No. 776,696.

PATENTED DEC. 6, 1904.

C. W. SHERMAN.

CASTING PLANT.

APPLICATION FILED MAY 22, 1901.

NO MODEL.

3 SHEETS—SHEET 1

FIG. 1.

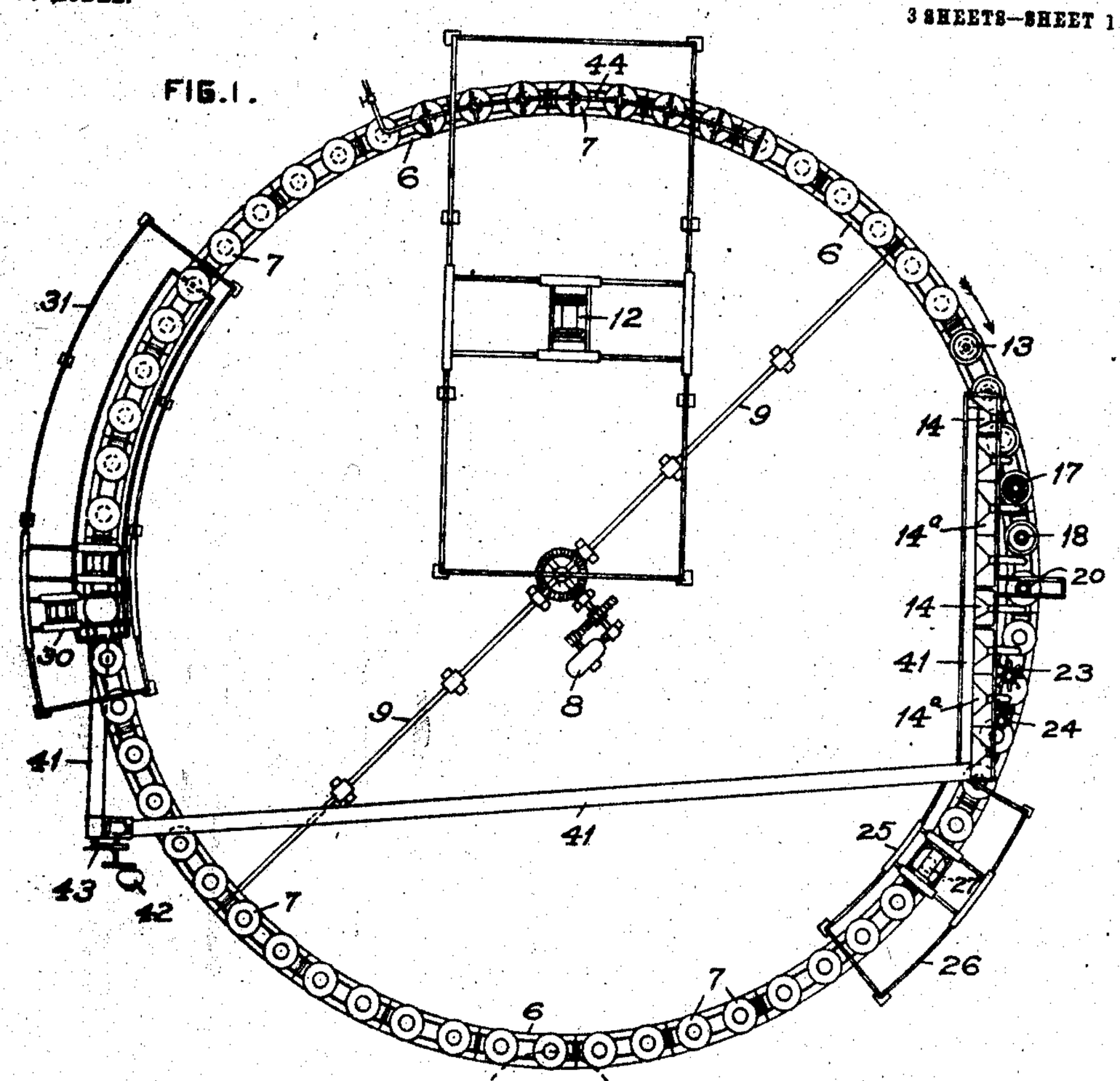
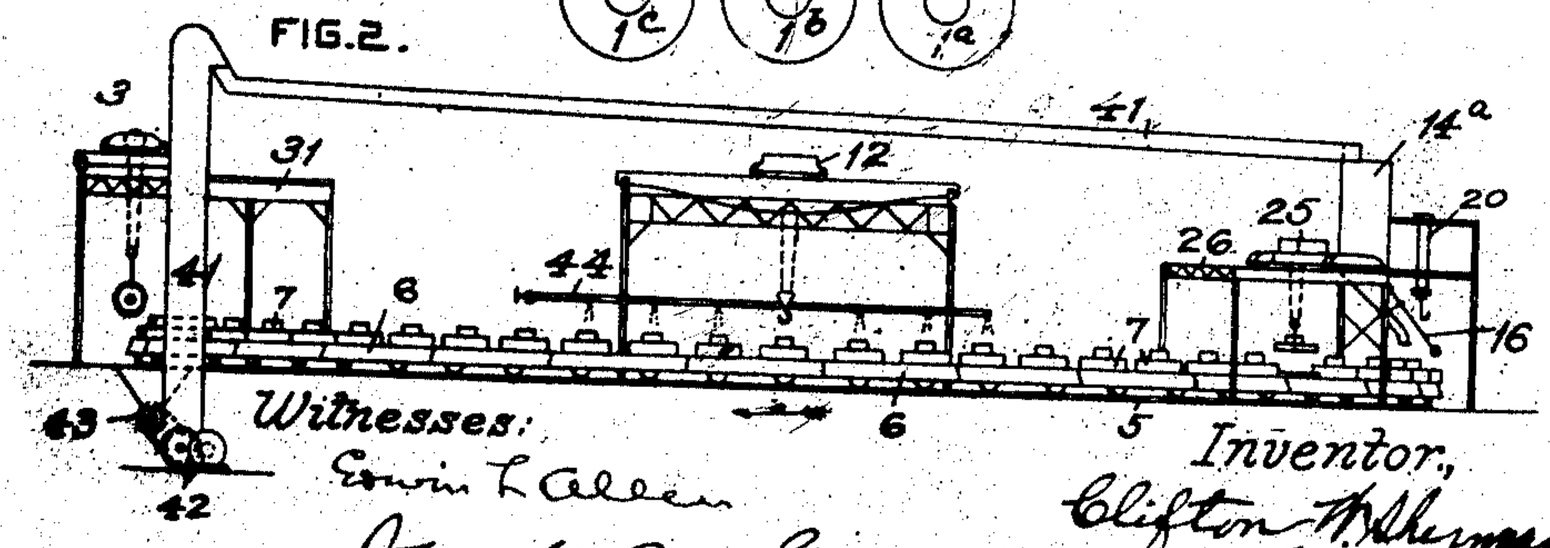


