THE HEMI-PLUNGER.

The novel form of vessel, to which the above odd name has been given by its inventor, M. Donato Tommasi, of Paris, France, is a combination of a boat wholly submerged with a raft: a connecting link, to borrow the naturalist's expression, between the submerged torpedo boat and the monitor. The advantages which are expected to be realized from this hybrid craft, the inventor describes as follows: "It is evident that a vessel, plunged several yards below the surface of the sea, is no longer influenced by wind or wave. Let the sea be agitated, let there be the most violent tempest, yet the boat which navigates under water will never be wrecked, for the same reason that a fish cannot be drowned. * * * What a beautiful vision, that of traversing the ocean, as a balloon floats through the air, with the same tranquillity, without shocks, without the insupportable rolling and pitching!" etc. The construction of the invention introduced in this glowing manner will be understood from Figs. 1 and 2. A is the plunger cylinder, shown with its side broken away in Fig. 2. In Fig. 1, G is the rudder, H the propeller, and I the tube through which sea water passes to the pump. In Fig. 2, C is the smokestack, M M are compartments in which water may be admitted to increase the weight, and hence the depth of flotation of the plunger, the same being filled or emptied by the pump, P. N is the hold for merchandise, partitioned off from the boiler room as shown.

From the plunger, A, rise two hollow columns, E, to which metallic plates, F, are attached to diminish friction through the water. These support the upper division or platform, B. The second shaft (not lettered), which rises above the platform in Fig. 1, serves to ventilate the plunger. The columns, E, serve as shoots down which merchandise is lowered to the compartments, N; and their upper ends are received in two immense inverted cups attached to the bottom of the part, B. Through these cups pass large screws, which confine the columns so that, by removing the connection, the whole submarine apparatus may in case of necessity be freed from the upper works. On each side of the platform, B, which is of elliptical figure, is a large float, seen in Fig. 3, which, by means of racks and gearing, may be raised or lowered at will. Usually these floats are carried at a height of a yard above the water. In calm weather, this distance is increased, and in storms it is diminished, the object of the floats being to keep the whole vessel on an even plane, and to prevent too violent oscillations. In order to facilitate navigation in shallow water, the columns, E, may be made telescopic, and operated by hydraulic apparatus, so that they may be shortened at will. Any form of engine or propeller may be used.

Besides the advantage of the vessel being unaffected by waves, since its submerged portion travels far below them, the inventor claims that it will meet less resistance from the water than would a vessel of corresponding volume sailing on the surface. It will make faster progress, because it has no waves to mount and descend; and hence it always travels in a nearly right line. The screw being submerged at a great depth will not tend to turn the vessel from her straight path. The platform being easily detachable may serve as a raft in case of injury to the submarine boat. For fast travel, on lakes, rivers, and shallow water generally, M. Tommasi proposes to support his platform on two floats which rest on the surface of the water. No weight, therefore, is thrown on the submarine vessel, which need be constructed with only just enough buoyancy to sustain itself and its engine. In this way, the upper craft has no engine or other load than its cargo; and as it merely rests upon the surface, the inventor thinks that it will skim over the same like an ice boat on ice.

For war purposes, the hemi-plunger is especially adapted, because the vulnerable portions, engines, boiler, rudder, etc., are wholly out of the reach of shot. Guns are mounted on the platform, which thus becomes a circular or elliptical turret, just above the water when the vessel is in fighting trim. Instead of steel armor, M. Tommasi has a new invention which he calls hydro-metallic plating. He reserves the details of this for future publication; but generally the armor consists of tubes in which liquid is forced under a pressure equivalent to the resistance, say, of forged steel. He thinks this will oppose shot as effectually as the solid metal, and will have the additional advantage of superior lightness.

IN-SOLES saturated with salicylic acid have been introduced as a remedy for perspiration of the feet.

