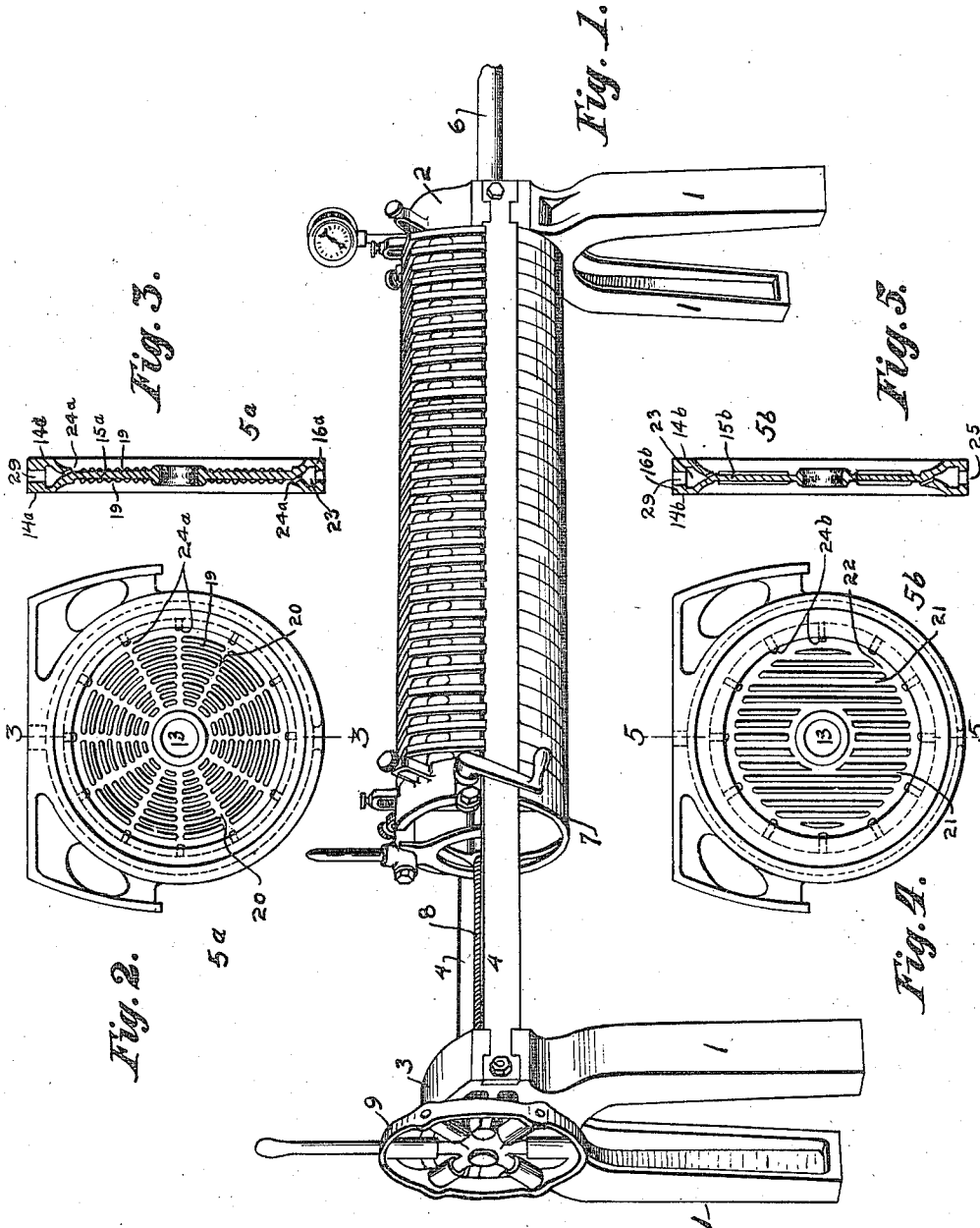


H. H. WHITING.  
 FILTER PRESS.  
 APPLICATION FILED SEPT. 4, 1908.

964,725.

Patented July 19, 1910.

2 SHEETS—SHEET 1.



WITNESSES

*Joel H. Hales*

*Ruth C. Miller*

INVENTOR

*Horace H. Whiting*

BY

*Harry Freese*  
 ATTORNEY

H. H. WHITING.  
 FILTER PRESS.  
 APPLICATION FILED SEPT. 4, 1908.

964,725.