FIG. 2.



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NO MODEL. 3 SHEETS—SHEET 2.

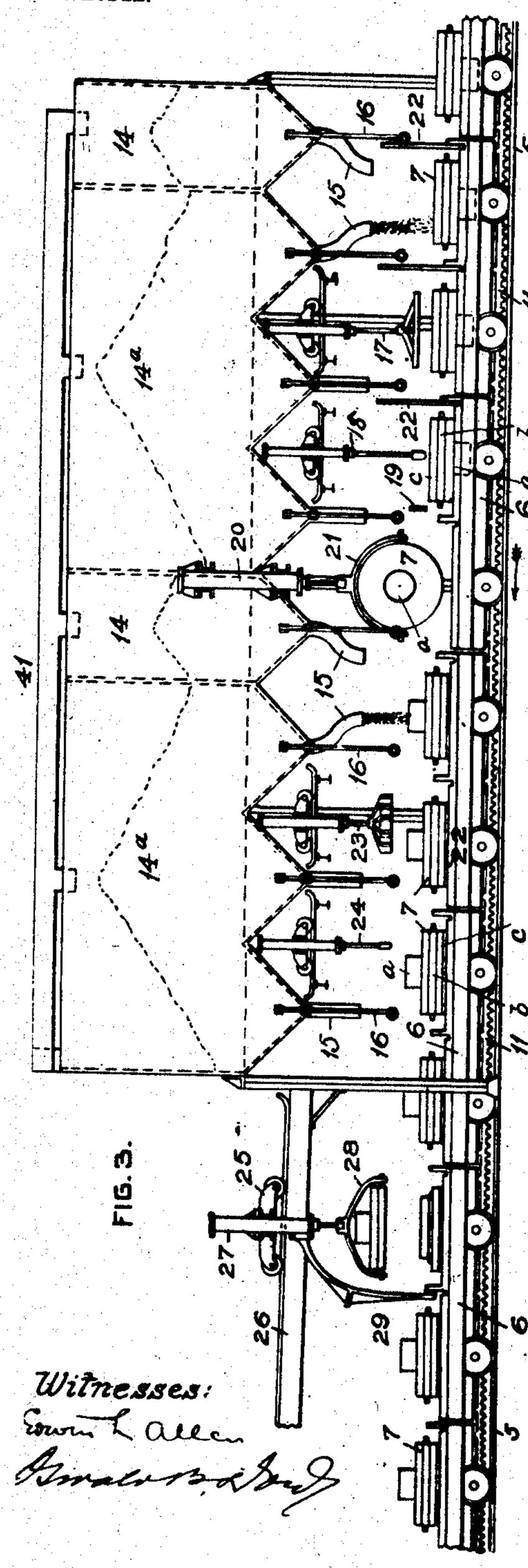

FIG. 3.