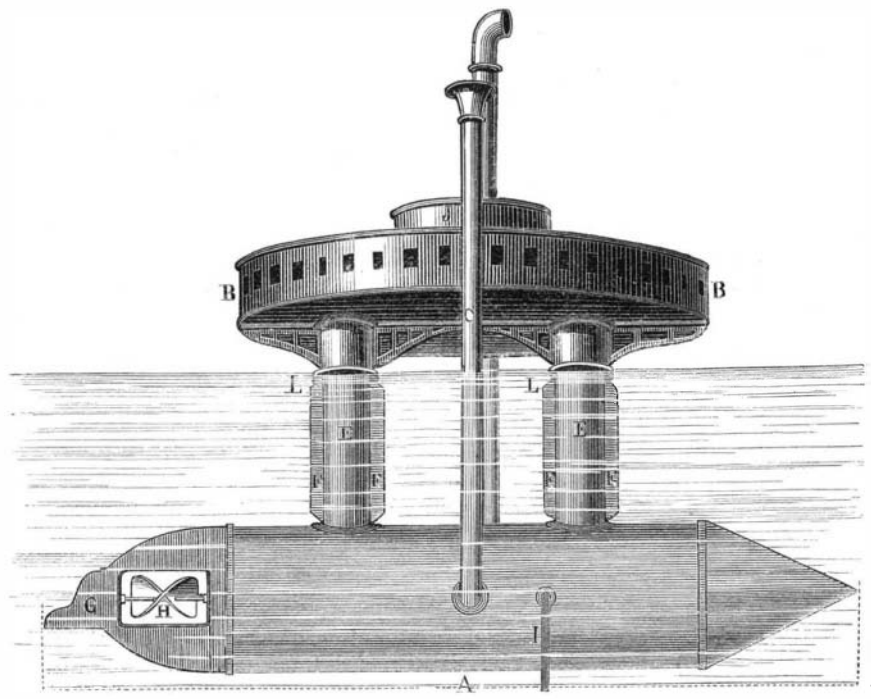


Fig. 1.—TOMMASI'S HEMI-PLUNGER.

Fig. 2.—THE HEMI-PLUNGER, THE SUBMERGED PORTION.

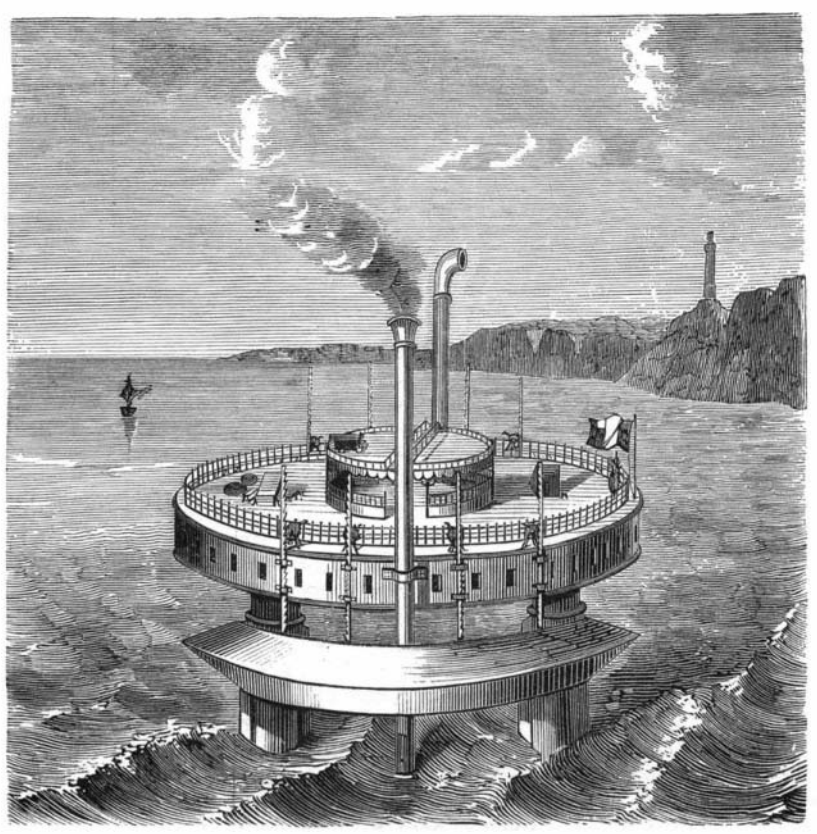


Fig. 3.—THE HEMI-PLUNGER ON A VOYAGE.

Supreme Court Patent Decision.

A United States patent was granted May 23, 1854, to John Myers and Robert G. Eunson for a wood-sawing machine for cutting boards into thin stuff for making picture frame and mirror backs. One of the principal claims was for the employment of two deflecting plates, one on each side of the circular saw, by which both sides of the sawed stuff, as fast as it was cut, was slightly deflected so as not to bind upon the saw. Suit was brought by the patentee against Dunbar and Hopper for infringement, and judgment was given in favor of the patentees, in the United States Circuit Court, this city, the damages awarded being $9,121. The defendants thereupon took an appeal to the Supreme Court of the United States, which tribunal has reversed the finding of the Circuit Court and dismissed the complaint. It was held by the Supreme Court that, inasmuch as the use of a single deflecting plate was old, well known, and in common use, it was simply an exercise of ordinary mechanical skill, and not a patentable invention, to employ a second deflecting plate, although the superiority of the double deflectors, for certain kinds of work, appears to be conceded.

