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R. BAGGALEY.

APPARATUS FOR PRODUCING VITRIFIED BRICKS, TILES, AND OTHER ARTICLES.

APPLICATION FILED APR. 19, 1904.

3 SHEETS—SHEET 1.

Fig. 3.

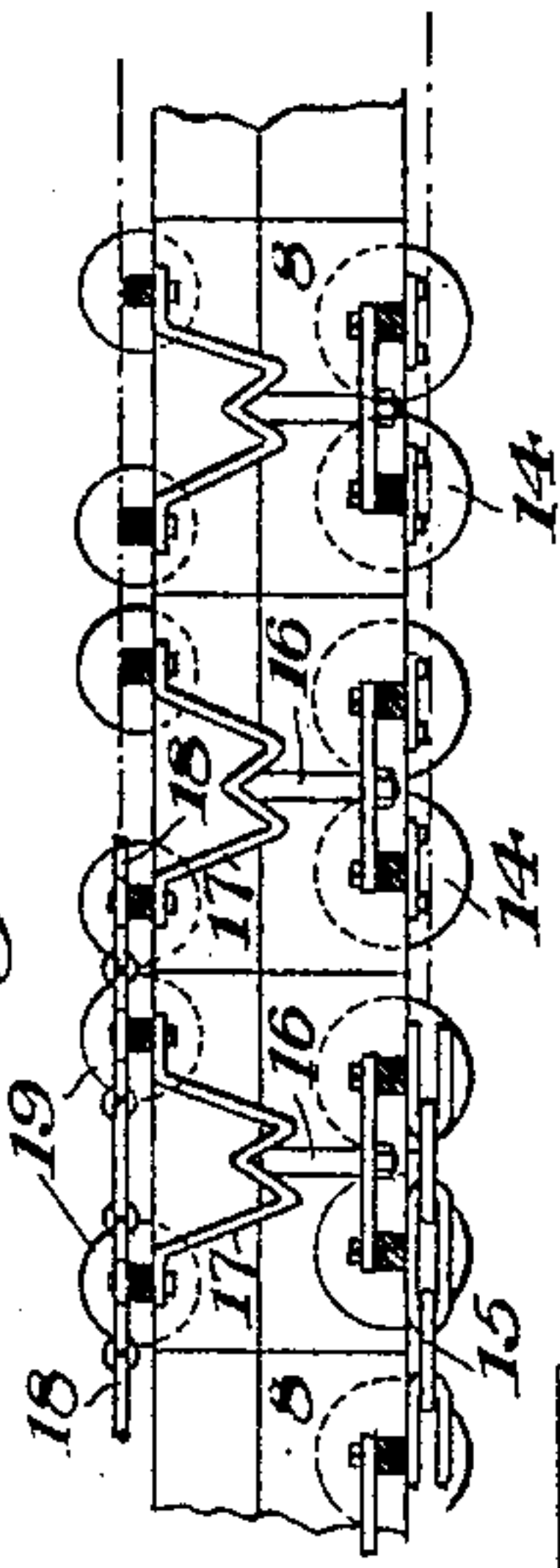


Fig. 2.