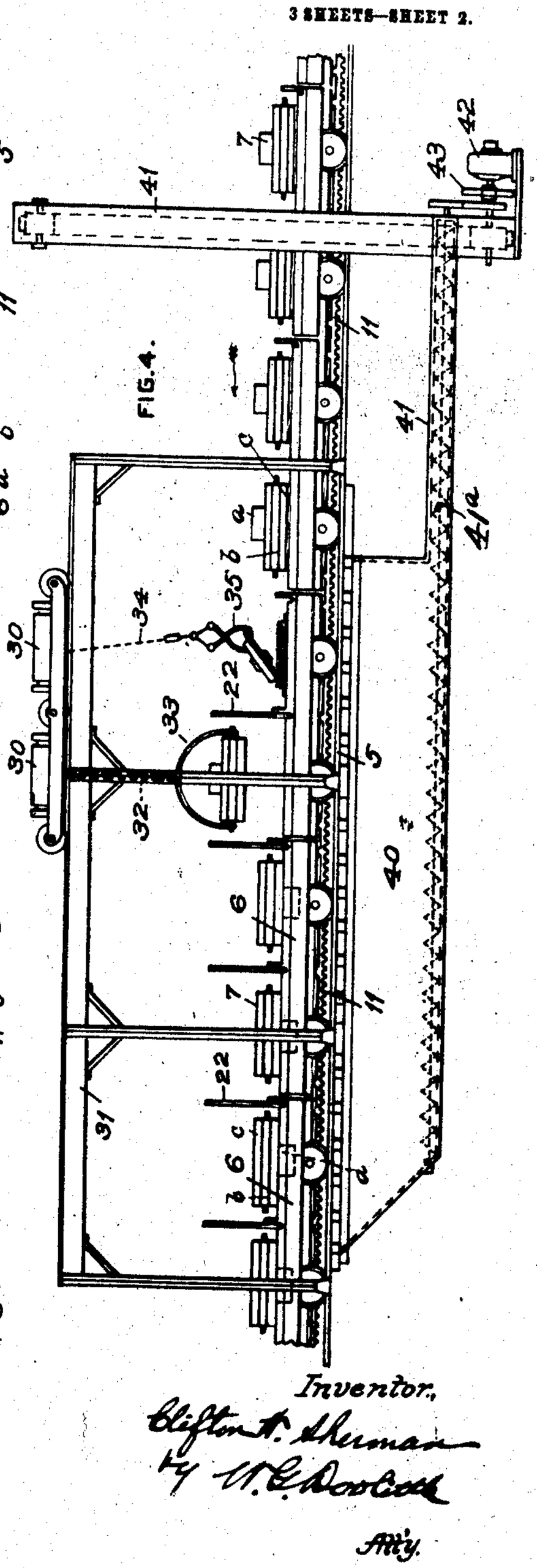

FIG. 4.

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No. 776,696. PATENTED DEC. 6, 1904.

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CASTING PLANT.

APPLICATION FILED MAY 22, 1901.

NO MODEL. 3 SHEETS—SHEET 3.

FIG. 5.