Planing Mill Machinery.

The planing machine, next to the saw, is perhaps the most important agent for the conversion and manipulation of wood in use; and before proceeding to consider it, in its present form, says the author of this article, Mr. F. H. Morse, in the *Northwestern Lumberman*, it may not be out of place to notice briefly its origin and history.

The first man to employ power in the operation of smoothing the surface of wood was Sir Samuel Bentham, of London, England, and to him belongs the honor of having discovered the principle upon which all planing machines operate. A brief personal notice of this remarkable inventor will serve to show under what circumstances the planing machine originated. His education was secured at the Westminster school of London, and, as far as can be ascertained from the meager records of his life that have come down to us, was of the most thorough kind, both classical and scientific, that could be obtained at that time (1770). When his education was finished, he was bound to the master shipwright of the Woolwich dockyard, to whom he served an apprenticeship of seven years, acquiring in that time a practical knowledge of the methods of working in both wood and iron then in vogue, and receiving the best scientific instruction that the development of that period afforded. After his term of apprenticeship had expired, he spent about two years in looking up the local peculiarities of other shipyards whose methods of working differed in some respects from those of the Woolwich mechanics.

In 1779 he was ordered by the government to examine into the progress of shipbuilding in Northern Europe, and in carrying out this commission he repaired to Russia, where he invented the first machine for planing wood. Its mode of operation, whether reciprocating or rotating, it is impossible to ascertain positively, but the conclusion arrived at, after referring to the specifications of his first patent, which was issued in 1791, is that it worked upon the former principle by means closely analogous to the operation of planing by hand. He seems to have made no use of his venture in Russia, though he resided there several years and filled several important positions under the Russian Government. He returned to his native country in 1791 and joined his brother, Jeremy Bentham, who had at that time just received an appointment from the government to introduce industrial prisons in England. To utilize the unskilled labor of the convicts, the talents of Sir Samuel were called into use, and he devised a number of new machines, the greater part of which were for working wood. For want of a more suitable place, these machines were constructed at the residence of Jeremy Bentham, which was thus converted into the first manufactory for woodworking machines. This factory was established in 1794, but was soon found to be too small for the purpose, and another building was occupied. In a lecture before the Society of Arts, in 1853, Professor Willis, referring to the shops of the Benthams, stated that "there were constructed machines for all general operations in woodwork, including planing, molding, rebating, grooving, mortising, and sawing, both in coarse and fine work, in curved, winding, and transverse directions, and shaping wood in complicated forms; and further, as an example, that all parts of a highly finished window sash are prepared, also all parts of an ornamented carriage wheel were made so that nothing remained to be done by hand but to put the component parts together."

In 1797 the Admiralty consented to the introduction of such of these machines as could be used to advantage in the different dockyards, and they were manufactured under the direction of Jeremy Bentham, and forwarded from time to time to Portsmouth and Plymouth, where they were used with good results, performing all that was claimed for them.

Bentham was joined in 1810 by another genius (formerly in the employ of the brothers) by the name of Brunel, who had invented several valuable machines, among which was one for shaping block shells, which seems to have had Bentham's indorsement. As Inspector General, in 1803, Sir Samuel advised the Admiralty to introduce many of his new machines, and also to permit the use of steam engines; accordingly, the dockyards were fitted with engines for sawing, planing, boring, tenoning, mortising, etc. The labor saved by their use can be inferred from the fact that Brunel, who had assisted in their construction, received as a premium for his inventions the amount saved in the yards by their use in one year, which reached the respectable sum of $80,000. In the same year the government settled with Jeremy Bentham, after arbitration,

and allowed him for machines furnished the yards and prisons, $100,000. We learn from testimony given before the arbitrators that "Sir Samuel Bentham prepared a system of machinery for the employment of men without skill, and particularly with a view to utilizing convict labor. In 1793 patents were taken out on these inventions to secure their exclusive use for the prisons." The testimony states that no skill was required in the use of these machines; they were introduced into the dockyards and worked by common laborers. It was claimed that nine tenths of the labor was saved by the use of Bentham's machines, which proves that they were at least effective, which cannot be said in all cases of those of modern manufacture.