Patented July 19, 1910.

2 SHEETS—SHEET 2.

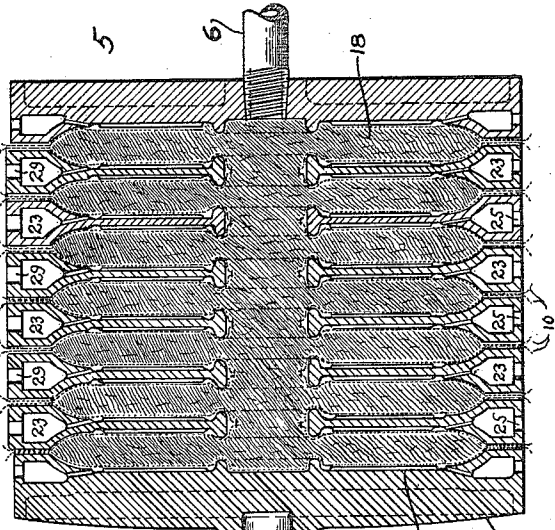


Fig. 8.

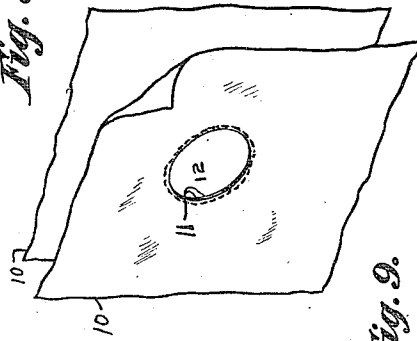


Fig. 9.

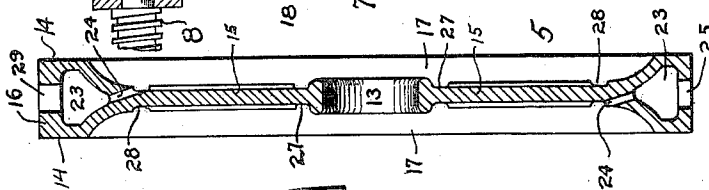


Fig. 7.

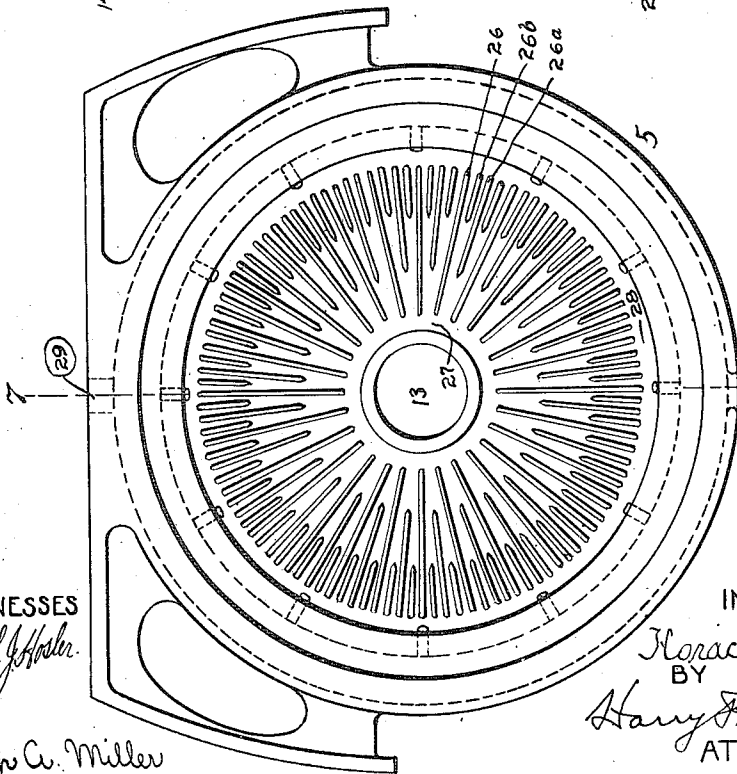


Fig. 6.

WITNESSES

Joseph J. Walker

Paul C. Miller

INVENTOR

Horace H. Whiting

BY

Harry Freese  
 ATTORNEY

# UNITED STATES PATENT OFFICE.

HORACE H. WHITING, OF CANTON, OHIO.