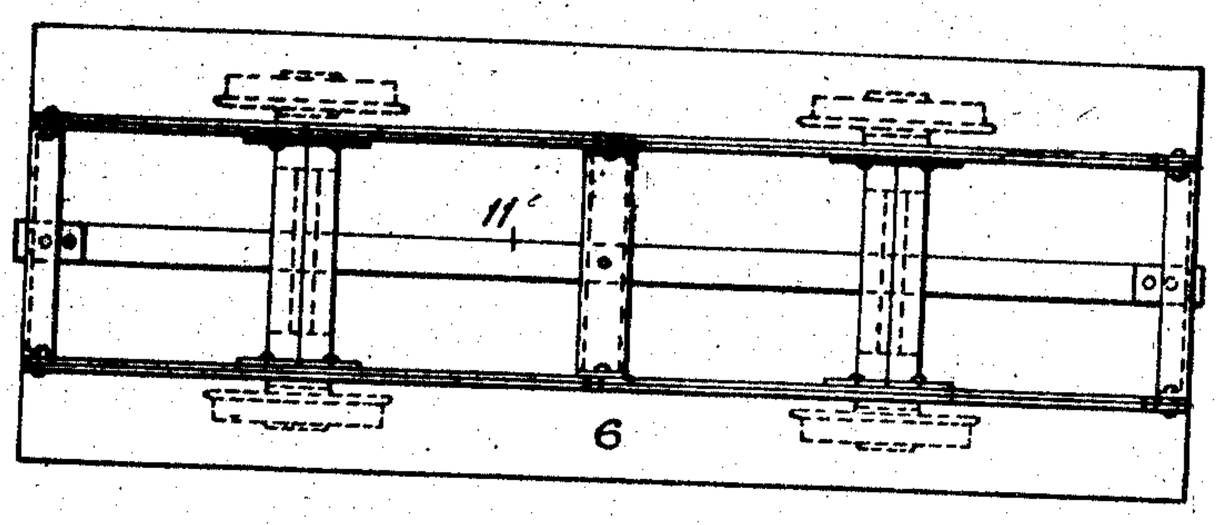


FIG. 6.

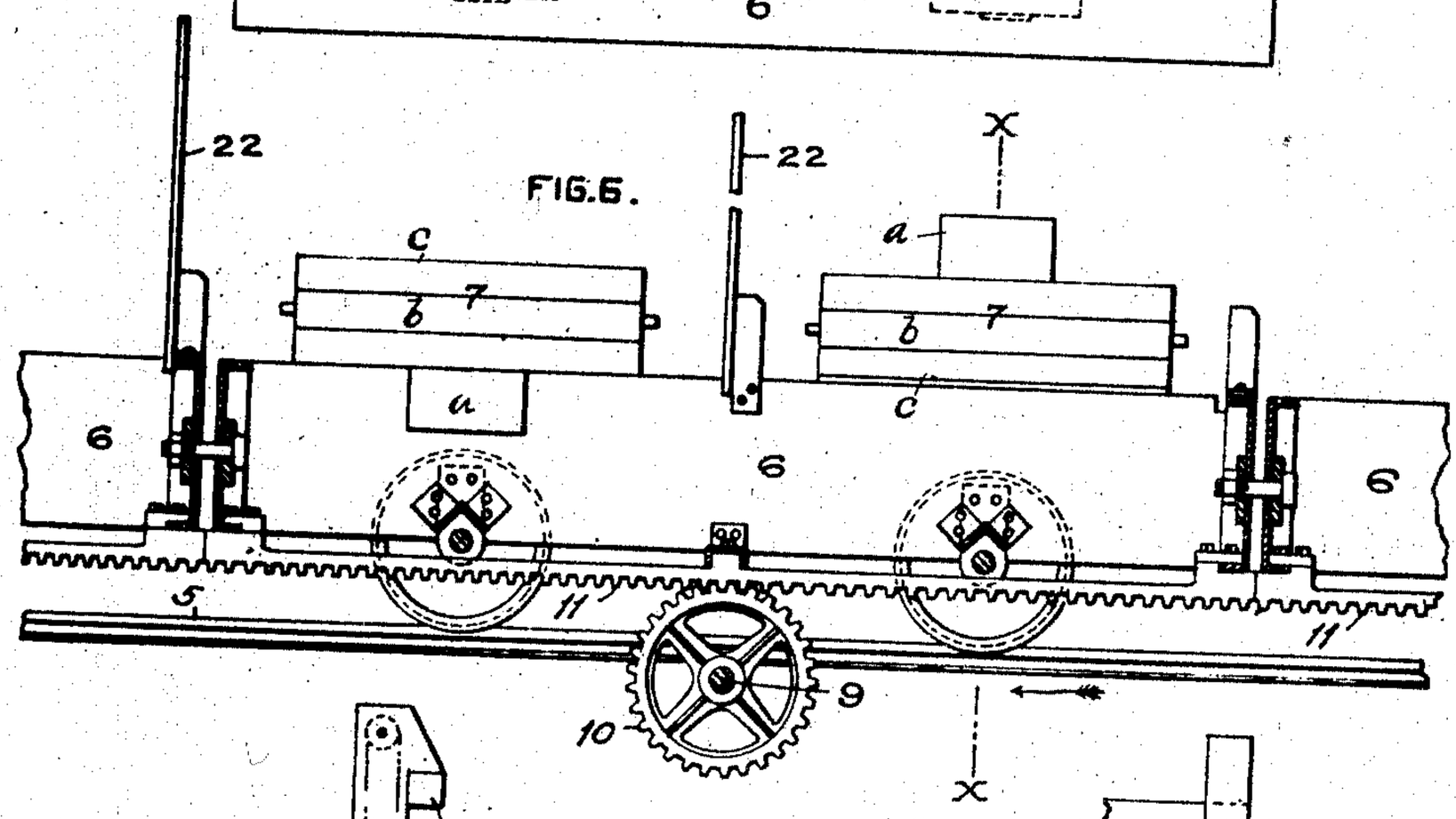


FIG. 8.

