the canvas and we fill in the stitches in designs more or less grand.

Thus far we have referred to but a portion of the cerebral functions, the functional excitant and the functional matter. The duty of the organ does not consist merely in collecting determined elements; it is supposed to work with some object, to attain an end which is not within the brain itself but outside. There must then be particular motions which the organ projects without itself, and these are termed functional movements.

The path we have just assigned to the impressing movement or vibration of the sensitive nerves to the optic couches and thence to the cortical cellules is now the only route followed by such motion. The optic couches are united by special filaments to another nucleus of cellules called the striated body. Here end all the fibers of the motive nerves placed in the antero-lateral part of the medulla. There is a presumption already indicating the function of the striated body, which however is transformed into a certainty when, on destroying such portion of the organ in living dogs, the total cessation of physical movement succeeds. Reasoning from this we can explain the functional mechanism of voluntary and involuntary motion.

Involuntary movements take place when the impressing cause, a danger for example, is sufficiently sudden to awaken instantly the activity of the striated body and as quickly provoke, through the intermediation of the motor nerves, a determined motion of the muscles. The movements of the body are voluntary when the impressing cause acts slowly enough for the perception to travel to the cortical couches and arouse the activity of the cellules. It is not until after the examination of the impression, in connection with acquired knowledge, that the movement takes place. In involuntary motion, the effect is a start, a sudden withdrawal of a member, an inarticulate exclamation, etc. In voluntary movement, the previous examination causes a dominant impression to prevail in the optic couches which gives to the effort a motion as if it had been considered and reasoned upon. To the last belong the movements incidental to speech.

SCIENTIFIC AND PRACTICAL INFORMATION.

RELIGIOUS ELECTRICITY.

Recently in New York city, at the dedication of the new and splendid Jewish synagogue, corner of Lexington avenue and 53d street, a portion of the first chapter of Genesis was sung by the choir; and as the words "Let there be light and there was light" were uttered with a grand burst of melody, the whole church was instantaneously lighted up by electricity. Thus it is that modern science lends her aid to give effect to the solemnities of her servants.

RESTORATION OF OIL PAINTINGS.

It appears that the brilliancy of the colors in oil paintings is due to the optical properties of the substance, contained in the oil, known as linoline. By exposure to the air this substance, at first liquid, absorbs oxygen, becomes solid and transparent, firmly enclosing the particles of color. Linseed oil contains 80 per cent of this linoline. By lapse of time and physical and chemical changes, the linoline loses in some degree its transparency and the picture fades, those colors containing the least oil changing most.

Pettenkofer has discovered that the vapor of alcohol will renew the qualities of the linoline, and he restores old oil paintings by placing them over a tight box, in the bottom of which is a flannel cloth, which has been dampened with alcohol of 80 per cent strength. The arrangement should be such that every part of the picture will be exposed to the alcoholic vapor.

THE FAIR OF THE AMERICAN INSTITUTE.

The exhibition building is now filling up quite rapidly, and nearly double the number of articles are in place that was the case at the time of our last visit. There seems to be an improvement in the arrangement of tables and space which admits of a much better display and at the same time economizes much room heretofore wasted in needless passages. Two wooden extensions are in process of construction beside the main building, in one of which will be a Campbell printing press, and in the other a huge saw mill. The excellent and instructive plan of exhibiting an industry by its processes in actual operation, we are pleased to note, is in some cases being carried out. A shoemaking firm enable the visitor to trace the entire manufacture of the shoe from its first cutting from the hides down to the finishing polish. The workmen are seated around the enclosed space, and the shoe passes from hand to hand, each man adding to or perfecting some portion. The extent of the crowd that constantly presses against the railing, eagerly watching the various manipulations, is a convincing proof of the interest taken by the public in such displays. In the same portion of the hall, a number of tailors are at work, cutting out, basting, sewing and pressing men's clothes; and about midway along one of the side aisles, an ivory turner makes billiard balls, chessmen, handles, etc., from the crude material, while another workman engraves monograms and designs on the finished articles. The display of fruit this year is exceptionally large and fine. There are some gigantic grapes and pears from Nebraska, and innumerable plates of apples, of excellent appearance, from various points of the West. The floral exhibit is as yet rather slim, but probably will be augmented when the Fair becomes completely organized. Evidences of improved management are plain; especially in the absence of the vendors of grease compounds and similar nostrums, who made their surroundings hideous with their yells, and provoked the ire, of every exhibitor in their vicinity, during the exhibition of last year.