## FILTER-PRESS.

964,725.

Specification of Letters Patent.

Patented July 19, 1910.

Application filed September 4, 1908. Serial No. 451,651.

*To all whom it may concern:*

Be it known that I, HORACE H. WHITING, a citizen of the United States, residing at Canton, in the county of Stark and State of Ohio, have invented a new and useful Improvement in Filter-Presses, of which the following is a specification.

The invention relates to an apparatus commonly known as a filter press for separating water from solid substances dissolved or suspended therein, as, for instance, ground or washed clay, sewage substances and other detritus; and a familiar form of such apparatus includes a series of disk-plates having concave sides and assembled side by side each with two intervening sheets of canvas—the plates and the canvas being provided with central apertures, and the edges of the apertures of the canvas sheets located on opposite sides of the same disk being connected together through the disk-aperture so that when the canvas sheets are compressed together by the abutment of the peripheral flanges of the plates, a longitudinal channel is formed through the plate and canvas apertures, which channel opens into radiating cavities formed between the canvas sheets on the respective sides of opposing plates. The solution is pumped into the longitudinal channel and fills the radiating cavities, whence the water filters through the canvas and is discharged through suitable grooves and apertures formed in the body of the plate, and the solid residuum is deposited and packed in the form of disk-like cakes in the cavities between the canvas linings of opposing plates.

The objects of the present invention include the shaping and constructing of plates with reasonably thin webs but of sufficient strength to stand the strains imposed upon them; and the providing of means for permitting the water and the air to escape freely from the cavities between the plates in all peripheral directions, and for discharging the water and air from the plates through separate outlets and vents located respectively in the lower and upper edge walls of the respective plates. These objects are attained by the construction and arrangement illustrated in the accompanying drawings, forming part hereof, in which—

Figure 1 is a perspective view of an ordinary form of filter press, showing the plates

in outline but omitting the canvas sheets; Fig. 2, a side elevation of an improved plate with a primary form of web; Fig. 3, a section on line 3—3, of Fig. 2; Fig. 4, a side elevation of an improved plate with a secondary form of web; Fig. 5, a section on line 5—5, of Fig. 4; Fig. 6, a side elevation of an improved plate with the improved form of web; Fig. 7, a section through line 7—7, of Fig. 6; Fig. 8, a longitudinal section of a number of improved plates collocated or assembled together between head plates, showing the canvas sheets and clay cakes between the plates; and Fig. 9, a perspective view of the canvas sheets pertaining to one of the plates.

Similar numerals refer to similar parts throughout the drawings.

The frame of the apparatus is composed of the legs 1 of which a pair are located at each end of the press, the fixed heads 2 and 3 formed or supported on the legs, and the side bars 4 which are connected at each end with the heads. The side bars form tracks or slides on which the disk-plates 5, 5<sup>a</sup> or 5<sup>b</sup> are supported and operated.

The head 2 on the rear end of the press is provided with the axial aperture with which is connected the inlet pipe 6 through which the solution is pumped into the press, and the inner side of this head is shaped like the side of one of the plates, thus constituting a fixed head for the series of plates. The movable head 7 is shaped on one side like the side of the plate, and in the other side is swiveled the longitudinal screw 8 which operates in and through the fixed head 3 on the forward end of the frame and is provided on its forward free end with the crank wheel 9, by means of which the screw is rotated and the movable head is operated endwise along the side bars.

A pair of canvas sheets 10, joined together at the edges 11 of the central aperture 12 pertains to each plate, one sheet being placed on each side of the plate, and the joined edges of the central aperture being located in the central aperture 13 of the plate; and when the plates are assembled together, the canvas sheets are held by being compressed between the side faces or rims 14 formed at the periphery of the several plates.

The web 15 of the plate is made quite

thin as compared with the peripheral or rim portion 16, 16<sup>a</sup> and 16<sup>b</sup> thereof, so that a dish-like concavity 17 is formed in each side of the plate, thus forming the radial cavities 18, between the canvas sheets on the opposing sides of adjoining plates.