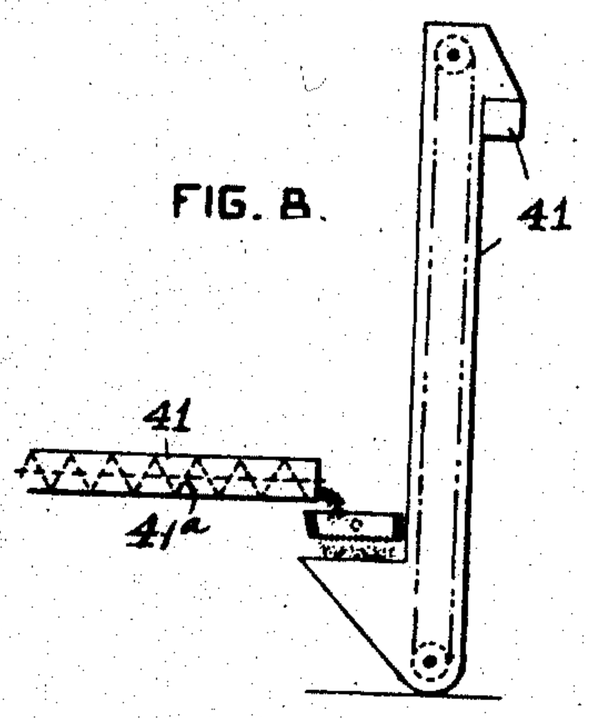


FIG. 7.

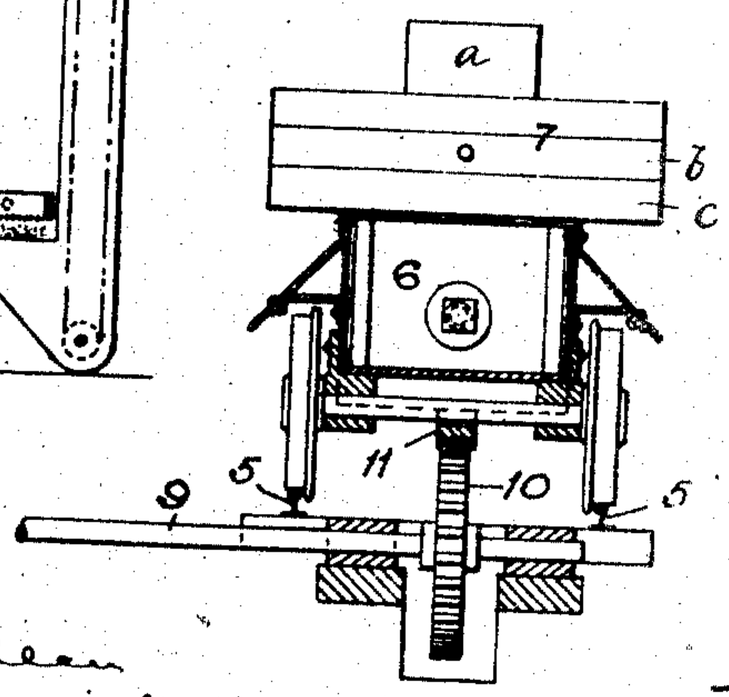
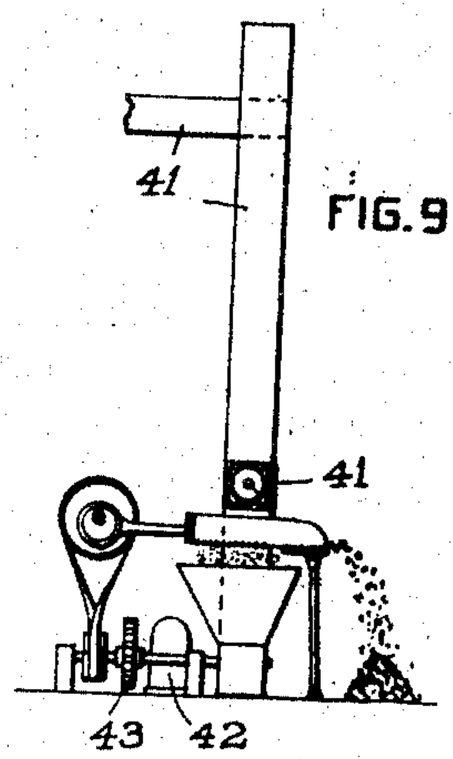


FIG. 9.



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No. 776,696. Patented December 6, 1904.

UNITED STATES PATENT OFFICE.

CLIFTON W. SHERMAN, OF BELLEVUE, PENNSYLVANIA.

CASTING PLANT.

SPECIFICATION forming part of Letters Patent No. 776,696, dated December 6, 1904.