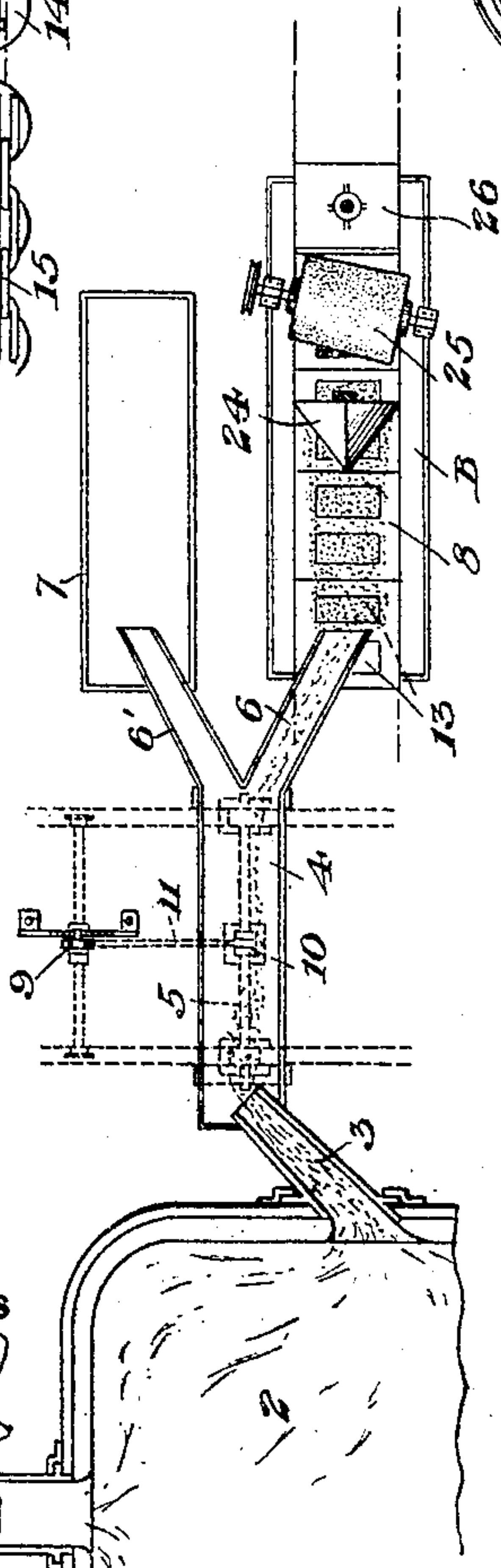
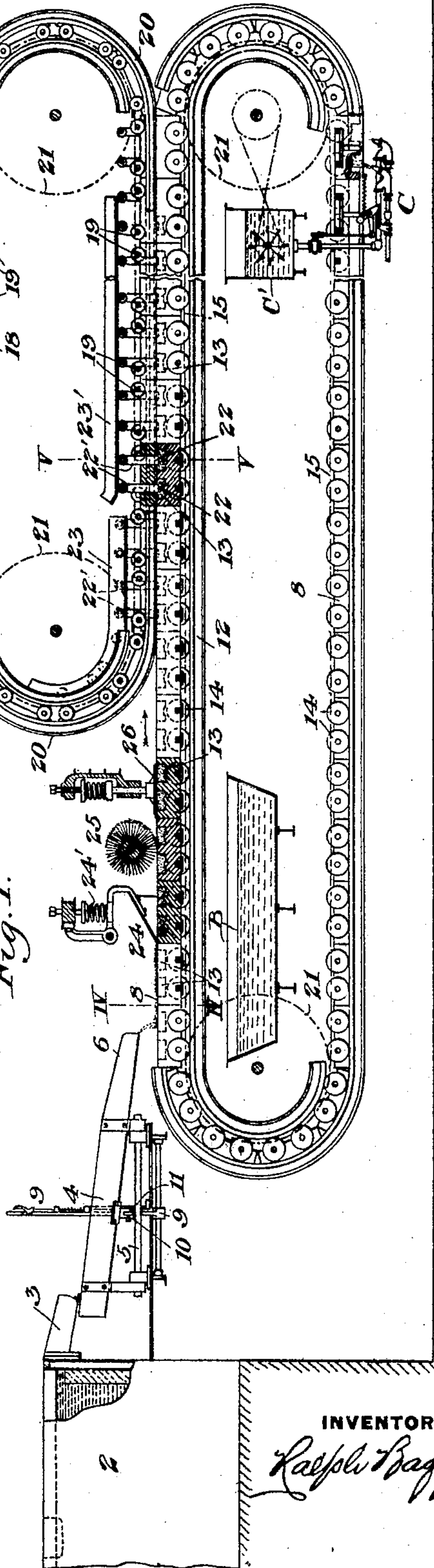


Fig. 1.



WITNESSES

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3 SHEETS—SHEET 2.

Fig. 5.