The patent of Bentham, issued in 1793, is doubtless one of the most remarkable ones ever issued, both for the importance of the inventions it protected and the clearness with which they and the principles on which they operated are described. Richards, in referring to that section of this patent which relates to rotary tools for woodcutting, quotes the inventor as saying: "The idea of adapting the rotative motion of a tool with more or less advantage, to give all sorts of substances any shape that may be required, is my own, and, as I believe, entirely new."

For those not skilled in nor acquainted with the nature and extent of the various operations in wood conversion which come under the head of shaping with rotary cutters, it will be difficult to convey an idea of the invention here set forth; it includes, indeed, nearly all operations in woodworking, and as an original invention may be said to consist in the discovery of the fact that flat surfaces, or surfaces of any contour, can be properly prepared by the action of rotating tools. It is not to be wondered at that such an operation should not have been sooner discovered, for even at the present time there are few processes in treating material which seem so anomalous as that of planing a flat surface with cutters revolving in a circle of a few inches in diameter.

In reference to planing mouldings, it is said: "If the circumference of a circular cutter be formed in the shape of any moulding, and projecting above the bench no more than necessary, the piece being shoved over the cutter will thus be cut to a moulding corresponding to the cutter—that is, the reverse of it, just as a plane iron cuts the reverse. If a plane cutter, such as that above spoken of for cutting a groove in the breadth of a piece, be made so thick, or, as we might be apt to say now, so broad, or so long, as to cover the whole breadth of the piece, it will present the idea of a roller. This I call a cutting roller; it may be employed in many cases with great advantage to perform the office of a plane."

The cutting roller of Bentham is the present cutter block of England, or the cutting cylinder of America, and after what has been quoted it may be seen that the idea of rotary planing and moulding machines had been fully grasped by Bentham. He goes on as usual to the various conditions which attach to the process of planing, and says further: "if a cutting roller of this sort be placed with its axis horizontal and the bench beneath, it may be made to rise and lower. The bench (machine) may be very readily adjusted, so as to determine the thickness to which a piece will be reduced by being passed under the roller." "To gain time, cutters may be applied to different sides of a piece at once, and such of them as make parallel cuts may be mounted on the same spindle."

These extracts would not be out of place in an explanatory lecture or essay on woodcutting at the present day, and cannot help awakening surprise that they should have been written eighty-three years ago, when there had, so far as we know, been no precedents, nor even suggestions from previous practice.

The foregoing shows that nearly all the fundamental principles, upon which woodcutting by machinery in its present development depends, were familiar to Sir Samuel Bentham, and though his name has been almost forgotten, it may be safely asserted that he gave to the world more useful inventions than any other man of his age. His work shows throughout a constant method and system of reasoning, which point rather to a life of persistent labor than to one of what would ordinarily be called genius. That latter quality he must certainly have possessed in the highest degree, for without it even his knowledge and experience could not have been equal to the work he accomplished. Directed to different ends, his talent and genius would doubtless have secured for him a fame that would live for years, though it does not seem possible that he could have conferred upon the world a greater benefit.

Suicide Statistics.

A curious and suggestive table of statistics has recently appeared in France, which will doubtless prove of much value in the hands of students of psychology and nervous mental ailments. It relates to suicides; and the conditions, etc., of the people who made away with themselves in 1874 in France are taken as the basis of the figures. In that year, 5,617 suicides occurred, the largest number ever known in any one year in the country. Of these, 4,435, or 79 per cent., were committed by men, 1,182, or 21 per cent., by women. In spite of the careful investigations of the police, the ages of 105 people could be determined. The 5,512 others are divided as follows: 16 years, 29; between 16 and 21 years, 193; between 21 and 40 years, 1,477; between 40 and 60 years, 2,214; exceeding the last mentioned age, 1,599. About 36 per cent. of these unfortunates were unmarried, 48 per cent. married, and 16 per cent. widowers. Of those which constituted the last two classes, nearly two thirds had children. More than seven tenths of the suicides were effected by strangulation or drowning. The crime was most frequently committed during spring, when 31 per cent. of the whole number destroyed themselves; during other seasons the percentages were: in summer, 27; in winter, 23; in autumn, 19.