Application filed May 22, 1901. Serial No. 61,389. (No model.)

To all whom it may concern:

Be it known that I, CLIFTON W. SHERMAN, a citizen of the United States, residing at Bellevue, in the county of Allegheny and State of Pennsylvania, have invented certain new and useful Improvements in Casting Plants; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to new and improved means for casting metals, and more particularly to a new and improved casting plant especially applicable for the manufacture of car-wheels.

To this end my invention consists of a casting plant, all as hereinafter described and claimed.

While I have shown my invention embodied in a casting plant for the manufacture of car-wheels and shall describe such a plant in this specification, a plant constructed with certain modifications in the apparatus or some changes in the arrangement of the same could be advantageously employed for the manufacture of other castings and would come within the scope of the present invention.

In the manufacture of cast car-wheels as heretofore practiced the work has been divided up among a number of molders, each having a space in the plant allotted to him, and most, if not all, the work done by hand-labor in a slow, expensive, and frequently in an unsatisfactory manner, the quality of the work as well as the amount of work performed depending upon the skill, judgment, and disposition of the operators.

Among the objects of my invention are to overcome the many disadvantages encountered in the systems heretofore in vogue in the manufacture of car-wheels, to lessen the original cost of a plant designed for this purpose, to reduce the cost of manufacture, to improve the quality of the wheels, and to provide new and improved means for performing the work before done by manual labor, whereby the making of the wheels is greatly expedited and the work performed in a continuous and orderly manner.

In the accompanying drawings, which illustrate a car-wheel-casting plant embodying my invention, Figure 1 is a plan view; Figs. 2, 3, and 4, elevational views showing different parts of the plant; Fig. 5, a top or plan view of a car; Fig. 6, a side elevational view showing cars, manner of connection between car and driving means, and the location of an equipment or flask upon a car; Fig. 7, a part-elevational view and a part-sectional view of an equipment or flask, a car, and the means employed for connecting the car with means for driving the same; and Figs. 8 and 9, detail views of screening apparatus.

Referring to the drawings, I have shown three cupolas, 1^a, 1^b, and 1^c, connected to a bull-ladle 2, which latter is arranged to discharge molten metal into a pouring-ladle 3, carried by the pouring-crane 4. Pouring-ladle 3 is arranged to swing directly over a portion of an endless track 5, on which cars 6, carrying equipments or flasks 7, travel. The term "equipment" is used to designate the cope *a*, chiller *b*, drag *c*, and bottom board, which comprise a flask employed in the manufacture of car-wheels. The form of cars or carriers for the equipments or flasks is particularly shown by Figs. 5 and 6 of the drawings, each car being designed to carry sets of two equipments or flasks thereon. While I have shown cars especially applicable for the class of work for which they are called upon to perform, other suitable forms of cars or carriers may be substituted in place of those shown. In building a plant for car-wheel manufacture it is necessary to bear in mind the great weight of the equipments, and a carrier capable of carrying one or more car-wheel equipments as well as the other parts and apparatus must be designed accordingly. All the cars are coupled together and form a train which is run by some suitable power. This train may be run continuously or intermittently, as desired. The means for driving the car as illustrated comprise an electric motor 8, which actuates a system of gearing, and shafts 9, each of the latter being provided with a driving-pinion 10, which is adapted to engage with a rack or pinion bar 11, securely attached to each car. It is obvious that the number of shafts 9 and their pinions 10, if it

is found necessary, may be more than two and that instead of employing an electric motor some other form of motor, such as a steam-engine, may be employed.

For the purpose of placing an equipment or flask upon and removing it from a car I provide a traveling crane, as indicated by the numeral 12.