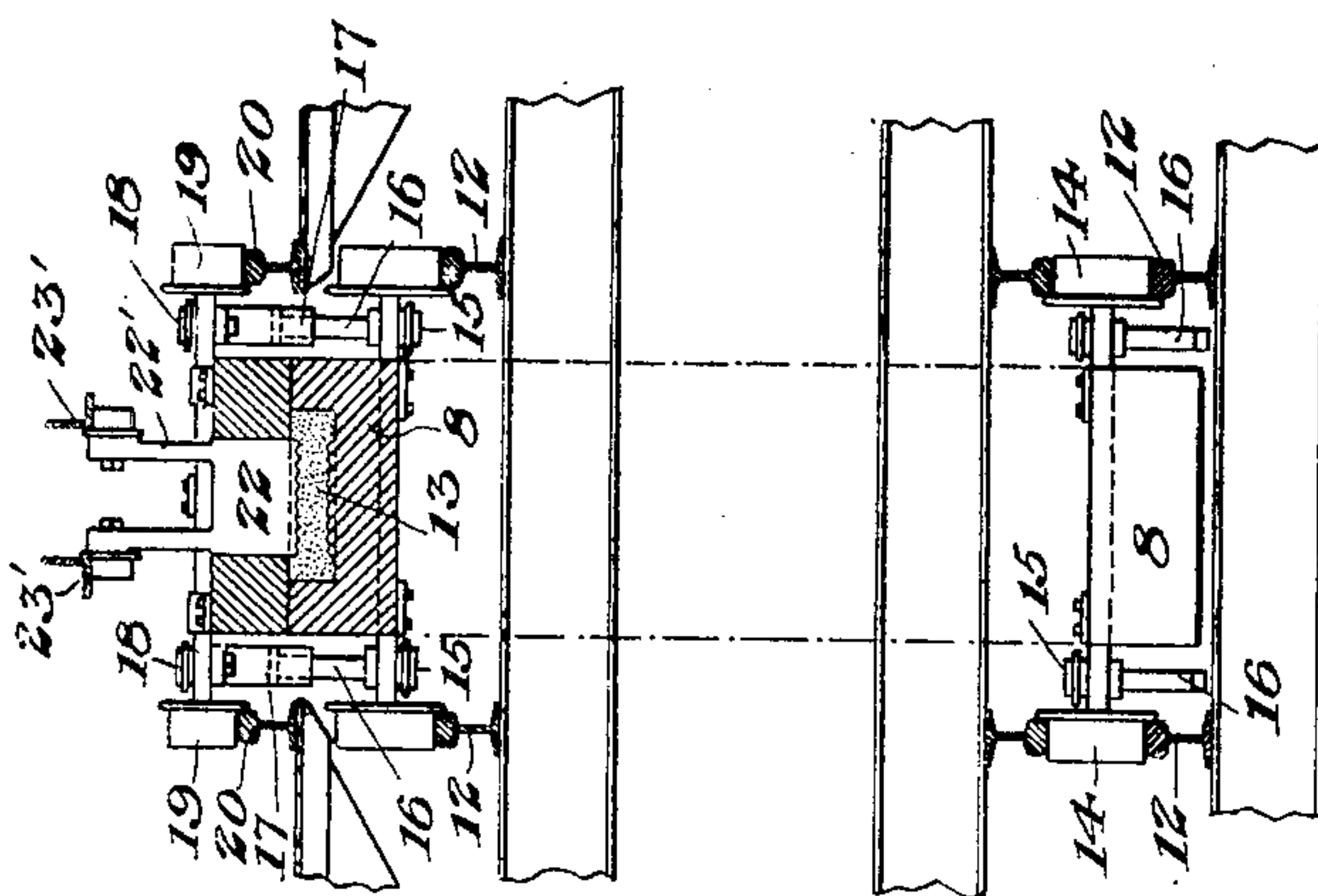
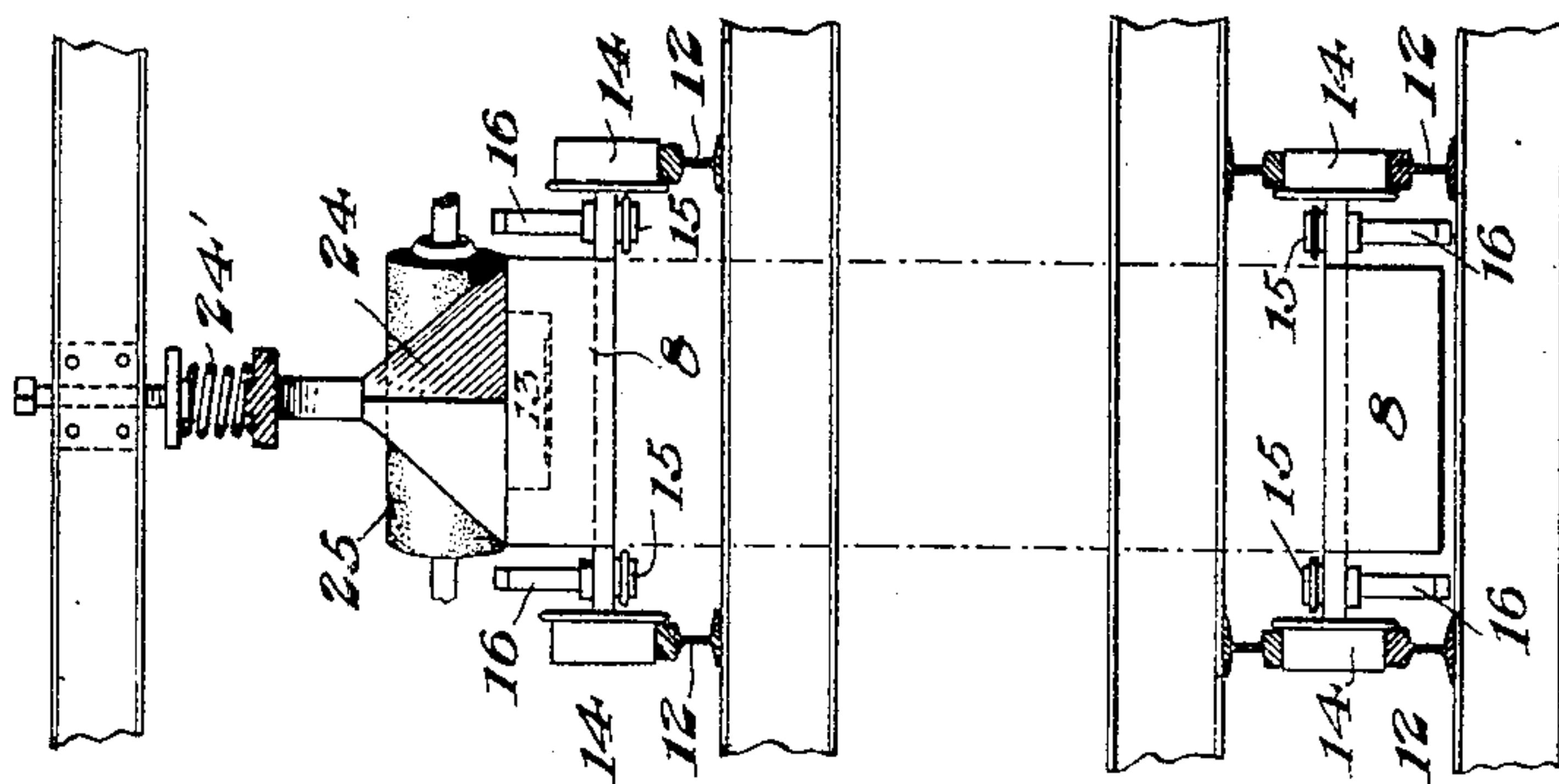