A primary form of the web of the plate includes a series of annular grooves 19 in each face thereof and intersected by one or more radial grooves as 20, as shown in Fig. 2. A secondary form of the web of the plate includes a series of vertical grooves 21 in each face thereof, having their ends connected by an annular groove as 22, as shown in Fig. 4.

The annular duct 23 is provided wholly within the peripheral rim of each plate, and this duct is connected with the outer groove in the primary form of web, or the annular groove 22 in the secondary form, by the radial ports 24<sup>a</sup> and 24<sup>b</sup> located at intervals entirely around the rim of the plate. A single outlet 25 is provided for the annular duct, and the same is located in the middle of the under side of the plate, so that the water is always discharged directly downward from the press, whence it is conveniently drained away in the customary manner, by means of a suitable trough or gutter, not shown. By this system of grooves and ports and duct, it is evident that as the filtered water can escape radially in all directions from the clay cavity, it can escape just as freely from the upper portions as from the lower portions thereof, and does not have to force its way through the lower grooves which are partially or entirely closed by the pressure of the clay on the filter sheets, with the resulting advantage that the upper portions of the cavities can be filled with the same rapidity as the lower portions thereof, and that this result is attained without any additional or increased pressure being required to pump the solution into the press. Further advantages of function and structure are attained by the improved form of the web of the plate illustrated in Fig. 6 wherein a series of radial grooves is formed between the series of radial ribs 26, 26<sup>a</sup> and 26<sup>b</sup> in continuous succession around the bottom of each concavity; the annular grooves 27 and 28 being formed respectively at the inner and outer ends of the ribs and communicate with the inner and outer ends of the radial grooves, so that each one of the radial grooves communicates with another by way of the annular grooves. The plate having the improved form of web, like the plates having the primary and secondary forms, is provided with the annular duct 23 in its peripheral rim and the radial ports 24 connecting this duct with the outer annular grooves on the respective sides of the web.

The improved form of web possesses greater strength than the primary and secondary forms for the reasons that the radial ribs are located like the spokes of a wheel, and serve to stiffen the plate to a greater degree than either of the other forms. Furthermore, as each of the grooves radiates from the center toward the outer annular groove, the filtered water always flows along a direct line to the annular groove without any tortuous curves or angles, which serves to increase the freedom with which the water can escape into the annular duct and thence through the outlet 25, which, as in the other forms, is located in the middle of the lower edge of the plate.

One or more air vents as 29, is provided in the upper edge of each plate and opens upward from the annular duct through the peripheral rim of the plate. It is quite evident that as the solution rises in the cavities, the air will freely escape in all forms of the plate upward through the various grooves and ports into the annular duct, and through the air vent, thus eliminating all need of the additional power required to force the air downwardly through the water-filled grooves and ports to an outlet in the lower portion of the plate.

It is evident that the outer wall of the annular duct serves as a shield to prevent a radial distribution of the water which is forced out of the various ports, and that by locating the air vent so as not to align with any of these ports there will be no water discharged through the vents. In other words, the annular duct serves as a clearing channel in which the air and water are separated, and in which the water flows downward and through the outlet in the lower edge of the plate and the air escapes upward through the vent in the upper edge thereof, each without conflicting in any manner with the other. It is also evident that it is not essential to use the air vent in connection with the annular duct, but it is very desirable to do so for the reason that the additional pump pressure which would otherwise be required to force the air downward through the water outlet is rendered unnecessary.

For realizing the general advantages to be derived from the use of the clearing channel or duct in the rims of the plates, it is not essential that the plates shall be made round or disk-like as illustrated and described herein, or that the apertures in the plates shall be located in the axis thereof; nor is it necessary that the plate concavities shall be grooved in any particular manner, or that the canvas sacks shall be formed and assembled with the plates in the particular manner herein set forth; although these features of the plates and press are preferred as being established by long usage.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. A filter-press including a series of col-  
located plates each having an axial aperture  
therein and concavities in each side around  
the aperture, two centrally apertured filter  
sheets between respective plates and com-  
pressed between the rims thereof, the sheets  
on opposite sides of each plate having their  
aperture edges joined through the plate ap-  
erture, a series of radial ribs with interven-  
ing grooves in each plate concavity, an annu-  
lar groove around each series and communi-  
cating with each groove thereof, an annular  
duct wholly within the rim of each plate,  
ports radiating in all directions from the  
annular grooves to the duct of each plate,  
and a water outlet in the lower side and an  
air vent in the upper side extending from  
the duct through the edge wall of each plate.