After the equipments are placed on the cars and the train started the operation of preparing an equipment for the reception of the sand, &c., is commenced by placing a pattern in the drag part of the equipment at some suitable point along the track, as at 13. In describing the plant and the different operations I have deemed it advisable to follow one equipment or flask from the time the pattern is placed therein until that equipment has completed its trip around the track. The direction of travel of the cars is shown by the arrows. When the pattern is in position within the drag part *c*, a sufficient quantity of facing-sand is first supplied, after which the drag is filled with molding-sand. The sand is then rammed and the equipment rolled over and substantially the same operations repeated with respect to the cope part *a*. For carrying out these steps in the manufacture of the wheels I provide sand-bins, hoisting apparatus, and machines for ramming the sand. The sand-bins 14 and 14ª are supported over the track and cars. From these bins sand is fed to the drag and cope in the manner particularly shown by Fig. 3 through spouts 15, the amount of sand delivered being regulated by suitable means operated by levers 16. The purpose of the two sand-delivery spouts at the left and center of the bins 14ª is to furnish additional sand if it is found desirable to do so. This additional sand is rammed by an operator. In the figure just mentioned the bins 14 contain the facing-sand and the bins 14ª the molding-sand. The facing-sand, which usually consists of pulverized or fine coal mixed with the ordinary molding-sand, is formed by adding the proper quantity of the coal to the sand at some suitable point before the sand reaches the bins 14. After the sand is placed in the drag the operation of peening the flange is performed by a suitable ramming-machine 17, after which another machine 18 is employed for completing the ramming. The sand is then smoothed off by a plate 19, thereby finishing the drag, with the exception of venting, which is done by an operator. By the time the work on the drag is finished the car carrying the same will have arrived under a hoisting device 20, which is provided with a bail 21, adapted to engage pins or lugs on the chiller part of the equipment. The equipment of flasks being raised from the car by hoist 20, bottom board 22, which when not in use is carried on a car, as shown, is attached. After the bottom board is in position the equipment while suspended above the car is turned over, so as to bring the cope part with its dish uppermost. When this is accomplished, the equipment is lowered and placed is position on the car. Facing-sand and molding-sand are now fed to the cope and the peening of the rim, bars, and dish performed by ramming-machine 23, after which more sand is furnished to the cope and the operation of butting the bars of the cope and finishing the dish is performed by means of the butt-machine 24. The cope is then vented and the head-block drawn. The ramming-machines 17, 18, 23, and 24 are carried on an overhead support I I and are adapted to travel thereon. It may sometimes be desirable or preferable to ram the sand by hand, and when this is done of course the ramming-machines just described are not employed.

A crane 25, arranged to travel on a support 26, is provided with a hoisting device 27, having a bail 28, which latter when lowered over a car engages with lugs on the chiller. The object of these means is to raise the cope in order that the pattern may be withdrawn and the cores and chaplets set in position. During the operation of withdrawing the pattern, &c., crane 25 is moved along with the car carrying the flask from which the pattern is being removed. This movement of the crane is effected by the employment of a swinging arm 29, extending downwardly from the crane and engaging with the car. Arm 29 is swung into and out of engagement with the car by the operator who withdraws the pattern. The support 26 may, if preferred, be inclined in such a manner as to cause the crane to return by gravity to a position ready to hoist the following cope and chiller. The pattern having been withdrawn, the cope and chiller are lowered to the drag, and after being locked thereto the equipment or flask is ready to receive the molten metal. A charge of metal is supplied from the pouring-ladle 3, which swings over the cars, as described, and particularly illustrated by Fig. 1. The distance between the pouring-ladle and an overhead crane 30 is sufficient to permit the metal to solidify and to assume a condition ready for what is termed the "shaking-out" steps in the method of manufacture. These steps comprise, first, the removal of the equipment, with the exception of the bottom board, from the car and placing it cope down on the vacant space ahead; second, transferring the cast wheel from the car upon which it was formed to some suitable and convenient place within reach of a pitting-crane, (not shown,) and, finally, changing the bottom board to a vertical position. For the purpose of carrying out these steps I employ the crane 30, which travels on a support 31 and carries means for removing the equipment and the cast wheel, as shown by Fig. 4. The means shown comprise a hoisting device 32, having a bail 33, and a hoist 34, provided with tongs 35. After the flask

is raised from the cast wheel by hoist 32 the tongs 35 are employed for lifting the wheel from the carrier and depositing it within reach of a pitting-crane. The carriers or cars, as well as the track, are constructed in such a manner as to permit the sand to pass through both during the shaking-out steps, and as it falls down through them it is caught by a hopper 40, which communicates with a sand-conveying system 41. The sand conveyer or conveyers may be of any suitable construction and driven by any preferred style of motor. In the drawings I have shown a conveyer system comprising an endless screw 41ª, driven by means of an electric motor 42 and intermediate gear mechanism 43. In practice means should be provided throughout the length of the sand-hopper 40, so as to move sand from any part of the hopper. Sand from the hopper is conveyed to the bins 14 and 14ª, from whence it is fed to the equipment in the manner heretofore described. After the sand falls into the hopper it is cooled by water. I have considered it unnecessary to show means for discharging the water on the sand at this point, for it is evident it may be done in a very simple manner by running a water-pipe over the hopper. Such a construction as 44, hereinafter referred to, would answer the purpose. The sand should be screened before it is returned to the bins, and in Figs. 8 and 9 I have shown simple and efficient means for performing this operation. This apparatus, which may be placed at some convenient point along the line of travel of the sand from the hopper to the bins, comprises a screen actuated by motor 42 and gearing 43. The method of handling or moving and screening the sand by mechanical means instead of by manual labor permits of a great saving in the cost of manufacture of the wheels.