Fig. 4.



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3 SHEETS—SHEET 3.

Fig. 7.

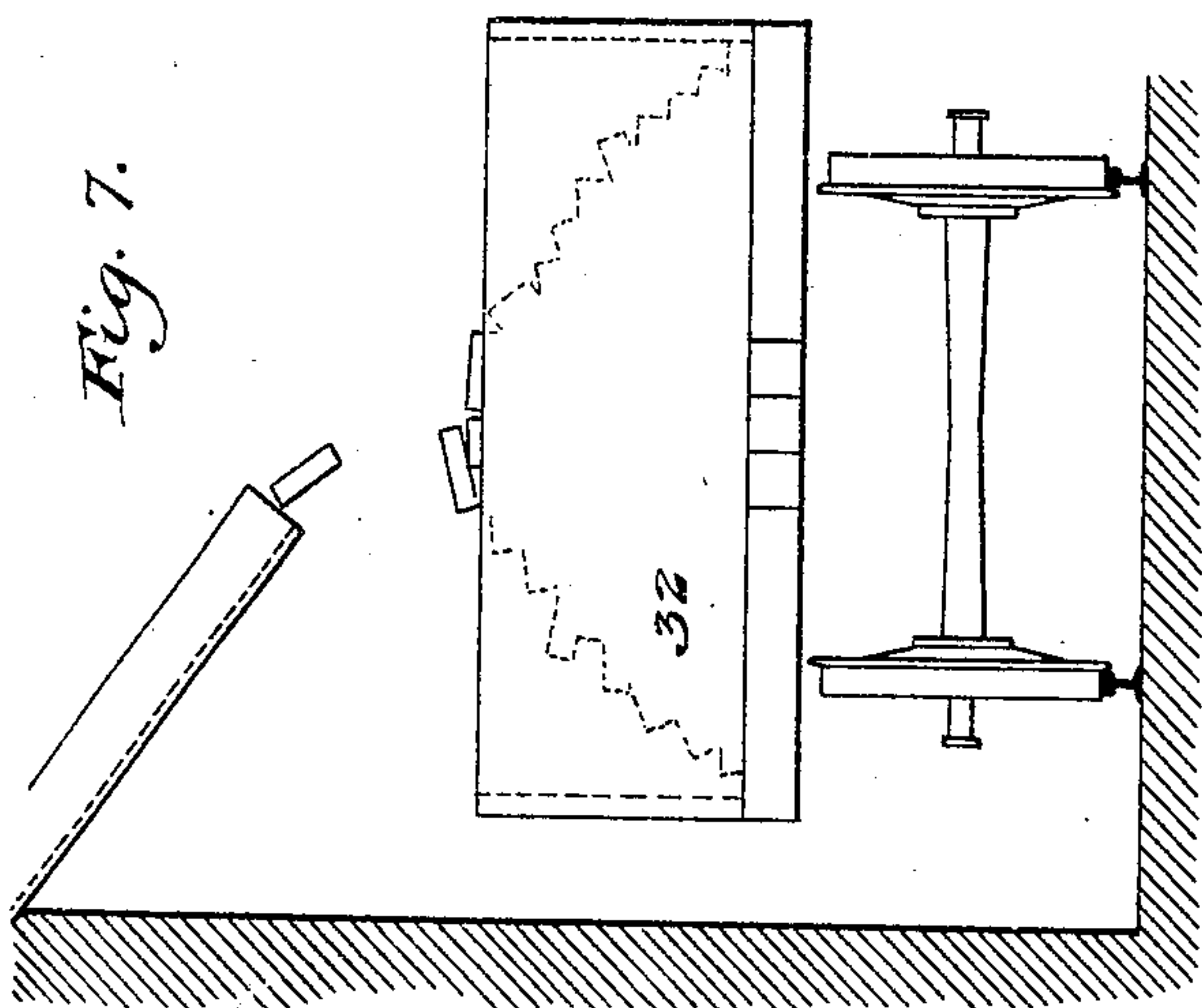
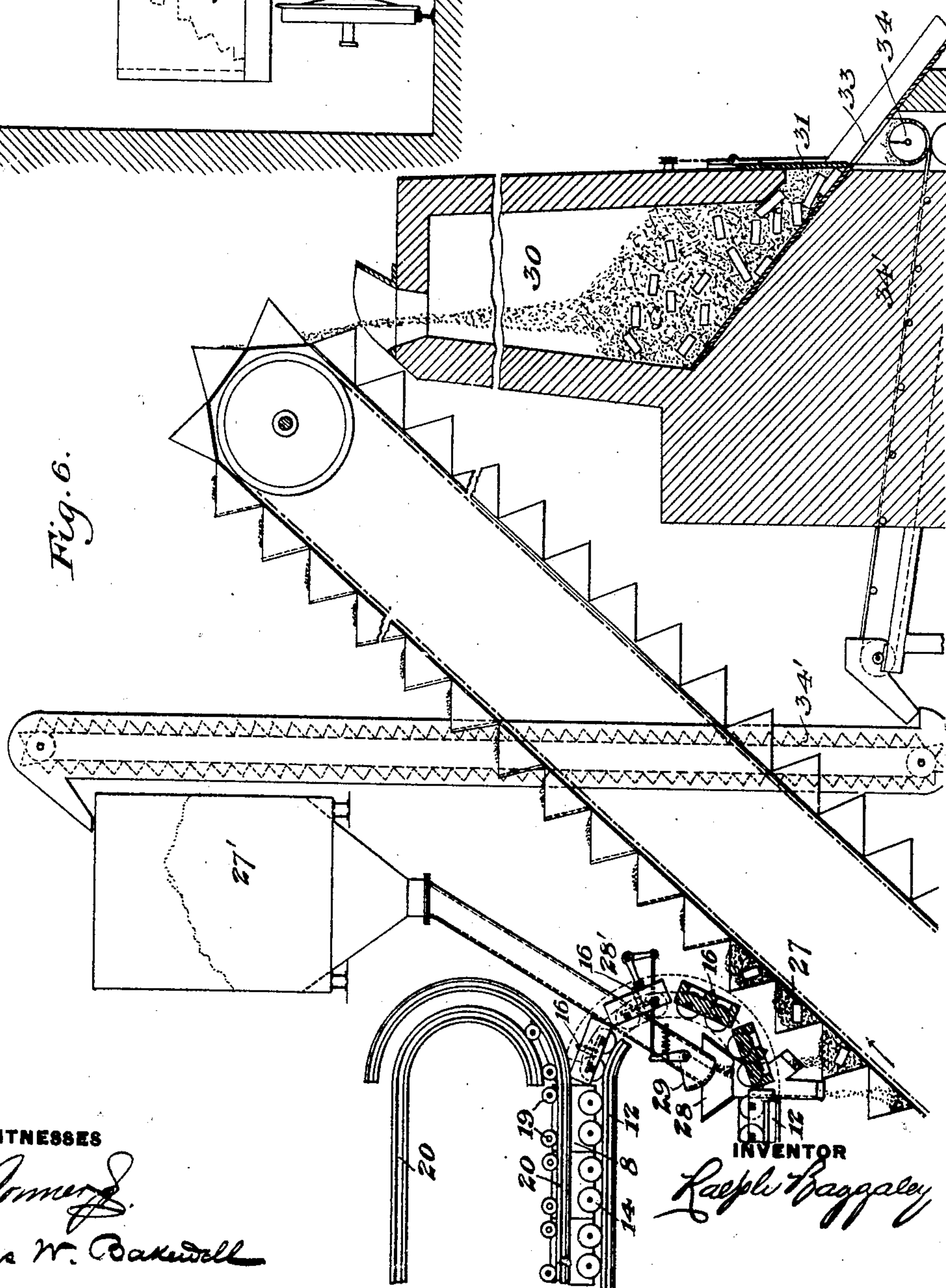


Fig. 6.