We resume our brief notices of such inventions as have attracted our attention, from their novelty or especial utility during recent visits. M. T. Boult's

MACHINE FOR CARVING,

paneling, molding and dovetailing in wood, is an excellently constructed and apparently very efficient device. It is four machines combined in one. The dovetail arrangement is a separate attachment connected with the table, which makes both tenons and mortises at once, so that it only remains to fit the portions together. The paneler is a revolving cutter, working upwards on a vertical shaft under the table. The pattern is fastened on the opposite or upper face of the plank while the lower side of the latter is pressed against the cutter. We examined the operation of the machine quite at length, and found much to admire both in the simplicity of its mechanism and the beauty of the work turned out. Young's

DIAMOND SAW

is at work in the machinery department, in the form of a neatly built iron model, one fifth the size of the more cumbrous wooden apparatus. The blade, it will be remembered, cuts through the stone by means of carbons or black diamonds which are securely set along its edge. There is an ingenious feed motion for moving the saw, and another device to lift the latter, consisting of an eccentric on the crank pin communicating with a knuckle joint and levers, so that it is allowed to cut only in drawing. The small machine exhibited, we were told, penetrated brown stone at the rate of 14 inches and marble at 7 inches per hour. A novelty about this invention is its application to the cutting of window moldings. Bevels are made by suitably turning the stone, and rounded edges by gradually moving the latter under the saw. The work exhibited to us was very smoothly cut, and especially noticeable for its clean and sharp angles. The apparatus, the inventor thinks, does the labor, in molding, of from 12 to 14 stonecutters. Lyall's

CORSET LOOM

is a most remarkable combination of the Jacquard card with the well known positive motion loom. The cards are hung in an endless chain in a frame work in the upper part of the machine, above the two rows of beams. These communicate with the harness, by the usual mechanism, so as to lift certain portions of the warp at certain times. Four strips or webs of corset are woven at once. To give a clear idea of the operation of the machine is hardly possible in mere words. If the reader, however, will imagine that half the warp in an ordinary loom, for instance, be pushed out of the way, and that the shuttle travels a dozen or so times through the portion left, then that the whole warp be allowed to come into action and the weaving go on as usual, it will perhaps be understood that there will be a gusset in the cloth formed by the half action, so to speak, of the filling. This, though crudely expressed, is about the operation of the Lyall loom. The Jacquard cards govern the quantity of warp to be kept in action, and this quantity is so graduated as to form the requisite gussets, welts, and gores. The shuttle consists of a box enclosing the bobbin, the thread from which passes around and through extended springs. By this ingenious arrangement the slack loop, which would result from the shuttle not passing through all the warp, in forming gussets as above described, is taken up and the thread kept taut. The winding of the finished web brings in another very ingenious though simple arrangement for taking up the irregular portions. There is an endless rubber belt pressing against the cloth from above. Below the latter is a strip of wood filled with needle point projections. The needles, while the whole warp is being filled, catch the entire web and, by the action of the rubber belt, pass it along. But when, however, only a portion of the width is being woven, the needles hook the inoperative part and hold it while they allow the part which is being increased to pass on.

The entire invention, which we have thus necessarily only faintly outlined, is of great ingenuity and may justly rank as one of the most important of modern improvements in the trade to which it relates.

A WIRE BRUSH MACHINE,

which puts us very much in mind of a pin-making apparatus, is at work in the main hall. It makes hair brushes, or in fact brushes for any purpose, out of fine tinned wire instead of bristles. The wire is led from the coil up to the back of a long strip of india rubber, and is moistened with camphene so as to penetrate the same with readiness. On setting the machine in motion, an awl first makes a hole in the band then the wire is brought up, cut by a blade, and dies hold it while a little swedge forms a head upon its end. Then a pusher drives it into the awl hole and through the band, where it remains. The number of pieces in each row is regulated by an ingenious cam device, which causes them to take the elliptical figure peculiar to hair brushes. It only remains to cut the band into suitable lengths and attach it to back and handle to complete the brush.

Near the apparatus just described is an

ENVELOPE MAKING MACHINE.

The paper, previously cut into proper shape, is placed under an angularly shaped plunger, kept covered with gum. This pushes the piece down through a correspondingly shaped slot and at the same time pastes the lower edges. Two arms then swing around and push the paper under another plunger, of different shape, which carries the piece through a square hole of the size the envelope is to be. The edges are next doubled over by swinging metal plates, arranged on the sides of the slot, and the envelope remains in its place until another arrives, when it falls into a suitable receptacle.

There is a peculiar horizontal steam pump, Eickemeyer's, in a corner of the machinery department. At the middle of the piston is a short arm which, by a ball and socket joint, connects with a yoke on the fly wheel shaft. The piston has thus a partial rotation on its axis, and so forms a self-operating valve for both pump and steam cylinder.

A rather queer invention is the

STEAM BOOT BLACKER,

which consists of brushes which rub the sides and top of the boot and another made in shape to conform to the heel. There are attachments for a supply of water, and other brushes for removing mud, etc. The mechanism is quite simple, and agitates the brushes at a rate which might carry dismay to any one who is afflicted with corns, bunions, or tender feet.