2. A filter-press including a series of col-  
located plates each having an axial aperture  
therein and concavities in each side around  
the aperture, two centrally apertured filter  
sheets between respective plates and com-  
pressed between the rims thereof, the sheets  
on opposite sides of each plate having their  
aperture edges joined through the plate ap-  
erture, a series of grooves in each plate con-  
cavity, an annular groove around each series  
and communicating in all directions with  
each groove thereof, an annular duct wholly  
within the rim of each plate, ports radiating  
in all directions from the annular grooves  
to the duct of each plate, and a water outlet in  
the lower side and an air vent in the upper  
side extending from the duct through the  
edge wall of each plate.

3. A filter-press including a series of col-  
located plates each having an axial aperture  
therein and concavities in each side around  
the aperture, two centrally apertured filter  
sheets between respective plates and com-  
pressed between the rims thereof, the sheets  
on opposite sides of each plate having their  
aperture edges joined through the plate ap-  
erture, a series of grooves in each plate con-  
cavity, an annular duct wholly within the  
rim of each plate, ports radiating in all di-  
rections from the grooves to the duct of each  
plate, and a water outlet in the lower side  
and an air vent in the upper side extending  
from the duct through the edge wall of each  
plate.

4. A filter-press including a series of col-  
located plates each having an axial aperture  
therein and concavities in each side around  
the aperture, two centrally apertured filter  
sheets between respective plates and com-  
pressed between the rims thereof, the sheets  
on opposite sides of each plate having their  
aperture edges joined through the plate ap-  
erture, a series of grooves in each plate con-  
cavity, an annular duct wholly within the

rim of each plate, ports radiating in all di-  
rections from the grooves to the duct of each  
plate, and a water outlet in the lower side  
extending from the duct through the edge  
wall of each plate.

5. A filter-press including a series of col-  
located plates each having an axial aperture  
therein and concavities in each side around  
the aperture, two centrally apertured filter  
sheets between respective plates and com-  
pressed between the rims thereof, the sheets  
on opposite sides of each plate having their  
aperture edges joined through the plate  
aperture, series of radial ribs with interven-  
ing radial grooves in continuous succession  
around the bottom of each plate concavity,  
an annular groove around the radial ribs  
and communicating with each intervening  
groove, and ports from the annular groove  
to an outlet through the rim of each plate.

6. A filter-press including a series of col-  
located plates each having an axial aperture  
therein and concavities in each side around  
the aperture, two centrally apertured filter  
sheets between respective plates and com-  
pressed between the rims thereof, the sheets  
on opposite sides of each plate having their  
aperture edges joined through the plate  
aperture, a series of grooves in each concav-  
ity, an annular duct wholly within the rim  
of each plate, ports leading from the grooves  
to the duct, and an upward air vent and a  
downward water outlet from the duct.

7. A filter-press including a series of col-  
located plates each having an axial aperture  
therein and concavities in each side around  
the aperture, two centrally apertured filter  
sheets between respective plates and com-  
pressed between the rims thereof, the sheets  
on opposite sides of each plate having their  
aperture edges joined through the plate  
aperture, a series of grooves in each concav-  
ity, an annular duct wholly within the rim  
of each plate, ports leading from the grooves  
to the duct, and an outlet from the duct.

8. A filter-press including a series of col-  
located plates having concavities in each side  
with a communicating aperture, two aper-  
tured filter sheets between respective plates  
and compressed between the rims thereof,  
the sheets on opposite sides of each plate  
having their aperture edges joined through  
the plate aperture, a series of grooves in  
each concavity, a clearing duct wholly  
within the rim of each plate, ports leading  
from the grooves to the duct, and an upward  
air vent and a downward water outlet from  
the duct.

9. A filter-press including a series of col-  
located plates having concavities in each  
side with a communicating aperture, two  
apertured filter sheets between respective  
plates and compressed between the rims  
thereof, the sheets on opposite sides of each

plate having their aperture edges joined through the plate aperture, a series of grooves in each concavity, a duct wholly within the rim of each plate, ports leading from the grooves to the duct, and an outlet from the duct.