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# UNITED STATES PATENT OFFICE.

RALPH BAGGALEY, OF PITTSBURG, PENNSYLVANIA.

APPARATUS FOR PRODUCING VITRIFIED BRICKS, TILES, AND OTHER ARTICLES.

No. 805,702.

Specification of Letters Patent.

Patented Nov. 28, 1905.

Application filed April 19, 1904. Serial No. 203,885.

*To all whom it may concern:*

Be it known that I, RALPH BAGGALEY, of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented an Apparatus for Producing Vitrified Brick, Tiles, and other Articles, of which the following is a description, reference being had to the accompanying drawings, in which—

Figure 1 is an elevation of the apparatus, partly in section. Fig. 2 is a partial plan view. Fig. 3 is a detail view showing means for centering the molds and their covers. Fig. 4 is a vertical section on the line IV IV of Fig. 1 viewed in the direction of the arrow and on a larger scale. Fig. 5 is a similar section on the line V V of Fig. 1. Fig. 6 is a side elevation, partly in section, of the delivery end of the parts shown in Fig. 1, together with the annealing apparatus. Fig. 7 is a view of the discharge from the annealing device into a car for shipment.

The object of my invention is to utilize a hitherto waste by-product and without manual labor to produce vitrified bricks, tiles, paving-blocks, and many other useful shapes. The material which I employ is the slag from a copper-smelter furnace, and to produce slag suitable for my purpose the charge of ores and fluxes in the furnace should be such that the resulting slag will be a silicate of iron containing not less than ten per cent. of lime, and preferably more. After this slag has flowed from the forehearth of the smelting-furnace, in which it is separated from its contained mineral-bearing mattes, I conduct it by gravity to the brick or tile molding mechanism.

2 is the forehearth of a smelting-furnace, having a slag-spout 3, under which is a rocking spout-section 4, mounted on a longitudinal axis 5 and having a forked delivery end 6 6', one branch of which is over a slag-granulating spout 7 and the other branch is over the course of the molds 8 8. The spout 4 is rocked on its axis 5 by means of a hand-lever 9, connected with the spout by a crank 10 and link 11, and it may be rocked thereby to deliver the slag either into the slag-granulator or the molds, or into both, in any desired proportion.

The molds 8, which pass under the branch 6 of the spout 4, are mounted in endless series and pass around tracks 12, as described below. They are shown in detail in Figs. 4 and 5, each mold having a body portion of heavy metal and preferably two open ma-

trix-cavities 13, and being attached to wheeled trucks 14, which travel on the tracks 12 and are connected by the links of endless chains 15. At intervals the chains have vertically-projecting fingers 16 adapted to engage recessed guide projections 17 on the chains 18 of an endless series of mold-covers, which are carried by wheeled trucks 19 on rails 20 and are adapted to move with their bottom surfaces in contact with and on the same plane with the top surface of the molds for a portion of the longitudinal course of the latter, as shown in Fig. 1. The endless series of molds and mold-covers are driven by suitable mechanism 21 at the same speed; but to keep them in exact register I provide the engaging parts 16 17, as above described. The mold-covers are of sufficient weight to resist by gravity the pressure which is applied to the plastic slag in the molds, and each cover carries two plungers 22, which are vertically movable in the cover and have arms 22' supported by rails 23 for a part of their travel, but are in proper position to enter the mold-cavities and to press the middle portions only of the articles by gravity when the mold and cover are in contact and the plunger-arms have passed the rails 23, as shown in Fig. 5. The plunger-arms 22' may then be pressed down to force the plungers positively against the articles by engagement of the arms with guiding-rails 23', arranged above the path of the covers and molds to insure the requisite pressure necessary in forcing the liquid or plastic material into all parts of each mold should the plunger stick in the cover and fail to perform this function by gravity alone.

The molds as they pass beneath the branch 6 of the spout receive therefrom a charge of molten slag, the rocking spout being adjusted as nearly as possible to fill the mold exactly as it passes; but if there is an overflow it will be caught by a water-bosh B beneath. The filled mold then passes under a scraper-blade 24, which is held yieldingly upon it by a spring 24', a revolving steel brush placed at an angle to the molds, and a second spring-scraper, which together brush and scrape all surplus slag from the molds and their edges, so that when they reach the mold-covers they will fit neatly the one upon the other. The cleaning of the edges of the molds in this way is important, and the action of the scraper may therefore be supplemented by the rotated brush 25 and scraping-plate 26.