By reference to Fig. 4 it will be noted that a space on one car of the train is left vacant—that is to say, in placing the equipments on the train all the cars, with the exception of one, are loaded with two equipments. This arrangement I find desirable in order that when an equipment is removed from the cast wheel it may be carried forward and placed in an unoccupied space in the manner shown by Fig. 4. After the casting has been removed from the car and its equipment lowered into position the continued movement of the train will bring the equipment under the cooling apparatus 44, whereby it is sufficiently cooled to receive a pattern, &c., on its next trip. If it is desirable or necessary, an equipment after having completed a trip may be removed from the carrier and another one substituted therefor. For this work the crane 12 is utilized.

Attention is called to the comparatively long travel that the stripping-crane may make when necessary. This is for the purpose of removing the equipment from the casting just at the proper time—that is to say, if the wheel is not in condition for stripping when it arrives under the crane and at the point at which it is usual to strip it is allowed to remain a little longer in the equipment and the crane caused to move over the equipment until the metal is in condition. In the plant illustrated it will take about twenty minutes for an equipment to travel from the pouring-ladle to the stripping-crane, and as this is the time it usually takes for the car-wheel casting to solidify and come to the proper temperature for drawing the casting it can ordinarily be removed when it first reaches the crane. If, however, it is found it is not yet in condition for removal, the crane is caused to travel along with the car until the proper time for stripping arrives. The importance of "stripping" the moment the casting has arrived at the right temperature is well known to car-wheel makers, and it will be noted that the means shown enable me to perform this important step in such a manner as to insure more of a uniformity in the castings than is the case under the old methods of manufacture.

What I claim is—

1. In a casting plant, the combination, with an endless way, of a traveling carrier, a flask carried by said carrier, a mechanism for separating the casting and flask and replacing the flask on the carrier, a mechanism for removing said casting, said mechanisms located adjacent to and in line with the line of travel of said carrier and adjustable in said line of travel, substantially as set forth.

2. In a casting plant, the combination, with a traveling carrier, a flask mounted thereon, a molding mechanism, a lifting mechanism for permitting the withdrawal of the pattern, means for permitting the lifting mechanism to travel in line with the line of travel of the carrier, and means for engaging said latter mechanism with said carrier, substantially as set forth.

3. A casting plant having means for effecting with respect to a traveling flask a complete casting operation and return of the flask to a starting-point in a cycle of mechanical operations consisting, of the combination, with an endless way, of a series of traveling flasks thereon, a mold-sand-supply mechanism, a ramming mechanism, a lifting mechanism for permitting the withdrawal of the pattern, a pouring mechanism, a mechanism for separating the flask and casting and replacing the flask, and a casting-removing mechanism, said last-named mechanisms having means to permit a travel thereof in line with the line of travel of the flasks, substantially as set forth.

4. In a casting plant, the combination, with an endless way, of a series of traveling flasks thereon, said flasks each comprising a cope and a drag, successive mechanisms as follows arranged in order named for making a mold and casting, namely, sand-supply bins having

spouts depending above said way, for filling the drag, drag-ramming mechanisms, a sand-scraper, a flask-hoisting device, sand-supply bins and spouts for supplying the cope, a cope-ramming mechanism, a lifting mechanism for permitting the withdrawal of the pattern and a pouring mechanism, substantially as set forth.

5. In a casting plant, the combination with an endless way of an endless series of connected carriers, a series of flasks on said carriers, interrupted at one point by a vacant space on one carrier, a mechanism for separating the casting and flask and placing the flask on the vacant space, and a mechanism for removing the casting, said mechanism arranged to travel above the carriers and in line with the line of travel of the carriers, substantially as set forth.

6. A casting plant having an endless way, a series of carriers mounted on the endless way, means for moving the carriers, a series of flasks on said carriers, sand-supply means arranged to furnish sand to the flasks, means for raising a flask, inverting the same and replacing the flask on a carrier, a lifting mechanism for permitting the withdrawal of the pattern, a pouring mechanism, a mechanism for separating the flask and casting and replacing the flask on a carrier, and a casting-removing mechanism, substantially as set forth.

7. In a casting plant the combination, with an endless way, of a series of traveling flasks thereon, said flasks each comprising a cope and drag, successive mechanisms as follows arranged in the order named, sand-supply means for filling the drag, means for raising a flask from a carrier, inverting the flask and replacing the flask on a carrier, sand-supply means for the cope, a lifting mechanism for permitting the withdrawal of the pattern, a metal-pouring mechanism, a mechanism for separating the flask and casting, and a mechanism for removing the casting from the carrier, substantially as set forth.

In testimony whereof I affix my signature in presence of two witnesses.

CLIFTON W. SHERMAN.

Witnesses:

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W. G. DOOLITTLE.