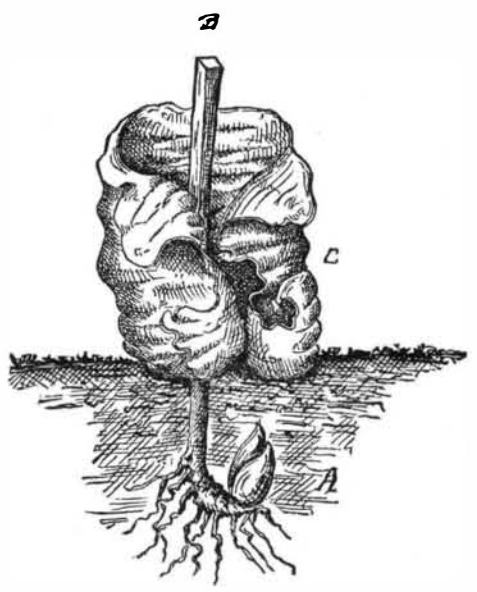
Included in the tables are the results of the judicial inquests, showing the professions and callings of the deceased. About 33 per cent. were farmers, 30 per cent. mechanics, 4 per cent. merchants or business men, 16 per cent. members of the liberal professions, 4 per cent. servants, and 13 per cent. were destitute of any calling. The table even analyzes, in all but 481 people, the motives which caused the fatal act. Thus we are told that 652 killed themselves because of reverses in fortune, 701 through family troubles, 572 through drunkenness, 243 through love, debauchery, etc.; 798 died to avoid physical suffering, 59 to avoid the penalties of capital crimes, 489 for unclassified troubles, and 1,622 were clearly shown to have been afflicted with some mental disease.

Communications.

The Frost Plant of Russia.

To the Editor of the Scientific American:

Mr. Charles Williams, of Winoa, Ohio, has written a letter to that veteran botanist, Humphrey Marshall, of Chester county, Pa., on the subject of the abovenamed plant, and my opinion concerning it has been asked for. Seeds of this plant were obtained by citizens of Boston, who had snow brought from the White Mountains and from the coast of Labrador, and who stated that they have "now the most unbounded satisfaction and pleasure of announcing that all signs are favorable to the realization of their fondest hopes." This wonderful plant, it seems, was found amid the perpetual snows of the northern boundaries of Siberia, in 1863, by Count Swinoskoff, the eminent Russian botanist, and it was by him cultivated at St. Petersburgh. The account sent me is very vague, and is evidently not from the pen of a botanist. It is stated that it comes forth on the first day of the year, grows to the height of three feet, and flowers on the third day. It continues in bloom for twenty-four hours, then dissolves itself, being of the finest snow; it has a stalk one inch in diameter, and leaves, three in number, 1½ inches wide, covered with infinitesimal frost or snow cones. The flower is of the shape of a star, with petals 3 inches long and ⅛ inch wide at the broadest part, forming a basketwork of frost. The seeds are like a pin's head. This is about all that can be gleaned from the description, and is by no means satisfactory. Allow me to present my humble views of an analogous discovery of frostwork on December 6, 1856, in a sandy loam in Chester county, Pa., near the Paoli monument. In the *Horticultural Journal* of Philadelphia, then edited by J. Jay Smith (New Series, volume vii., page 73, 1857), an account was published of my observations then. These I have since more fully confirmed. The common dittany (*cunila Mariana*) is frequently met with in December, with the base of the stem surrounded with shellwork of



Root-bud and frost-flower of the *Cunila Mariana* (Maryland Dittany). A, the developing or budding root. B, the old stem of the previous year. C, the congealed vapor or hoarfrost, forming the first flower of various shapes.

ice, of a pearly whiteness. Dr. Darlington, in his "*Flora Cestrica*," published in 1853, page 199, under the article *cunila*, observes: "In the beginning of winter, after a rain, very curious ribbons of ice may be observed, attached to the base of the stems, produced, I presume, by the moisture of the earth rising in the dead stems by capillary attraction, and then being gradually forced out horizontally, through a slit, by the process of freezing. The same phenomenon has been observed in other plants. See observations on *helianthemum*, page 27." Had the doctor given a more extended investigation, I fancy he would have agreed with me as to the cause. I found hundreds of diversified specimens. I am not aware that it was after a rain, but I took up a number of the plants, and always found a vigorous scaly root bud, undergoing development at this early season under ground, to produce a new stem the following spring. I came to the conclusion that, as the temperature was below freezing and snow was on the ground, the expanding bud, in close proximity to the surface, gave out sufficient caloric or warmth to generate vapor from the moist soil. This vapor rising around the stem of the plant, and attracted by it, becomes congealed into what we term hoar-frost, in numerous forms; some like shellwork, others like tulips, with radiated petals, variously contorted, and often as symmetrical as snowflake crystals.