The molds whose surfaces have thus been scraped and brushed free of all particles of congealed slag next pass in succession under the traveling covers, which are automatically placed upon them, and as the meeting faces of the covers and molds are planed and will therefore make perfect joints no parting-fins will be formed on the articles. The weight of the cover is purposely made greater than that of the articles to be made. The outer portion of the slag in contact with the mold-surface chills very quickly, while the inner portion remains molten for a considerable time. I avail myself of this fact by applying pressure to the inner portion of the congealing article to cause it to fill the cavities of the mold, so as to produce full sharp lines on the article in process of manufacture. For this purpose after the cover has been placed upon the mold by the machine the central movable plungers 22 of the cover are allowed to drop by gravity, if they will; but should they stick in the cover then they are pressed down automatically by the top rail into the still molten slag in the central portion of the mold. This produces indentations or corrugations on the middle surface of the brick or tile and also by its weight creates a pressure upon that portion of the article that is still molten, forcing it upward against the superincumbent cover and making a perfect brick or tile with sharp edges. The bottom of the mold is also indented or corrugated, as shown in Fig. 5, and recessed spaces are therefore provided on each side of each brick or tile for the mortar, hydraulic cement, or other binding agent that may be used in construction work to hold it in place. Red brick or fire-brick as ordinarily used in construction work are necessarily porous, and because of this fact mortar, hydraulic cement, or any other binding agent will form a perfect bond with them. This is not the case with vitrified brick or tile, which are impervious to water, and to mortar or hydraulic cement, so that in order to create a bond in construction work with such tiles or bricks their flat sides should be corrugated or indented, as above described. By flowing the slag into the molds, then removing the surplus slag, if any, from each mold and its edges, and then putting covers on the molds and applying pressure I produce articles which are not disfigured or injured by the breaking off of pouring gates or sinking heads, as in the case of slag articles heretofore made.

In order to prevent sticking of the pressed articles within the molds, I coat them with a thin refractory wash of clay and water or the like, which I apply with a spraying device C. The wash is preferably supplied by gravity from an elevated tank C'.

The machine is designed so that the travel of each mold will be sufficiently prolonged

that the heavy mold and the heavy cover, as hereinbefore described, will have time to thoroughly solidify each brick or tile and to partially anneal the same before the discharge-point in the machine has been reached at which the brick or tile is discharged automatically. As each brick or tile is discharged from the mold it falls by gravity in a thoroughly-congealed state, though still very hot, into a bucket elevator or conveyer 27, whereupon dry sharp sand or dry granulated slag is automatically discharged by the machine in sufficient quantity to fill the bucket containing the hot article. Sufficient sand is previously deposited in each bucket to prevent the hot article from coming into contact with the metal of the bucket, so that it may not thus be chilled. In this manner the cooling of the article is retarded, and it is prevented from becoming brittle. The automatic discharge of the sand from the sand-hopper and spout 28, both before and after the entrance of the hot piece into the bucket, may be effected by a lever 28', connected with the spout-gate 29 and adapted to be moved twice momentarily by each passing bucket and to open the gate to permit the flow of a suitable portion of sand into the bucket, first to form a bed and thereafter to form a non-conducting air-proof covering for the article. The elevator carries the protected brick or tile to and over an annealing-receptacle or soaking-pit 30, preferably constructed of brick, into which the still hot article, with its accompanying sand or granulated slag, is discharged. This operation is continued until the annealing-receptacle is completely charged, whereupon a suitable covering or envelop of dry sand or granulated slag is preferably discharged by the elevator to a depth of one or two feet over the entire contents in order still further to protect the articles from the atmosphere and to force them to cool very slowly and to become thoroughly annealed. There may be a number of such annealing-pits into which the elevator may discharge, or, if preferred, the elevator may discharge upon a suitable conveyer, whereby the hot articles still protected from the atmosphere may be delivered successively into any desired number of annealing-pits. It is important that roofs should be erected over the top of these annealing-pits in order to protect the contents from rain, snow, wind, or even from intense cold. The movement of the bricks or tiles through the elevator and into the annealing-pit will have the effect of removing any fins or excrescences that may exist upon them. In constructing the annealing-pits I observe the following points: I provide the bottom with a floor at an angle of about forty-five degrees, so that the brick and the sand or the granulated slag may be discharged automatically by gravity when a suitable door 31



at the side is opened for this purpose. I provide a railroad-track, Fig. 7, in front of the mouth of each pit in such position and on such level that the articles will be forced to slide by gravity into the center of each car 32 and throughout the entire length of said car in order thus to completely load a car without manual labor. At the bottom of the door I provide a grizzly or slide 33, composed of bars or rods of iron or steel over which the bricks slide in their passage from the annealing-pit into the center of the railroad-car. The spaces between these bars are too small to permit the brick to fall through; but the sand or granulated slag will pass readily through them and will thus become thoroughly separated from the articles as both are discharged by gravity out of the annealing-pit. Underneath the bars I provide a suitable conveyer 34 34', which returns the sand or granulated slag to the supply-hopper 27' of the machine, from which such material is again used in protecting and in annealing the brick or tile, as before stated.