10. A filter-press including a series of collocated plates having concavities in each side with a communicating aperture, two intervening filter sheets compressed between the rims of respective plates and joined with adjacent sheets to form cavities opening through the plate apertures, a clearing duct wholly within the rim of each plate, ports leading from each concavity to the duct, and an upward air vent and a downward water outlet from the duct.

11. A filter-press including a series of collocated plates having concavities in each side with a communicating aperture, two intervening filter sheets compressed between the rims of respective plates and joined with adjacent sheets to form cavities opening through the plate apertures, a duct wholly within the rim of each plate, ports leading from each cavity to the duct, and an outlet from the duct.

12. A filter-press plate having an axial aperture therein and concavities in each side around the aperture, a series of radial ribs with intervening grooves in each concavity, an annular groove around each series and communicating with each groove thereof, an annular duct wholly within the rim of the plate, ports radiating in all directions from the annular grooves to the duct, and a water outlet in the lower side and an air vent in the upper side extending from the duct through the edge wall of the plate.

13. A filter-press plate having an axial aperture therein and concavities in each side around the aperture, a series of grooves in each concavity, an annular groove around each series and communicating in all directions with each groove thereof, an annular duct wholly within the rim of the plate, ports radiating in all directions from the annular grooves to the duct, and a water outlet in the lower side and an air vent in the upper side extending from the duct through the edge wall of the plate.

14. A filter-press plate having an axial aperture therein and concavities in each side around the aperture, a series of grooves in each concavity, an annular duct wholly within the rim of the plate, ports radiating in all directions from the grooves to the duct and a water outlet in the lower side and an air vent in the upper side extending from the duct through the edge wall of the plate.

15. A filter-press plate having an axial aperture therein and concavities in each side around the aperture, a series of grooves in each concavity, an annular duct wholly with-

in the rim of the plate, ports radiating in all directions from the grooves to the duct and a water outlet in the lower side extending from the duct through the edge wall of the plate.

16. A filter-press plate having an axial aperture therein and concavities in each side around the aperture, series of radial ribs with intervening radial grooves in continuous succession around the bottom of each concavity, an annular groove around the radial ribs and communicating with each intervening groove, and ports leading from the annular groove to an outlet through the rim of the plate.

17. A filter-press plate having an axial aperture therein and concavities in each side around the aperture, a series of grooves in each concavity, an annular duct wholly within the rim of the plate, ports leading from the grooves to the duct, and an air vent and a water outlet from the duct.

18. A filter-press plate having an axial aperture therein and concavities in each side around the aperture, a series of grooves in each concavity, an annular duct wholly within the rim of the plate, ports leading from the grooves to the duct, and an outlet from the duct.

19. A filter-press plate having concavities in each side with a communicating aperture, a series of grooves in each concavity, a clearing duct wholly within the rim of the plate, ports leading from the grooves to the duct, and an air vent and a water outlet from the duct.

20. A filter-press plate having concavities in each side with a communicating aperture, a series of grooves in each concavity, a duct wholly within the rim of the plate, ports leading from the grooves to the duct, and an outlet from the duct.

21. A filter-press plate having concavities in each side with a communicating aperture, a clearing duct wholly within the rim of the plate, ports leading from each concavity to the duct, and an air vent and a water outlet from the duct.

22. A filter-press plate having concavities in each side with a communicating aperture, a duct wholly within the rim of the plate, ports leading from each concavity to the duct, and an outlet from the duct.

23. As an improved article of manufacture, a filter press plate consisting of a corrugated web and a hollow integral rim, said corrugated web provided with a central aperture, a series of ports leading from the sides of the corrugated web into and communicating with the hollow rim, the walls of said hollow rim and web formed substantially of the same thickness, substantially as and for the purpose specified.

24. In a filter press plate a web portion

and a chambered rim portion, said rim portion provided with a series of ports leading from the sides of the web into the interior of the chambered rim portion and an outlet  
5 in said rim portion providing means for the discharge of water from said chambered portion.

25. A filter press plate provided with a chambered rim portion said chamber being  
10 provided with ports for the entrance of wa-

ter from the filter and an outlet for the discharge of water.

26. The herein described filter press plate comprising a web portion and a rim portion, said rim portion being chambered.

HORACE H. WHITING.

Witnesses:

JOSEPH FREASE,  
HARRY FREASE.