That plants in germinating have the power of generating heat was proved by Mr. Hunter and by Lamarck. Experiments of Hales and Du Hamel show that vegetation is not wholly suspended, however cold it may be; and that there is a regular and gradual progress till the returning warmth of spring gives a greater degree of velocity to the juices, rendering their development more vigorous and apparent. If the crystallization takes place when the air is calm, the crystals will be regularly formed; otherwise, when windy, I have seen them like a shell within a shell, very thin, of a pearly whiteness. Professor Tyndall has shown in a very beautiful manner that ice is but an agglomeration of snow crystals: the transparency of the former being due to the expulsion of the air, entrapped in and causing the whiteness and opacity of the latter. There is a formation called the snow plant of California, which arises to some height, and has been compared to various things, a fountain convoluted and enlarged above, a crystallized small bushy shrub, etc.; but on closer inquiry, I have failed as yet to get any definite ideas to its true character. Some bulbs in the soil might cause such formations by the congelation of vapor deposited successively upon itself, or the stems of the previous year's growth yet remaining, and thus give them a sheathing of frosting.

The shape of a star is common in snow crystals, which we all know assume the most beautiful forms, and which are illustrated in various publications. The eminent botanist Count Swinoskoff should give us some clue as to the genus or character of the plant, the flower of which, we are told, melted away on being touched, and as to the stamens, the diamond seeds like a pin's head, etc. The whole needs further explanation.

I trust those Bostonians who are in such hope will edify the public as to the final result of their experiment. What has that veteran in botany, Dr. Asa Gray, to say about it? Let some one well qualified tell us more about this frost flower of Russia.

J. STAUFFER.

Lancaster, Pa.

Patent Matters in Washington, D. C.

To the Editor of the Scientific American:

From the report of the Commissioner of Patents, just issued, it appears that its surplus revenue for the past year amounts to over one hundred and five thousand dollars, and that there is nearly a million dollars in the United States Treasury to the credit of the Patent Office; and yet, notwithstanding that this enormous amount is lying idle, our psendo-economists at the Capitol refuse to grant the Office sufficient of its own funds to carry on its business promptly. So much is the work behindhand in some of the departments that, as the Commissioner states in his report, some of the attorneys who require certified copies of papers have been obliged to employ their own clerks to do office copying, and then had to pay the full legal rate of ten cents per hundred words, the same as though the Office had done the work. This style of *economizing*, by making inventors pay two prices for their work, may be "reform" in the eyes of the average Democratic Congressman; but speaking for myself, as one of those who have had to pay twice, I would prefer to dispense with this style of "retrenchment and reform," and therefore ask you, Messrs. Editors, in behalf of the inventors of the United States, to so stir up our legislators that they will allow the Office sufficient of its own funds to do its work properly, and not delay the work of the inventor—work that he has to pay for in advance—and so prevent the discouragement and trouble which these delays always cause.

As the Patent Office has been doing a good business lately, there appears to be some attempt at rivalry at the Capitol, as the following list of applications for extension will show:

LIST OF APPLICANTS FOR EXTENSIONS OF PATENTS NOW BEFORE CONGRESS.

——— Reynolds, power loom brake.
Strong & Ross, scales.
Wm. & W. H. Lewis, photographic plates.
T. A. Weston, differential pulley.
S. S. Hartshorn, buckles.
H. A. Stone, making cheese.
N. Whitehall, cultivator.
J. R. Harrington, carpet lining.
H. L. Emery, cotton gins.
J. Stainthorp, moulding candles.
Walter Hunt's heirs, paper collars.
A. B. Wilson, sewing machines.
S. A. Knox, plows.
Rollin White, firearms.
Aikin A. Felthousen, sewing machines.
H. Woodman, stripping cotton cards.
L. Hall, heel trimmer.
J. A. Conover, wood splitter.
J. Dyson, carding engine.
G. Wellmann, card strippers.
E. Brady, safety valves.
Jearum Atkins, harvester rakes.
John Thomas, re-rolling railroad rails.
Thomas Mitchell, hair brushes.
Stephen Hull, harvesters.
T. R. Crosby, wiring blind slats.
G. W. Laban, mitre cutting machine.
T. A. Whitenack, harvesters.
J. J. Vinton, furnaces.
A. Fuller, faucets.
D. Baker, pitcher spouts and lids.
G. F. Chandler, refining sugar.