Bricks and tiles produced by my invention possess important advantages. They are thoroughly annealed and of perfect shape, and their density is such that rain will serve only to wash their surface without in any way injuring them. For sewers, foundations, and other underground structures they are of especial utility, because they are impervious to moisture and possess great power of resistance to crushing strains.

Many modifications of my invention will suggest themselves to those skilled in the art without departing from the spirit of my invention, since—

What I claim is—

1. Apparatus for the manufacture of vitrified articles from slag, comprising molds means for feeding molten slag thereto, gravity-retained covers for said molds, and movable pieces adapted to press upon a portion of the slag in the molds and to shape the same; substantially as described.

2. Apparatus for the manufacture of vitrified articles from slag, comprising movable molds means for feeding molten slag thereto, gravity-retained covers for said molds, and movable pieces adapted to press upon a portion of the slag in the molds and to shape the same, means for moving the molds and means for applying the covers to the molds automatically; substantially as described.

3. Apparatus for the manufacture of vitrified articles from slag, comprising molds means for feeding molten slag thereto, covers for said molds, and plungers, said mold covers and plungers mounted in said covers being arranged in series and adapted to travel in contact; substantially as described.

4. Apparatus for the manufacture of vitrified articles from slag, comprising molds means for feeding molten slag thereto, grav-

ity-retained mold-covers and plungers mounted in said covers, said molds traveling in series, and means for applying the covers to the molds; substantially as described.

5. Apparatus for the manufacture of vitrified articles from slag, comprising molds adapted to receive molten slag from a slag-supply, plungers for shaping the articles, covers for said molds of greater gravity than the pressure to be applied to the plungers, and means for applying pressure to the plungers; substantially as described.

6. The mold-covers having plungers in their middle portions, arranged in traveling series and independent means for supporting the plungers; substantially as described.

7. The mold-covers having plungers in their middle portions, arranged in traveling series, independent means for supporting the plungers, and means for depressing them; substantially as described.

8. Apparatus for the manufacture of vitrified articles from slag, comprising molds adapted to receive molten slag from a slag-supply, said molds being arranged in endless series, mold-cleaning devices, and traveling plungers adapted to meet the molds; substantially as described.

9. Apparatus for the manufacture of vitrified articles from slag, comprising molds adapted to receive molten slag from a slag-supply, said molds being arranged in endless series, traveling plungers adapted to meet the molds, and covers; substantially as described.

10. Apparatus for the manufacture of vitrified articles from slag, comprising molds adapted to receive molten slag from a slag-supply, conveying mechanism to which the articles are delivered from the molds, and means for supplying a protective covering material to the articles to retard their cooling; substantially as described.

11. Apparatus for the manufacture of vitrified articles from slag, comprising molds adapted to receive molten slag from a slag-supply, a heat-retaining conveying mechanism to which the articles are delivered from the molds, and an annealing-chamber into which the articles are discharged by the conveying mechanism; substantially as described.

12. Apparatus for the manufacture of vitrified articles from slag, comprising molds adapted to receive molten slag, means for moving the molds in a series for a sufficiently long period of time to permit setting of the articles, and an annealing-chamber into which the articles are discharged, said annealing-chamber having a sloping bottom and an opening for the discharge of the annealed articles; substantially as described.

13. Apparatus for the manufacture of vitrified articles from slag, comprising molds adapted to receive molten slag from a slag-



supply, means for moving the molds for a  
sufficiently long period of time to permit set-  
ting of the articles, an annealing-chamber  
into which the articles are discharged, said  
5 annealing-chamber having a sloping bottom  
and an opening for the discharge of the an-  
nealed articles and an open discharge-slide  
by which the articles are separated from the  
protective material used in annealing; sub-  
10 stantially as described.

14. Apparatus for the manufacture of vit-  
rified articles from slag, comprising molds  
adapted to receive molten slag from a slag-  
supply, conveying mechanism to which the

articles are delivered from the molds, an an- 15  
nealing-chamber into which the articles are  
discharged by the conveying mechanism, and  
means for delivering the annealed articles  
mechanically from the annealing-chamber to  
a car to load the same; substantially as de- 20  
scribed.

In testimony whereof I have hereunto set  
my hand.

RALPH BAGGALEY.

Witnesses:

J. H. REED,

THOMAS W. BAKEWELL.